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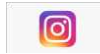 @journalofekonomi

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Cruise Industry in Greece: Possibilities and Prospects

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ABSTRACT

The cruise industry is considered among the most rapidly growing alternative tourism sector worldwide, exhibiting rising demand trends over the last decades., The origin of cruising in Greece go back to 1930s, at a time when the first Greek cruise firms introduced cruising routes in the Aegean Sea and the greater area of the Mediterranean basin. At present, the Greek cruise tourism can be considered as a significant participant in the broader East Mediterranean market. The objective of this paper is to examine whether there is a correlation, and in what extent, between the cruise passengers' arrivals, the international airports' arrivals and the GDP per capita for six Greek regions/regional units. For this purpose, data are collected from a range of official sources, including national accounts derived from the Hellenic Statistical Authority and the Bank of Greece, the Hellenic Ports Association and the Civil Aviation Authority and they are referred to the 2010-2016 period. Studying the statistical relationship between the three variables, we found mixed results among the examined Greek regions for the defined time intervals. Our empirical findings contribute to the existing literature by providing useful conclusions for the cruise industry's impact on the Greek regions' GDP growth.

1. Introduction

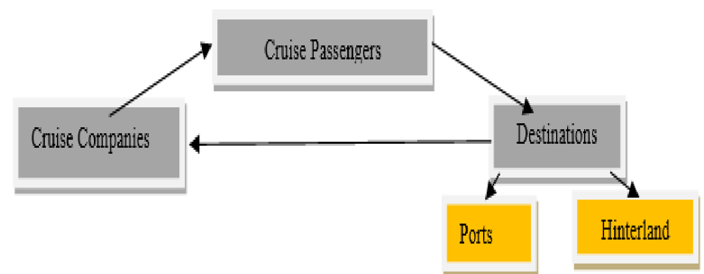
International tourism is one of the fastest-growing service sectors in the world, especially during periods of economic crisis (McIntoch, Goeldner, & Ritchie, 1995; Tang & Tan, 2017; Isik et al., 2017; Isik et al., 2018; Kasimati, & Ioakeimidis, 2019). In addition, it is both the engine for generating economic growth (Belloumi, 2010; Clancy, 1999) and the leading driver of socio-economic progress (Shahzad et al., 2017). Moreover, the expansion of the tourism industry is considered as the engine of tourism development worldwide (Brida & Risso, 2009; Tang & Tan, 2013; Paramati, Alam & Chen, 2017).

Due to the negative effects of mass tourism, since the early 1980s, interest has shifted to alternative forms of tourism (Järviluoma, 1992). Cruise tourism, part of Maritime Tourism, presents increasing trends in both the demand and the offer of products and is emerging to become one of the fastest-growing segment of the tourism industry (Sun, Feng & Gauri, 2014; Sanz Blas & Carvajal-Trujillo, 2014; Dowling & Weeden, 2017; McCaughey, Mao & Dowling, 2018). The cruise sector represents the example of globalization: natural mobility, capital that can be transferred anywhere and at any time, crews coming from different countries on the same ship, favorable regulations and maritime registrations chosen in the best possible way (Brida & Zapata, 2010). This rapid growth of cruise tourism (Brida et al., 2012a, b, 2014) has been due to the incorporation of mega-cruise ships and new ports of call (Douglas & Douglas, 2004; Sanz Blas & Carvajal-Trujillo, 2014). For that reason, a variety of concerns raises regarding the environment, economic benefits, social climate, cultural integrity of cruise destinations, especially in the ports of the regions whose rich cultural heritage has made them strategic destinations for operators of cruises (Perce et al., 2018; Adams, 2017; London & Lohmann, 2014; Klein, 2011; Brida & Zapata, 2010; Hritz & Cecil, 2008; Klein, 2007; Jonhson, 2002; Marsh, 2012; Ritter & Schafer, 1998; Rodrigue & Notteboom, 2013; Rosa-Jimenez et al., 2018; Dragovic et al., 2015).

First of all, a cruise product is a combination that includes the cruise ship as destination (Dowling, 2006; Erkoc, Iakovou & Spaulding, 2005; Karlis & Polemis, 2018) as well as the itinerary, which includes transit ports along the journey (Esteve- Perez & Garcia-Sanchez, 2015; Karlis & Polemis, 2018). It is characteristic that the cruise ship is a 'mobile resort' comprising a wide range of pleasant and comfortable activities for travelers of different age, place of residence and socio-economic profile (UNWTO, 2012; Brida & Zapata, 2010; Sun, Feng & Gauri, 2014; Esteve-Perez & Garcia-Sanchez, 2018), which transport passengers from place to place in the form of a floating hotel. The cruise ship is a mobile, secure, social and friendly customer service tool, providing easy access to many of the world's most popular destinations (Gibson, 2006, 2008; Pizam, 2008; Ferrante, De Cantis & Shoval, 2018).

A cruise ship represents all four faces of the tourism industry: transportation, accommodation (including food and beverages), attractions and tour operators (Brida & Zapata, 2010). The cruising evolves as a hybrid form of tourism and transport. The key players in the cruise industry and their interactions are shown in Figure 1. There are three key players in the cruise circuit, the individuals - cruise buyers, the cruise companies, which design and offer the cruise trips and the destinations, which consist of ports and hinterland (Niavis & Vaggelas, 2016).

Figure 1: The basic players of the cruise industry



Source: Niavis & Vaggelas, 2016

Cruise companies consider the port very important for the cruise ship's operational stages (Esteve-Perez & Garcia-Sanchez, 2018). Three features the port has to offer: airline connections, transport of many people and must be a unique destination (Rodrigue & Notteboom, 2013). Moreover, the decision of cruise passenger to purchase a cruise trip is subject to motivation and emotional factors such as relaxation, socialization, and exploration (Hung & Petrick, 2011; Niavis & Tsiotas, 2018). For that reason, the route is

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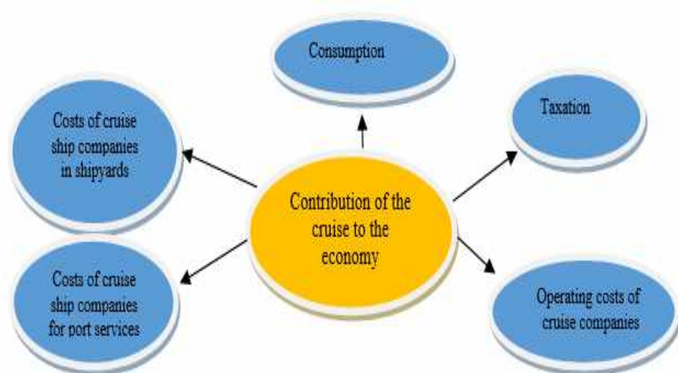
still a central component of consumer cruise selection (Johnson, 2006; Esteve-Perez & Garcia-Sanchez, 2015). Furthermore, choosing a port needs to be attractive, that is, near or in the vicinity of other cruise ports, in order to plan a route. Moreover, in a series of intermediate ports there must be a mix of 'must-see' ports and ports to be discovered, depending on the tourist attractiveness of each port. 'Must-see' ports are world-famous ports that are essential for any route. Discovery ports are not universally known, but they do offer a sense of discovery of an unknown treasure (Rodrigue, Comtois, & Slack, 2013; Esteve-Perez & Garcia-Sanchez, 2018).

According to their use by cruise companies, cruise ports are distinguished in three categories (Lekakou, Pallis & Vaggelas, 2009; Lekakou, Pallis & Vaggelas, 2009a; Lekakou, Pallis & Vaggelas, 2009b; Troumpetas et al., 2015; Pallis et al., 2017). The first one is that of homeports. These ports are the starting, or ending point for a cruise, or even both these points. The second category is the port calls or transit calls, in which cruise ships stay for a specific short time of between 5 and 6 hours (Brida et al.a,b, 2012). The third category is the hybrid ports, which are a blend of the previous categories; these ports are homeports for some cruise itineraries but they also act as intermediate ports for other cruise itineraries.

Therefore, the establishment of a port as a homeport is directly related to the provision of integrated services for cruise ships, crew members and passengers, as well as the ability of the port hinterland to ensure passenger accommodation, etc. (Niavis & Vaggelas, 2016). Most ports aim to attract services that provide a large margin and have a high economic impact on local communities (Kefala, 2016). The cruise sector relies on the deep interconnection between sites, contributing to their development at social, cultural and economic level (Dowling, 2006). The economic impact of cruising on a port destination is identified in the consumption activity of three sources, the cruise companies themselves, the cruise passengers and the vessels crews (Lekakou, Stefanidaki & Vaggelas, 2009c; Pallis et al., 2017; Brida & Zappata, 2010). The cruise industry is a major source of income for cruise lines and workers, and multiplier benefits are generated in the visited destinations by increasing or improving profits, tax revenue, employment, foreign exchange earnings and economies of scale, raising living standards, improving infrastructure, maintaining and harnessing urban and rural areas, improving public services, improving the quality of catering services, which also spread to neighboring areas with cruise ships' ports, such as hotels, restaurants, transportation, local attractions (Perce et al., 2018 ; Dwyer & Forsyth, 1998 ; Liu & Var, 1986; Akis, Peristianis & Warner, 1996; Tosun, 2002; Brida et al., 2012a,b).

The economic benefits affecting the local, regional and national economy include: a) supplies (consumable, food, clothing, fuels, lubricants, etc.); b) port services (mooring, light dues, etc.), c) local and State tax revenue; d) shipyards (buildings and repairs); e) passenger and crew spending (Dwyer & Forsyth, 1998; Diakomihalis et al., 2009; Castillo-Manzano, Lopez-Valpuesta & Alanis, 2014).

Figure 2: The effect of the cruising on the economy



Source: Lekakou & Pallis (2005)

In addition, the continuing increase in ship size and the average number of passengers per port are putting pressure on Authorities to extend infrastructure to accommodate larger cruise ships. Infrastructure investment plays a vital role in attracting cruise passengers and spreading the economic benefits of cruise ship approaches to port cities (Dwyer & Forsyth, 1996; Chang et al., 2016; Karlis & Polemis, 2018). The economic impact is expected to vary at local, regional and national level (Dwyer & Forsyth, 1998).

Cruise companies estimate that at the homeport a passenger spends three times more than he spends at the transit call. Also, the benefits that a destination receives from cruise ship access through the spending of tourists and crew members may be perceived differently by stakeholders (e.g. companies, travel agencies, hotels, shops) (Lopes & Dredge, 2018).

Prior to 2000, academic research related to the cruise sector was limited (Wild & Dearing, 2000; Papathanassis & Beckmann, 2011). Papathanassis & Beckmann (2011) note that cruise tourism research is often conducted in a highly controlled environment where cruise operators maintain surveillance and access to research opportunities. In particular, the cruise industry is cooperating to produce research that supports the positive effects of this sector. Although the number of cruise researches has largely increased, it still remains in the areas of administration, sociology, psychology, economics, as reported by Papathanassis & Beckmann (2011). In particular, a significant number of studies have analyzed the positive and negative impacts of the cruise sector on economic, environmental, socio-cultural and political reception sites (eg Brida & Zapata, 2010; Dwyer, Douglas & Livaic, 2004; Dwyer & Forsyth, 1998; Eijgelaar, Thaper, & Peeters, 2010; Klein, 2009, 2010; Scherrer, Smith, & Dowling, 2011; Scarfe, 2011; Stewart & Draper, 2006 ; McKee & Chase, 2003 ; Gibson & Bentley, 2006 ; Wilkinson, 1999; Brida & Risso, 2010 ; Hall & Braithwaite, 1990 ; Silvestre, Santos & Ramalho, 2008). However, there are very few publications concerning the cruise industry locally for sustainable development (e.g. Hritz & Cecil, 2008), the interaction between cruise liners and their hosts and hosts (e.g. Klein, 2011), evaluating the impact on the financial sector (e.g. employment opportunities, crew and passenger costs of cruise liners and how hosts perceive them), the likelihood of returning cruise liners to visit in the same destination as individual tourists or recommend to the friendly people, which creates the so-called «showcasing effect» (Gabe, Lynch & McConnon, 2006). Recent research focuses on the perceptions and behaviors of residents for the development of cruise tourism in their area (eg Del Chiappa & Abbate, 2013; Brida, et al., 2012b, 2012a; Hritz & Cecil, 2008; Marusic, Horak & Tomljenovic, 2008; Diedrich, 2010; Gatewood & Cameron, 2009). Scholars agree that the development of alternative tourism is possible when there is co-operation between all relevant authorities, local authorities, local communities and the government in shaping tourism policy (Vernon et al., 2005). Studies have also focused on areas such as the Caribbean (e.g. Hritz & Cecil, 2008), Canada (e.g. Stewart et al., 2007), the islands of Italy, Sicily and Sardinia (e.g. Pulina, Meleddu & Del Chiappa, 2013).

Empirical studies have been conducted for Greece to analyze the impact of the cruise industry on the Greek economy. To give some examples, Diakomihalis (2007) analyzed the characteristics of Greek marine tourism (cruise, yacht and coastal marine recreation) and highlighted their positive and negative impacts and their prospects for the Greek economy. Diakomihalis et al. (2009) studied the potential benefits and contributions of the cruise sector to local communities in Greece and concluded that this sector has significant economic impacts on local communities.

Lekakou, Pallis & Vaggelas (2009) analyzed and prioritized the criteria by which Greek cruise companies choose the homeport. Andriotis & Agiomirgianakis (2010) presented the port of Heraklion Crete in order to identify factors related to the motivation, satisfaction and likelihood of returning cruise liners to the area. Moira & Mylonopoulos (2010) evaluated services on two cruise ships with different destinations (Aegean and Eastern Mediterranean) and concluded that both the port of departure and the ports approaching the port and the services offered were also important. Diakomihalis & Lagos (2011) analyzed leisure shipping in Greece and assessed its financial contribution to the Greek economy. Lekakou, Stefanoudaki & Vaggelas (2011) conducted on the island of Chios as an emerging area for cruises and concluded that cruising is a promising sector for the island's economy. Stefanidaki & Lekakou (2012) analyzed the economic impact of the cruise sector on the port of Piraeus. Simantiraki & Skivalou (2013) explored the capacity, existing infrastructure, benefits of the port of Agios Nikolaos, Crete, and proposed measures to improve the cruise sector. Simantiraki, Skivalou & Trihas (2015) investigated the characteristics, experience, activities of a tourist visiting the port of Agios Nikolaos in Crete with cruise ships and compared them with other Mediterranean ports. Troumpetas et al. (2015) analyzed the governance model and pricing policy of the twenty-two ports in general and the factors in cruise pricing in the port of Heraklion Crete in particular, during the period 2008-2014.

Taking the aforementioned into account, the purpose of this research is to shed light on the existing institutional and economic framework of the Greek cruise industry and to assess the major economic implications that the cruise industry induces in Greece, taking into account the fact that the country is still

through its tenth year of economic recession. This paper examines whether there is a correlation, and in what extent, between firstly, the cruise passengers' arrivals, secondary, the air arrivals of foreign passengers affect the GDP per capita of the region and/or regional unit of Greece in the period 2010 and 2016 by applying different time intervals of the three variables. The findings are important in identifying the impact of the cruise industry on GDP growth of Regions / Regional Unit of Greece.

The article is structured as follows. Section 2 analyses the features of the global cruise market and Section 3 focuses on the European cruise market and especially on the Mediterranean region. Section 4 analyses the features of the Greek cruise market and presents the ports of Regional Units of Greece. Section 5 presents the methodology used for calculating the impact of cruise activity in Regions / Regional Units of Greece and the empirical results of this research. Finally, the paper concludes by discussing the results and discusses suggestions for further research as well as the potential use for policy formation from the cruise ports of the Regional Unit / Region.

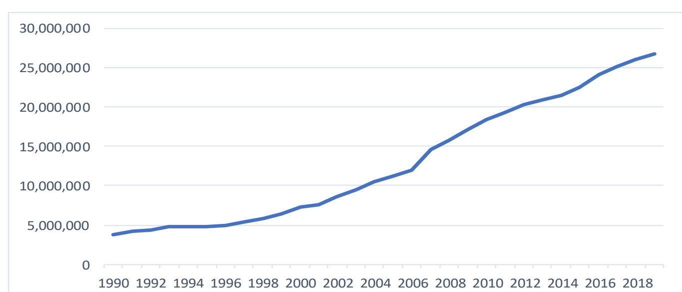
2. The World Cruise Market

Cruise tourism has recorded continuous growth the last twenty years, despite the economic crisis, with the average growth of 7% per annum (FCCA, 2017; Karlis & Polemis, 2018; Vaya et al, 2018; Simantiraki, Skivalou & Trihas, 2015). The global increase in cruise passengers since 1990, when 3.8 million people decided to take a cruise within a year. In 2004, more than 10 million people took a cruise within a year (UNWTO, 2017). CLIA (2018), points out that global demand for cruises has increased by 50% from 17.8 million passengers in 2009, to 26.7 million in 2017 representing an increase of 5.4% annually. For that reason, a variety of concerns raises regarding the environment, economic benefits, social climate, cultural integrity of cruise destinations, especially in the ports of the regions whose rich cultural heritage has made them strategic destinations for operators of cruises (Perce et al., 2018; Adams, 2017; London & Lohmann, 2014; Klein, 2011; Brida & Zapata, 2010; Hritz & Cecil, 2008; Klein, 2007; Jonhson, 2002; Marsh, 2012; Ritter & Schafer, 1998; Rodrigue & Notteboom, 2013; Rosa-Jimenez et al., 2018; Dragovic et al., 2015).

This market is an oligopoly, after some integrations and acquisitions and 80% is dominated by three companies (Carnival Corporation & plc (CCL), Royal Carribean Ltd. (RCL), Norwegian Cruise Line (NCL) (Lekakou, Pallis & Vaggelas, 2009a; Lekakou, Pallis & Vaggelas, 2009; Lekakou, Stefanidaki & Vaggelas, 2011; Chang, Lee & Park, 2017; Vaggelas & Pallis, 2016; Bjelicic, 2012) and achieve a portfolio of widely recognized cruise brands that serve different lifestyles and budgets, targeting different cultures and demographic groups (Datamonitor, 2012). The structure of the oligopolistic market in the cruise sector has its roots in two factors: the huge fixed costs required for the operation of the cruise and the high entry barrier (Papatheodorou, 2006; Chang, Lee & Park, 2017).

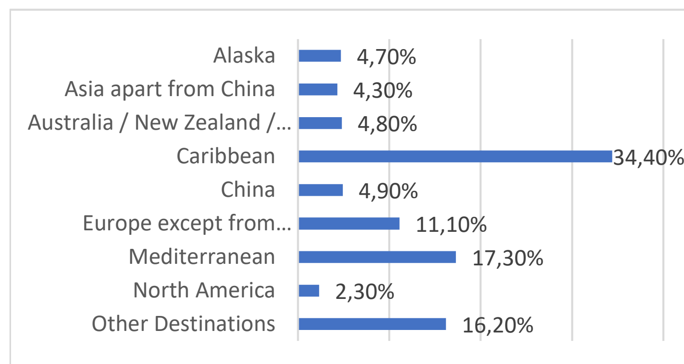
Although the main tourist destination of cruise ships was the Caribbean in the 1970s, which serves the 34% of the total cruise passengers, the following years appeared destinations like Gulf of Mexico, Atlantic, Pacific, Northern Europe, Asia, Australia, New Zealand and especially the Mediterranean region, which is the second most popular destination (17%) (Vaya et al., 2018; Rosa-Jimenez et al., 2018; Mancini, 2014; Sun, Feng & Gauri, 2014). The European cruise industry has been on the rise as demand for cruises has increased by 72% over the last decade (CLIA, 2018). The cruise market in Asia has also grown rapidly in recent years. The annual number of cruise passengers in Asia increased from 0.85 million in 2005 to 1.27 million in 2010 and is expected to reach 2.02 million in 2020 at a growth rate of 4.8% (CLIA, 2011). The Asian market differs from the South American and European market in terms of different stages of development, demographic characteristics and travel choices (Chang et al., 2016).

Chart 1: Arrivals of cruise passengers worldwide



Source: Cruise Market Watch, www.cruisemarketwatch.com

Chart 2: Development of cruise popular destinations, 2018



Source: Cruise Market Watch, www.cruisemarketwatch.com

During the global economic crisis, the cruise industry is an indicative example showing the notable resistance to economic recession (Lekakou, Stefanidaki & Vaggelas, 2011). The rapid growth of the cruise industry has increased the interest of many countries as they consider it to be the key to tourism development. For the economic impact of the cruise industry, many international metropolises have been affected by the cruise economic element (Sun, Jiao & Tian, 2011; Sun, Feng & Gauri, 2014) and are economically dependent on the sector (Teye & Leclerc, 1998; Sun, Feng & Gauri, 2014). Several destinations are interested in being included in the selected group of ports selected by the cruise companies (Lekakou, Pallis & Vaggelas, 2009). Many ports are aimed at attracting cruise companies, as the economic contribution to the site increases significantly and the result is longer lasting (Lekakou & Stefanidaki, 2015) and policymakers argue that it is worth spending money to build new terminals and for expanding infrastructure (Brida, Riano & Zapata-Aguirre, 2011). For example, emerging markets, such as Asia, Australia and the New Zealand region, are growing rapidly and they are trying to build and improve port infrastructure to be selected as part of a selected group of ports by large cruise companies (Brida et al., 2012a, b; Sun, Feng & Gauri, 2014). In particular, more than 20 ports have been built to attract cruise ships in Asia and many of the biggest cruise companies have launched cruises to this market (Sun, Feng & Gauri, 2014). Though, in terms of cruise lines, the business is limited by the size and development of existing environmental protection infrastructures and regulations (Pesce et al., 2018).

According of the results of the International Cruise Companies (CLIA) annual study published in 2017, cruising has a significant positive impact on the world economy. The study estimates the total economic impact of the cruise on the global cruise at $ 133.96 billion, taking into account the indirect and associated costs, offering full-time employment to 1.108.676 million employees and $ 45.6 billion in 2017 revenue. For this reason, in the year 2018, thirteen new cruise ships with a capacity of 33,379 passengers were added to the existing cruise ship list. From 2018 to 2020, 37 new cruise ships with a capacity of 99,895 passengers are expected to add 11.7 billion annual revenues to the global industry (Cruise Market Watch, 2018).

Therefore, cruise companies are required to introduce new products (routes) with a larger and more diversified range of ships and durations of journeys, in order to differentiate themselves from competitors and to attract different market segments (Bagis & Dooms, 2014; Niavis & Tsiotas, 2018). Specifically, companies set up ports that include ports of different sizes, as each type of port provides different types of experiences by highlighting different types of customer attraction among different port access options (Esteve-Perez & Garcia-Sanchez, 2018). In their search for new destinations, companies consider port geopolitics, congestion, modernization of infrastructure, effective port services, institutional stability of cruise destinations and the level of port and tourist hinterland security to provide 'safe and comfortable' routes. These factors influence both the continuous development of the cruise destination and the success of a particular itinerary (Esteve-Perez & Garcia-Sanchez, 2018). They note that travelers may present different patterns depending on whether they are in a homeport or a transit port. Although travelers in a transit port give priority to local attractions, travelers to a homeport tend to get in touch with locals and gain experiences through local culture. Also important is the interaction between residents and visitors, in which if they were satisfied, then positive impressions of their trip were formed and fulfilled the wishes, expectations and needs created by the travel decision (Chen & Tsai, 2007; Artal-Tur, Villena-Navarro & Alama-Sabater, 2018). If tourists are satisfied then they will visit the destination

again and they recommend it to friends and relatives (Geng-Quin Chi & Qu, 2008; Yuksel, Yuksel & Bilim, 2010; Kozak & Decrop, 2008; Artal-Tur, Villena-Navarro & Alama-Sabater, 2018).

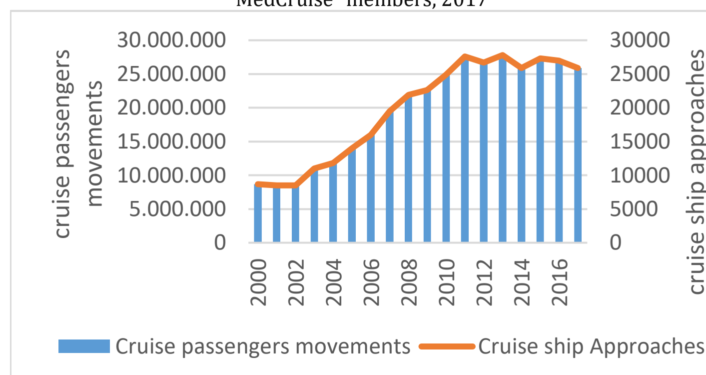
3. The European Market

The cruise industry continues to show strong dynamics in Europe and is a key market for the global cruise industry (Simantiraki, Skivalou & Trihas, 2015). The Mediterranean basin has become a particularly attractive destination, both for cruise tourists and for companies operating in the cruise industry (Skagiannis & Rallias, 2012). The Mediterranean market can be subdivided into the east and west, with the Italian peninsula being a natural frontier (Lekakou & Tzannatos, 2000; Lekakou & Stefanidaki, 2015). Several specific geographic markets can be distinguished in the Eastern Mediterranean, namely: (i) the Aegean, (ii) The Black Sea (iii) Levante (Cyprus – the Holy Land – Egypt) and (iv) Venice – the Adriatic – Ionian Sea (Lekakou & Stefanidaki, 2015).

The main pioneering markets are Germany, the United Kingdom (including Ireland), Italy, Spain and France. The number of passengers in Europe increased from 5.5 million to 6.96 million, representing 26% (CLIA, 2018). The Mediterranean is a self-contained market with most cruises coming and ending in this particular area. Many Mediterranean regions with key ports accepted the new role as "tourist ports" (Rosa-Jimenez et al., 2018; McCarthy, 2003). In the Mediterranean basin, it corresponds to 60% of the capacity developed in Europe with 28 million days of residence (CLIA, 2018). In the year 2017, the main port of the Mediterranean remains Barcelona, while the port of Piraeus occupies 5th place. Important Mediterranean destinations or transit ports are Rome (Civitavecchia), Palma of Mallorca, Venice, Genoa, Savona, Marseille, Tenerife (CLIA, 2018; Vaya et al., 2018). Correspondingly, northern Europe grew by 18.8 million days of stay. Most cruises come and end in the area. The main port is Southampton, while the most important destinations are Stockholm, St. Petersburg, Lisbon (CLIA, 2018).
In particular, in the last decade, in the Mediterranean, the number of passengers has risen by 111% (Karlis & Polemis, 2018). However, in the period 2011 – 2016, there was a 16% reduction in cruise ship approaches and 4% on passenger throughout, respectively. This change in trend comes from external factors, such as the Arab Spring, the fiscal measures adopted by southern countries, the war in Syria, the political instability in Turkey and the negative publicity accompanying the socio-economic crisis that Greek economy is experiencing. These events have reduced the attractiveness of the southeastern Mediterranean as a cruise destination (Karlis & Polemis, 2018; Organization of Research and Analysis, 2018).

In the year 2017, the ports of the Union "MedCruise" took place 12,139 cruise ship approaches and 25.9 million passenger movements. Compared to the year 2016, the number of ship approaches decreased by 7.3% and passenger movements by 4.1%, respectively (Chart 3).

Chart 3: Cruise passengers' movements & Cruise ships' approaches of "MedCruise" members, 2017



Source: Processing data "MedCruise Report Statistics 2017" http://www.medcruise.com/sites/default/files/2018-03/cruise_activities_in_medcruise_ports-statistics_2017_final_0.pdf

According to MedCruise's annual data (2017), in Table 1 listed the top ten ports of MedCruise members. Barcelona, Rome (Civitavecchia) and Tenerife were the only ports to increase passenger movements compared to 2016. Tenerife grew by 9.1% to 7th place, Barcelona increased passenger movements by 1.1% and remained in the first place, while the Balearic Islands increased by 7.8% and consolidated 3rd. It is noteworthy that the Balearic Islands increased passenger movements by 36.93% in the last five years. Similarly, Tenerife has increased passenger movements by 21.43% over the last five years.

Table 1: Major MedCruise Port Members (Passengers Movements)

Rank 2017	Rank 2016	Port	Passengers Mov. 2017	Passengers Mov. 2016	2017/2016	Passengers Mov. 2013	2017/2013
1	(1)	Barcelona	2.712.247	2.683.594	1,07%	2.599.232	4,35%
2	(2)	Rome (Civitavecchia)	2.204.336	2.339.676	-5,78%	2.538.259	- 13,16%
3	(3)	Balearic Islands	2.110.663	1.957.429	7,83%	1.541.376	36,93%
4	(5)	Marseille	1.487.313	1.597.213	-6,88%	1.188.031	25,19%
5	(4)	Venice	1.427.812	1.605.660	-11,08%	1.815.823	- 21,37%
6	(7)	Piraeus	1.055.559	1.094.135	-3,53%	1.302.581	- 18,96%
7	(10)	Tenerife	964.337	884.173	9,07%	794.151	21,43%
8	(6)	Naples	927.458	1.306.151	-28,99%	1.175.018	- 21,07%
9	(8)	Genova	925.188	1.017.368	-9,06%	1.050.085	- 11,89%
10	(9)	Savoy	854.443	910.244	-6,13%	939.038	-9,01%

Source: Processing data "MedCruise Report Statistics 2017" http://www.medcruise.com/sites/default/files/2018-03/cruise_activities_in_medcruise_ports-statistics_2017_final_0.pdf

In the case of the European Union, the major contribution of the global cruise industry is attributed to three factors. Firstly, the majority of new orders for cruise ships are placed in European shipyards (Italy, France, Germany). Secondly, a significant number of passengers come from European Union countries, namely Germany, the United Kingdom and Ireland, Spain and Italy. Finally, the abundance of cruise destinations, both in the Mediterranean and secondarily in northern Europe, has helped to develop the cruise industry and to increase the costs incurred by passengers, cruise companies and cruise liners (Organization of Research and Analysis, 2018).

According to the results of the annual International Cruise Companies Association (CLIA) study published in 2017, the direct financial contribution of cruise activities to the European economy amounted to $ 21.34 billion (spending by cruise companies, passengers and crew members). The study estimates the total economic impact of the cruise on the European cruise at $ 51.85 billion, taking into account the indirect and incurred costs. On the European continent, 403,621 jobs have been retained.
According to CLIA Europe (2017), 40 cruise companies are based in Europe, operating 137 ships with a capacity of approximately 164,000 beds. Another 75 ships with a capacity of about 95,000 beds are being deployed in Europe by 23 non-European cruise lines. In addition, in the Mediterranean market, the dominant companies are Carnival Corporation & plc (CCL) and Royal Carribean Ltd. (RCL), which account for 60% of the market, while MSC Cruises account for 20% (Karlis & Polemis, 2018; Cusano, Ferrari & Tei, 2017).

4. The Greek cruise tourism

At present, the Greek cruise tourism can be considered as a significant participant in the broader East Mediterranean market. Greece as the country with the longest coastline and numerous islands, mild climate, rich cultural and religious background, gastronomy, local tradition and culture and natural environment make it one of the most important tourist destinations in the world and especially in the Mediterranean basin. In Greece, the origin of cruising goes back to 1930s, at a time when the first Greek cruise firms introduced cruising routes in the Aegean Sea and the greater area of the Mediterranean basin (Diakomihalis, 2009; Diakomihalis et al., 2009). In particular, Greece is the fourth popular destination of the Mediterranean area, but is the eighth in revenue from the specific market (Organization of Research and Analysis, 2018). The tourism sector in Greece has undergone significant changes in recent decades. It is worth noting that, up to 1999, the Greek cruise sector was operating under cabotage protection. The aim of the European Law (No 3577/92) was to create a market between the Member States and the equalization of all European flags. Nowadays, the Law No 4439/2016, has been included the Community Directive on the use of liquefied natural gas. For Greece, the ports of Piraeus, Thessaloniki, Igoumenitsa, Heraklion and Patras should be able to supply ships with LNG fuel (Nautemporiki, 2018). It is noted that after 1999, none of the companies-

colossus was interested in using Greek ports as homeports. It proves that institutional interventions were inadequate and did not occur increase in cruise passengers at homeporting in the Greek islands (Kefala, 2016; Vaggelas &Stefanidaki, Pallis et al., 2017). The discouraging picture of Greek ports as homeports is due to the lack of a port which has all the necessary prerequisites (port infrastructure) to attract large cruise ships and cruise itineraries throughout the year (Pallis et al., 2017; Troumpetas et al., 2015; Vaggelas & Stefanaki, 2015).

In the Greek Tourism Confederation study (SETE, October 2018), according to data of Bank of Greece, in 2016, cruise passenger arrivals amounted to 3.4 million with an increase of 28.7%, while according to the data of the year 2017, there was a decrease of 10.3%. Most arrivals take place between May and October. Total cruise tourist spending in 2015 amounted to €504 million, in 2016 to €509 million, while in 2017 it decreased to €476 million, or 6.4%. Also, in 2016 and 2017, average spending per passenger's arrival was €150 and €156 respectively, whereas the year 2015 was €191.

The Union of Greek Ports has collected the arrivals of cruise liners and cruise passengers from its members (Port Authority SA) and Members - Observers (Ports Funds). The data relates to cruise ships and passenger visits to each port separately, as cruise travel is cyclical and ship and passenger visits can relate to arrivals to more than one destination (Union of Greek Ports, 2019).

According to data from the Union of Greek Ports (2018), the Greek port system includes forty-three (43) registered destinations (land and island) throughout our country. In their geographical distribution by region, we find (2) ports in the Region of Eastern Macedonia and Thrace, one (1) in the Region of Central Macedonia, two (2) ports in the Region of Epirus, three (3) in the Region of Thessaly and the Region of Ionian Islands. two (2) in the Region of Western Greece, one (1) in the Region of Central Greece, three (3) in the Region of Attica, five (5) in the Region of the Peloponnese, four (4) in the Region of Northern Aegean, twelve (12) ports in the Region of South Aegean and five (5) in the Region of Crete.

The forty-three (43) cruise ports are separated, based on the total number of cruise passengers they host each year, in primary and secondary ports. The main (M) ports include Greek ports that handle 100,000 visitors per annum (based on 2018). Secondary (S) ports include those that handled less than 100,000 passengers for the year 2018 (Table 2). The ten main Greek ports received a total of 4.539.933 million visitors in 2018, or 94.8% of the country's total cruise visitors and 2.805 cruise ship approaches.

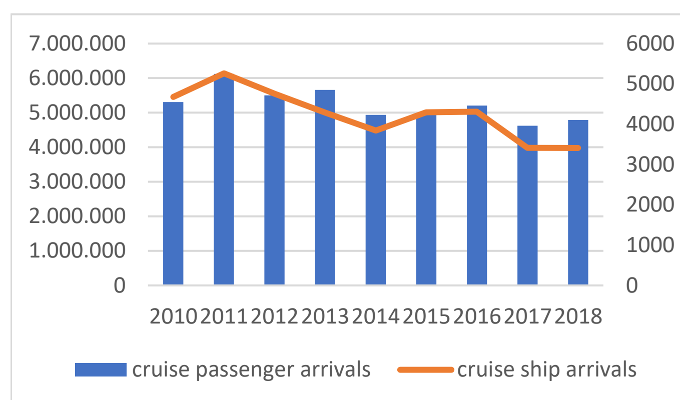
Table 2: Primary and Secondary Cruise Ports of Greece, 2018

Category	Description	Number of ports	Ports
Primary ports	Cruise passenger arrivals> 100.000 per year	10	Piraeus, Santorini, Kerkyra, Mykonos, Katakolo, Herakleio, Rhodes, Kefallonia – Ithaki, Chania (Souda), Patmos
Secondary ports	Cruise passenger arrivals < 100.000 per year	33	Nayplio, Volos, Syros, Milos, Samos, Zakynthos, Agios Nikolaos, Hgoumenitsa, Monemvasia, Githio, Skiathos, Kalamata, Symi, Kos, Itea, Naxos, Pylos, Paros, Skopelos, Kavala, Chios, Patra, Thessaloniki, Sitia, Rethymno, Ios, Alexandroupoli (Samothrakes), Limnos, Mytilini, Kythyra, Layrio, Preveza, Andros

Source: Processing data by Union of Greek Ports (2018), www.elime.gr

According to the available data from the Union of Greek Ports (2018), in total, during the period 2010-2018, the above (43) ports of our country were visited by cruise passengers and cruise ship approaches. Despite the significant figures, the trends of recent years are not particularly encouraging. By comparison, cruise ship arrivals to Greek cruise ports in 2010 and at the end of 2018 are down by around 9.8%. In 2010, cruise ship arrivals to Greek ports totaled 5.3 million, with cruise ship approaches reaching 4,677. In 2018, these sizes declined, as cruise passenger arrivals were 519,417 fewer and cruise ship approaches dropped by 1,267 approaches (Chart 4).

Chart 4: Cruise ship arrivals and cruise passenger arrivals in Greek ports, 2010-2018



Source: Processing data by Union of Greek Ports (2010-2018), www.elime.gr

Specifically, according to Union of Greek Ports data available for the year 2018, 3.410 cruise arrivals (vs. 3.415 in 2017) and 4.788.642 cruise visits (vs 4.625.363 in 2017) were recorded in all cruise destinations. In conclusion, retained the same view as 2017, after the same number of arrivals and a slight increase in passenger visits of around 3.5%. Despite the geopolitical problems that have arisen over the last two years in the Eastern Mediterranean, the Greek cruise remains strong.

Currently, six ports (Piraeus, Thessaloniki, Heraklion, Kerkyra, Lavrio, Rodos) from Greek ports also operate as homeports on cruise market (Union of Greek Ports, 2018). In 2018, these ports received 2,234,703 million cruise passengers, or 46.67% of all passengers. Cruise ship approaches amounts to 1.339 (Table 3).

Table 3: Greek Homeports, 2018

No	Port	Arrivals of cruise passengers	Approaches of cruise ships
1(M)	Heraklion	297.929	187
2(S)	Thessaloniki	1.502	5
3(M)	Kerkira	735.832	413
4(S)	Lavrio	0	0
5(M)	Piraeus	961.632	524
6(M)	Rhodes	237.808	210

Source: Processing data by Union of Greek Ports (2018), www.elime.gr

5. Methodology and Results

The research examines the impact of the cruise industry on GDP growth of Regions / Regional Units of Greece. In particular, we examine whether there is a correlation, and in what extent, between firstly, the cruise passengers' arrivals, secondary, the air arrivals of foreign passengers affect the GDP per capita of the Region and/or Regional Unit of Greece in the period 2010 and

2016 by applying comparison of different time intervals of the three variables. The findings are important in identifying the impact of the total of passengers' arrivals (cruise passengers' arrivals and the air arrivals of foreign passengers) on GDP growth of Regions / Regional Units of Greece.

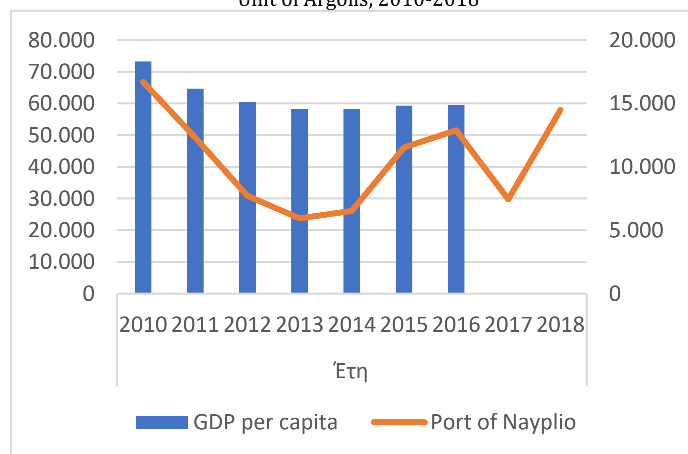
Our empirical approach is based on data, are collected from a range of official sources: including national accounts derived from the Union of Greek Ports (ELIME, 2019[1]), the Hellenic Statistical Authority (ELSTAT, 2019[1]) and the Bank of Greece (Bank of Greece, 2019[1]) and the Civil Aviation Authority (CAA, 2019[1]). In particular, the Gross Domestic Product (GDP) per capita by Regional Unit and / or Region is annual (in euro and current prices) and we derive it from the Hellenic Statistical Authority for the period 2010-2016, the cruise passengers' arrivals are annual and we obtained them from the Union of Greek Ports for the period 2010-2018 and the air arrivals of foreign passengers in Greece are annual and we obtained from the Bank of Greece and the Civil Aviation Authority for the period 2010-2017, respectively.

Based on our empirical findings, we result that in the Region of Attica, the Regional Unit of Kavala, the Regional Unit of Thesprotia, the Regional Unit of Fokida, the Regional Unit of Kefalonia indicates an increase in the total of passengers' arrivals (arrivals of cruise passengers and air arrivals of foreign passengers), which does not affect GDP per capita, as it decreases. On the other hand, the Regional Unit of Evros, the total of passengers' arrivals (arrivals of cruise passengers and air arrivals foreign passengers) decreases, which does not affect GDP per capita, as it increases. Moreover, for some Regional Units (e.g. Regional Unit of Thessaloniki, Regional Unit of Preveza, regional unit of Achaia and Ilia, Regional Unit of Messinia, Regional Unit of Laconia, Regional Unit of Argolis, Region of Crete, Regional Unit of Zakynthos, Regional Unit of Kerkira, Regional Unit of Magnesia, Region of North Aegean Sea, Region of southern Aegean Sea) we have mixed results.

From the above, we take into consideration the Regional Unit of Kerkira and the Regional Unit of Thessaloniki, in which their ports operate as homeports. Moreover, the Region of Crete, one of the most popular destinations of Greece, has got 5 ports of which the port of Heraklion operates as homeport. The Regional Unit of Argolis, at the same time is famous for the historical centre and the port of Nafplio. The Region of Southern Aegean Sea concludes the island complexes of Cyclades and the Dodecanese. The most famous ports are Mykonos, Santorini, Rhodes, etc. The Region of North Aegean Sea concludes the famous islands, Lesvos, Limnos, Ikaria, Chios and Samos. From the year 2015, the islands, Lesvos, Limnos and Samos have come to terms with the refugee crisis. The results of the research are listed in the table below (Table 3).

More specifically, from the Regional Unit of Argolis (Port of Nayplio), we result that, the year 2016 compared to the year 2010, the arrivals of cruise passengers decline by 22,80%, which they might affect GDP per capita, decrease by 18,7%. Also, in the period 2014-2016, the cruise passengers increase by 32% and they might affect the increase in GDP per capita by 0.7% (Chart 5).

Chart 5: GDP per capita and cruise passengers' arrivals of Regional Unit of Argolis, 2010-2018



Source: Processing data of Union of Greek ports, www.elime.gr

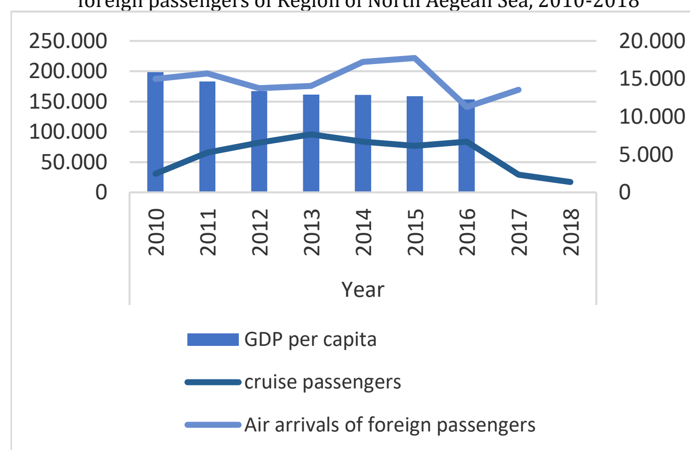
Table 3: Empirical Findings

Regions / Regional Units	Periods	GDP per capita	Total of cruise passengers	Total of air arrivals foreign passengers	Total of arrivals	Effect
Region of Crete	2010-2016	↓3.6%	↑5.8%	↑7.7%	↑32%	No
	2014-2016	↑0.6%	↓0.3%	↑5.6%	↑5.3%	Yes
Regional Unit of Thessaloniki	2016/2010	↓ 19.9%	↑18%	↑51%	↑69%	No
	2015-2016	↑2%	↑2.6%	↑4.5%	↑7,1%	Yes
Regional Unit of Kerkira	2010-2016	↓2.8%	↑5.1%	↑9.22%	↑14.3%	No
	2014-2016	↑1.7%	↑0.7%	↑9.5%	↑10.2%	Yes
Regional Unit of Argolis	2016/2010	↓ 18.7%	↓22.80%		↓ 22.80%	Yes
	2014-2016	↑0.7%	↑32%		↑32%	Yes
Region of North Aegean Sea	2010-2016	↓4.2%	↑24%	↓3%	↑21%	No
	2014-2016	↓1.7%	↓4%	↓3.7%	↓7.7%	Yes
Region of Southern Aegean Sea	2016/2010	↓18%	↓11%	↑49%	↑38%	No
	2014-2016	↓0.2%	↑0.5%	↑4.7%	↑5.2%	No

Source: Authors calculations

Also, the Region of North Aegean Sea, in the period 2010-2016, the total of passengers' arrivals increases by 21% (an increase of 24% in cruise passengers, decrease in air arrivals of foreign passengers by 3%) and does not affect the GDP per capita, as it decreases by 4,2%. On the other hand, in the period 2014-2016, the total of passengers' arrivals declines by 7,7% (a decrease of 4% in cruise passengers and 3,7% in air arrivals of foreign passengers) and they might affect the decline in GDP per capita by 1,7% (Chart 6).

Chart 6: GDP per capita, cruise passengers' arrivals and air arrivals of foreign passengers of Region of North Aegean Sea, 2010-2018

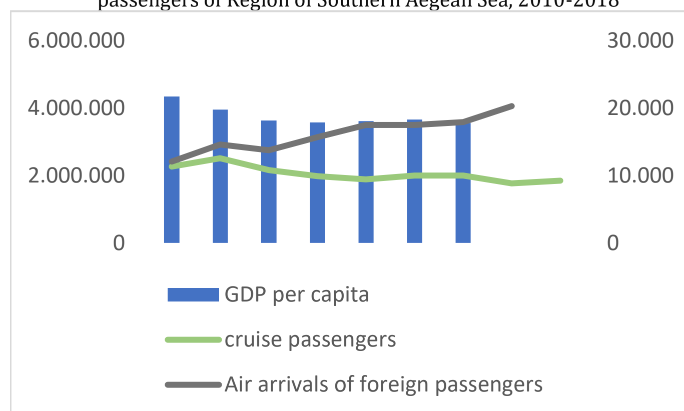


Source: Processing data of Union of Greek ports, www.elime.gr

[2] www.elime.gr
[3] https://www.statistics.gr/el/statistics/-/publication/SEL57/-
[4] https://www.bankofgreece.gr/Pages/el/Statistics/externalsector/balance/travelling.aspx
[5] http://www.ypa.gr/editions/statistical-data/

Also, the Region of southern Aegean Sea, the year 2016, compared to the year 2010, the total of passengers' arrivals increases by 38% (11% decrease in cruise passengers, an increase in air arrivals of foreign passengers by 49%), which does not affect the GDP per capita, decline by 18%. Moreover, the period 2014-2016, the total of passengers' arrivals increases by 5.2% (an increase of 0,5% in cruise passengers and 4,7% of air arrivals of foreign passengers) which does not affect the decline in GDP per capita by 0,2%. Specifically, Cyclades, the year 2016 compared to the year 2010, the total of passengers' arrivals increases by 143% (7% increase in cruise passengers, increase in air arrivals of foreign passengers by 136%) which does not affect the GDP per capita, decline by 19%. Moreover, the period 2014-2016, the total of passengers' arrivals increases by 21% (increase 4% in cruise passengers and 17% of air arrivals of foreign passengers) which does not affect the decline in GDP per capita by 0,1%. On the other hand, Dodecanese, the year 2016 compared to the year 2010, the total of passengers' arrivals decreases by 10% (46% decrease in cruise passengers, increase in air arrivals of foreign passengers by 36%) and it might affect the GDP per capita, decline by 17%. Moreover, the period 2014-2016, the arrivals of foreign passengers declines by 6,7% (decrease 9% of cruise passengers and increase 2,3% in air arrivals of foreign passengers) and it might affect the decline in GDP per capita by 0,1% (Chart 7).

Chart 7: GDP per capita, cruise passengers and air arrivals of foreign passengers of Region of Southern Aegean Sea, 2010-2018



Source: Processing data of Union of Greek ports, www.elime.gr

6.Conclusions and implications

The cruise industry has recorded considerable growth in the last decades. A significant number of ports have been included in cruise itineraries. In particular, the Caribbean owns the first place, while the Mediterranean region remains in second place, even though there is a decrease in passenger volumes. Moreover, the rate of growth of the Asian cruise market has increased and a lot of cruise companies have turned in this market. This has led to an increase in competitive pressures for cruise ports around the world. Especially, the Southeast Mediterranean as a cruise destination has diminished, as a number of external factors such as the Arab Spring, the adoption of tax measures from southern countries, the war in Syria, the political instability in Turkey and the negative publicity accompanies the socio-economic crisis experienced by our national economy has helped the cruise companies to turn into new destinations.

The present research analyzed if there is a correlation between cruise passengers and air arrivals of foreign passengers and affect on GDP per capita between 2010 and 2016 in ports of Greece. Based on the findings of the research there seem to exist impact of cruise tourism on GDP per capita for some Regional Units / Regions of Greece for defined time intervals. Especially, the Region of Crete, the Regional Unit of Kerkira and the Region of North Aegean Sea, for the period 2014-2016, indicates an increase in the total of passengers' arrivals which affects the GDP per capita, as it increases, whereas for the period 2010-2016 records an increase in the total of passengers' arrivals, which does not affect the GDP per capita, as it declines. Furthermore, for the period 2015-2016, the Regional Unit of Thessaloniki, indicates an increase in the total of passengers' arrivals (cruise passengers and air arrivals of foreign passengers) which affect the GDP per capita, as it increases, whereas from the comparison of the years 2016/2010, records a decrease in GDP per capita. On the other hand, the Regional Unit of Argolis, for the period 2014-2016, indicates an increase in the cruise passengers, which affect the GDP per capita, as it increases, whereas from the comparison 2016/2010, records a decrease in cruise passengers which affect the GDP per capita, as it declines. The Region of Southern Aegean Sea, for the period 2014-2016, indicates an increase in the total of passengers' arrivals which does not affect the GDP per capita, as it decreases, whereas for the period 2010-2016, records an increase in the total of passengers' arrivals, even though there is an 11% decline in cruise passengers, which does not affect the GDP per capita, as it declines. Especially, the Cyclades present an increase in the total of passengers' arrivals (an increase in cruise passengers and air arrivals of foreign passengers), whereas the GDP per capita declines. On the other hand, the Dodecanese present a decrease in the total of passengers' arrivals, with a noticeable drop in cruise passengers, which affects the decline in GDP per capita.

As we observe from the results, the Region of Crete, in the period 2014-2016, presents a 0.3% decline in cruise passengers, as the ports of Heraklion, Sitia and S. Nikolaou have been affected by the external factors of the Southeast Aegean. Also, the Regional Unit of Thessaloniki presents a continuous increase in cruise passengers and air arrivals of foreign passengers. Moreover, the Regional Unit of Kerkira presents an increase in cruise passengers, because the cruise companies have turned in the islands of Ionian Sea, which are closer to the ports of Italy in order to avoid the Southeast Mediterranean. Moreover, the Regional Unit of Argolis, as a historical town, relies on tourism and especially the cruise tourism and the increase or the decrease in the passengers' arrivals directly affects the GDP per capita. Furthermore, the Region of North Aegean Sea, in the period of 2014-2016, presents a noticeable decline in cruise passengers and air arrivals of foreign passengers, which is affected by the refugee crisis. Also, the Dodecanese have been influenced by the events that happen in this area, as the islands present a noticeable decline in cruise passengers. On the other hand, Cyclades present a noticeable increase in cruise passengers and air arrivals of foreign passengers, which does not affect the GDP per capita as it declines. The GDP per capita of the Regions / Regional Units declines. According to research, by the year 2015, there is a reduction in the average spending per passenger's arrival and this results in a continuous decline in the GDP per capita, respectively.

As we conclude, the ports of Greece compete with ports of the Mediterranean region (e.g. Barcelona, Rome), which operate as homeports. Most ports of Greece operate as transit calls and the cruise passengers stay for five and six hours at the port. In this case, cruise passengers do not spend money, as they prefer to visit sights. Moreover, most of the ports do not offer services that the cruise companies consider necessary, such as easy access for tourists, airline connections, safe and comfortable routes, facilitation of cruise ships, connection with historical sites, etc. These results can be useful during the stage of marketing in order to implement strategies for the investment decisions, the improvement of infrastructure (passenger terminals, berth allocation systems, installation of power supply systems, etc.) and to penetrate new tourist markets. The image of a port during the stay of tourists can influence future behavioral intentions. If tourists are satisfied, they will return and they will recommend the destination to others. It is important to enhance the cultural image in order to attract visitors who are interested in historical areas. Moreover, it is necessary to connect the cruise tourism with other alternative forms of tourism (agritourism, adventure tourism, religious tourism, wine tourism, etc.), so that ports of Greece could have a competitive advantage with other ports of Mediterranean countries.

Further research is required to investigate the competitiveness of transit ports of Greece with other ports of the Mediterranean region. In addition, it will be fruitful to undertake further research between the ports of Greece, which operate as homeports.

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Tourism and innovation: A literature review

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ABSTRACT

It is merely evident that innovation is more in the ascendant not only in the practical field but also in theory. However, although innovation seems to be entirely discussed within different business fields, tourism -due to its "service" and "manpower" based nature-, is considered to be one of the relatively stepwise sectors. Thus, this study aims to review 235 articles indexed by SSCI, SCI, SCI-E, ESCI and SCOPUS between 1900-2019 in the context of *tourism-innovation* relationship. In this review, these articles are grouped under the five themes of Schumpeter (1934) as *product innovation*, *process innovation*, *market innovation*, *input innovation* and *organizational innovation*. Among these studies, while *process innovation* was found to be the most studied subject, *product and service innovation* was found to be the least studied subject. The most frequently used keyword was found to be *innovation* itself. Besides it was seen that *sustainability* in *process innovation*, *perceptions of employees and managers* in *organizational innovation*, *business performance* and *customer satisfaction* in *service innovation*, product *development* and *business performance* in *product innovation* are the most frequently used keywords all through the entire tourism literature. These findings highlight that innovation in tourism research is developing as it does in the manufacturing industry. This research might be considered as not only an opportunity for contemporary innovation executives to follow up the developments in the theory and update their practices in the sector but also an inspiration for the theorists to discover the gaps and the relatively disregarded niche areas and contribute to the future researches.

1. Introduction

Innovation, which is one of the *driving forces of development*, is defined as the introduction of a new product or bringing a different feature of an existing product to fore, the development of new techniques during the production process, and the availability of new resources in the supply chain (Schumpeter, 1911; 1934). Some researchers agree that the size of the enterprises has a negative correlation with the innovative activities (Becheikh et al., 2006) therefore it is accepted as a very important tool especially for small and middle sized enterprises (SMEs) (Massa and Testa, 2008). However, regardless of the size, in the knowledge era, innovation might be assumed as a start off on the right foot to win a seat among the rivals.

Despite the fact that, innovation is considered to support the merchandising companies mostly, new developments prove that even the service sector demands the adaptation to innovative practices. Tourism, as being one of the service sector members, faces new technologies, new customers and their changing consumption patterns, new rivals, new environmental expectations (eg. green energy, sustainability tc). In order to meet the continuous changes within the sector, innovation comes up with a valuable opportunity to shape the future.

It is evident that tourism is in a close relationship with many other sectors. This encounters many difficulties as well as some opportunities. Any shift in nano technology may affect the housekeeping practices; artificial intelligence may trigger new accommodation types; augmented reality may offer a brand-new experience in museums. Although the developments encourage the practitioners to cope up with the speed of innovation, the interest of the theorists in the field is comparatively below the desired level which may be just because of the perceived "tactual sense" of the services; touching the experience, touching the soul and touching the needs of the guests.

The aim of this research is to question the emergence of "innovation" in tourism literature. Due to the interest of the practitioners in innovative products, processes and organizations, related theory should be in sync. This research not only questions where the theorists stand but also aims to encourage new researches to enrich the literature and close the existing gap. Innovation should not be only assumed as a tool of the technology and production sectors. Thus, even the service sector needs to adopt the new developments to any product, any process any function and/or any organization.

Therefore, starting by 1900 until today, tourism-innovation related articles were got to the bottom of the lens. 235 articles indexed by SSCI, SCI, SCI-E, ESCI and SCOPUS were gathered together to cradle the old and recent publications and were analyzed to find out the most popular and the least cared variables just to modestly lead the future researches.

2. Literature review

The concept of innovation encompasses such meanings as 'renovation' and 'improvement'. Although the classical economists of the 19th century (e.g.Smith, Ricardo and Marx) prioritised the concept of technological development (technological advance), undoubtedly Schumpeter played the most important role in the adoption of the concept of innovation with positive content; because Schumpeter (1911) was the first researcher to use the concept of innovation in his book titled as '*The Theory of Economic Development*'. In the above-mentioned book, innovation referred to a product which is not yet known by customers or to modifications made to a product or to additional properties of a product. Schumpeter's theory of innovation is, in fact, a starting point (Alsos et al., 2014). The theory, describes innovation as researching, discovering, developing, improving, accepting and commercialising the new processes, new products,

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new organizational structures and procedures (Hjalager, 2002; Nordin, 2003; Hjalager, 2010). Schumpeter (1934) examined innovation under; (a) new product and service creation (product and service innovation), (b) new process of manufacturing (process innovation), (c) new markets (market innovation), (d) new suppliers (input innovation) and (e) changing system of organisation or administration (organisational innovation).

Product innovation is recognized as an innovation strategy that enables the growth, sustainability and competitiveness of modern organizations in the market through the improvement on the features of existing goods and services to the market in a better and different way (Hart, 1996; Johne, 1999; Dengiz and Belgin, 2007; İpçioğlu and Gönüllüoğlu, 2008). This type of innovation is important to develop, differentiate and improve the intended use of the product, which can be adapted to different markets before it is placed (Hjalager, 2002).

Process innovation is expressed as the generation of new ideas to eliminate an existing problem in production methods (Ottenbacher and Gnoth, 2005). It is also considered as the new methods for reducing costs and increasing productivity in an enterprise. Process innovation addresses the entire production line to effectively deliver the goods or services to the market and improve the quality of the product offered (Avermaete, 2003; İpçioğlu and Gönüllüoğlu, 2008; Coşkun et al., 2013).

Organizational innovation is defined as the methods used to make competitive advantage sustainable, to improve product quality and external relations activities (Damanpour et al., 1989; Caroli and Van Reenen, 2001; Grenan, 2003; Fagerberg et al., 2005; Dengiz and Belgin, 2007; Acül, 2008). Tuzcu (2008) emphasized that the success of innovation has a positive relationship with the accuracy of organizational activities. In their study, Armbruster et al. (2008) stated that organizational innovation is not a technical process, whereas OECD (2005) states that the processes in the organization's business activities are considered as changing the business structure. In summary, organizational innovation covers all the performances of companies to gain a competitive advantage (Damanpour et al., 1989; Piva and Vivarelli, 2002; Greenan, 2003).

Service innovation is defined as the strategy put into practice to gain a competitive advantage, which includes the activities proposed to improve the ever-changing customer demands (Faria and Gomes, 2016). Gaining a competitive advantage in existing markets and increasing the quality of services provided emphasize the importance of service innovation (Hussain et al., 2016). Service innovation is also an important element in increasing quality and productivity in enterprises, developing new service designs and developing new solutions to strengthen operational performance (Jeong and Oh, 1998; Jian and Zhou, 2015). Tian (2016) stated that service innovation requires the development of new service activities or the improvement of existing services to meet the needs of both employees and suppliers to maintain the competitive advantage of the enterprise in the market.

The framework of *management innovation* has been limited by Kimberly (1981) to managers and their activities. Kimberly (1981), who emphasized that the decision-making party is the managers, accepted the decision-making stages of the change process as management innovation. At the same time, management innovation is thought to encompass everything that brings about change, as it aims to advance traditional management affairs in accordance with organizational objectives (Hamel and Bren, 2007). Bernhut (2001) emphasized that management innovation will maintain the competitive advantage of enterprises in the market by moving away from conventional management principles. In summary, management innovation is a form of management that enables processes, work structures and strategies to focus on efficiency by linking changes in administrative systems to an innovative activity (Brikinshaw, 2008; Walker et al., 2011; Vaccaro et al., 2012; Damanpour and Aravind, 2012). Lynch (2007) considered management innovation as a catalyst for strengthening and sustaining relationships with other stakeholders that surround a business.

On the other hand, the advantages innovation offers firms can be listed as; increase in efficiency, superiority in sustainable competition, solutions to the problems encountered in the balance of payments, raising awareness of social responsibility in the society and improving it, expanding the range of loyal customers, securing institutionalisation and branding and directing firms into good quality output promised by research and development. There are almost no areas in which competition is not available today. The most effective instrument of sustainable competition in this atmosphere is the strategies created from an innovative perspective. Innovation-oriented economies fed with high technology contribute significantly to the growth and thus to the balance of payments (Işık, Doğru, and Sirakaya-Turk, 2018; Doğru, Işık, and Sirakaya-Turk, 2019;).

There are important strategic factors in securing growth and sustainable development for every sector. The major elements in the tourism sector in which especially the market is in the hard competition are innovation and new service development properties (Peters and Pikkemaat, 2006). Tourism sector goes through severe change due to differing product types and strong market growth. The changes and transformations oblige businesses in the service sector to innovate (Alsos, Eide and Madsen, 2014); because innovation plays significant roles in promoting the quality of service in the tourism industry (Hjalager, 2002; Aldebert, Dang and Longhi, 2011). Innovation research did not attract much interest in the 90s, and researchers mostly concentrated on the issue as technological novelties observed in the manufacturing sector. (De Jong 2013). While innovation research in the service sector did not attract much attention until the 1990s, researchers focussed on the issue rather in the manufacturing sector in the form of technological innovations (De Jong 2013).

The fact that tourism area is vast, and it is versatile, dynamic and variable due to the structure of service, sector, prioritises innovation in tourism sector (Zengin and Dursun, 2017). Tourism sector has always been fast in adopting technological innovations from product development to marketing to serve its customers better (Miralles, 2010). Tourism enterprises need to innovate continuously to be competitive, to adapt to the changing technologies and to continue offering its customers attractive service (Hall and Williams, 2008; Razafindravelo, 2017). In addition to creating a new product or service, those innovations also contribute to the innovations offered or planned to be offered in other areas of management (Razafindravelo, 2017). The integration of new technologies into businesses (especially in information and communication) reduces errors significantly and increases service quality and efficiency (Sharmistha, 2001). Evaluated in general, innovations enable improvements in productivity and thus increase in welfare and income. For this reason, the central role of innovation as the driving force of long-term growth should be stressed (Boycheva, 2017).

It is necessary to detect gaps in an area and problems to be able to start a scientific study detecting the gap in the field is possible through a detailed review of relevant literature. Thus, an examination of this study compiling the international studies available in the theme of innovation by all the researchers setting innovation as their main subject of study or as the sub-topic of their study would be beneficial in detecting the above-mentioned problems Besides, the studies offering detailed information containing; a) the number of studies available on innovation, b)distribution according to years, c) the relative topics throughout literature are not available. Therefore, it is assumed that researching this subjectand piling up the so far applied researches would definitely contribute to the existing tourism literature and strengthen the future researches. This study is expected to guide prospective researchers to analyse and see the areas the innovation – tourism relationship concentrated more intensely and the incomplete and rarely touched sides.

3. Methodology

Bibliometrics is defined as the analysis of scientific information-sharing tools such as published books, journals and articles by mathematical and statistical techniques (Pritchard, 1969). The main purpose of bibliometric studies can be expressed as developing scientific information and communication opportunities from printed documents by quantitative analysis technique (Osareh, 1996). Bibliometric studies help to make the meaning, importance and forms understandable by synthesizing the materials of the related fields. While this approach increases methodological sensitivity for researchers, it helps to develop reliable knowledge by gathering information from a wide range of studies for managers and practitioners (Tranfield et al., 2003). This study is important for researchers who will examine the relationship between tourism and innovation, as it aims to reveal the distribution, intensity, methods and gaps of the literature. Moreover, the fact that it presents the information needed in the tourism sector by synthesizing the data obtained from many studies makes it important for business managers and practitioners.

To collect the research data, the top 50 journals in the ISI Journal Rankings on Tourism, Leisure and Hospitality were scanned in Scopus and Google Academic. To find the right articles, three combinations of keywords related to the concept of tourism and innovation were used. The keywords generated are 'innovation and tourism', 'tourism and innovation' and 'tourism innovation'. While scanning, these words were found in keywords or abstracts of a wide number of articles. Hence, in the process of data collection, the process is resolved by focusing on the article titles. Until 2019 (January 31), 333 articles have been identified examining the relationship between tourism and innovation. Since these academic documents will be accepted as certified information (Van Raan, 2003), 235 articles indexed by Social Sciences Citation Index (SSCI), Science Citation Index (SCI), Science Citation Index-Expanded

(SCI-E), Emerging Sources Citation Index (ESCI) and SCOPUS were analysed from the data obtained.

4. Findings

There is no common consensus on the definition of innovation in the literature. Many researchers define innovation as the sum of successful individual and organizational activities that start with the emergence of new ideas and continue until the commercialization of these ideas (Goldhar, 1980; Rogers, 1983; Dosi, 1988; Hjalager, 2002; Reddy, 2002; Jacob et al., 2003; Novelli et al., 2006; Chen and Huang 2009; Hall, 2008; Hall, 2009; Williams and Shaw, 2011; Rodriguez et al., 2014; Gomezelj, 2016; Isik, 2019). When the literature is examined, it is seen that innovation is an important factor for maintaining the sustainability of enterprises and gaining a competitive advantage (Voss, 1994; Bettis and Hitt, 1995). Researchers emphasize the importance of innovation, highlighting changes in customer demands, and social and economic conditions (Hjalager, 2015). Therefore, to provide a stable and sustainable competitive advantage in a dynamic environment, it is a strategic necessity for enterprises to improve their innovation capabilities (Sharif and Huang, 2012). In this context, innovation is one of the basic prerequisites for the long-term success, growth, increase of resources and sustainability of enterprises (Jimenez and Sanz-Valle, 2011). Even if the tourism industry is not a pioneering sector in innovation, it uses new ideas and information immediately and adapts them to the sector (Hjalager, 2015).

When the studies investigating the relationship between tourism and innovation are examined, it is seen that the innovations made in the fields of business (Poon, 1988; Hialager, 1997; Lynn, 2004) and management (Jafari, 1981; Hialager, 2005) are intense. Therefore, to explain the relationship between tourism and innovation, examining the structure and economic impacts of the tourism sector will make this relationship more understandable.

Tourism has attracted the attention of the public administration because of its economic contributions rather than its socio-cultural effects. The reason for this importance given to tourism is that it is one of the fastest-growing industries in the world. The importance given to tourism stems from its being one of the fastest-growing industries in the world. In addition, the average growth rate of the tourism sector in OECD countries in the last two decades and the fact that it generates more income than most non-OECD countries are stated to be effective in this regard (OECD, 2010). These evaluations reveal the importance of the tourism sector both in economic development and regional growth.

It is strategically important that the tourism sector, which is an important value for the economy, can innovate to sustainable growth and development (Greve and Taylor, 2000). Innovation and new service development are also important to ensure growth and sustainability in every sector (Peters and Pikkemaat, 2006). Otherwise, it will cease to be an attractive sector with a stagnation that will cause economic downsizing. This situation may distract the investor and therefore the consumer from the market. In order to maintain its competitiveness in the global tourism market, it needs strategies supporting innovation (OECD, 2010).

When the structural features of tourism are examined, we see that the processes of production and marketing differ from the manufacturing industry and often show specific features that create constraints or problems (Korres, 2007). Tourism is an integrated industry that includes different activities such as accommodation, transportation, food and beverage services and retail trade, as well as the characteristics of the service sector, such as the participation of the customer in the service process and the simultaneous production and consumption (Olalı and Korzay, 1993; 6).

These structural features of tourism have led innovation to focus on such areas as product, process, service, technology and social innovation as well as business and management (Hialager, 2010; Kuscer, 2013; Guttentang, 2015). In addition, when the innovation literature is examined, it is seen that *clustering* (Tseng, et al., 2008; Fundeanu, 2015; Backman, et al., 2017), *cooperation* (Mei, et al., 2015; Alegre and Berbegal-Miraben, 2016; Giacosa, et al., 2016; Booyens and Rogerson, 2017), information sharing (Kim and Shim, 2018) and business-to-business network connections (Sorensen, 2007; Romerio and Costa, 2010; Booyens, 2016; Patluang, 2017; Koflera, et al., 2018) come to the fore. This situation demonstrates the importance of innovation in order to eliminate the problems arising from the structural characteristics of the sector, to ensure synchronization in the sector and to enable enterprises to achieve a sustainable competitive advantage by dealing with change.

The market structure of the tourism sector has become more saturated, especially in the recent period, where customers choose products and services from all over the world. This change has made innovation a more important and prior strategy (Peters and Pikkemaat, 2006). Because it is seen that most companies that are effective in the tourism sector today are more preferred than their competitors with their innovative and needs-oriented service approaches towards consumers (Işık, 2018;62).

In recent years, the concentration of demand on experience-based products (Sundbo et al., 2007) increased sensitivity to the protection of the natural environment (Hjalager 1997) and strong growth in the market (Lordkipanidze et al., 2005) have made innovation a necessity for the tourism sector. In this context, when the results of the studies on the relationship between customer satisfaction and innovation in the literature are examined (Su, 2011; Čivre and Omerzel, 2015; Jin, et al., 2016; Bharwani and Mathews, 2016; Tajeddini, et al., 2017; Sipe, 2018; Verreynne, et al., 2019), it is observed that the relationship between the two variables is positive. In addition, innovations on *sustainability* (Carlsen and Edvard, 2008; Huibin and Marzuk, 2012; Kuscer, 2013; Ali and Frew, 2014; Spenceley and Snyman, 2017; Aquino, et al., 2018), *environment* (Carlsen and Edvard, 2008; Huibin and Marzuk, 2012; Kuscer, 2013; Ali and Frew, 2014; Spenceley and Snyman, 2017; Aquino, et al., 2018) and eco-tourism (Almeida, 2016; Pozo, et al., 2016; Rosario, et al., 2017) have been found to have an impact on consumer behavior and satisfaction.

The importance of the tourism industry, which plays an important role in social, economic and environmental developments in today's world, is determined by developing innovations, activities and projects that meet the needs or expectations of individuals along with social changes and developments. Tourism offers growth and job opportunities for economics in the new world order (Doğru and Bulut, 2018; Isik, Dogru and Sirakaya-Turk, 2018). Employment and innovative approaches create the infrastructure for a dynamic eco-system which is influential in the emergence of new ideas. Many researchers describe innovation as the whole of successive individual and organisational behaviours in the process starting at the emergence of new ideas and continuing until the commercialisation of those ideas (Goldhar, 1980; Rogers, 1983; Dosi, 1988; Hjalager, 2002; Reddy, 2002; Jacob et al., 2003; Novelli et al., 2006; Chen and Huang 2009; Hall, 2008; Hall, 2009; Williams and Shaw, 2011; Rodriguez et al., 2014; Gomezelj, 2016; Isik, 2019). Innovation puts businesses into an advantageous position in terms of their importance in economic growth since it is an economic process. In other words, innovation creates the resource for growth and makes it possible to develop and spread new technologies (Schumpeter, 1932, 1934, 1939).

An examination of the studies investigating the correlations between tourism and innovation demonstrates that the correlations are heavily in innovations made in the areas of business (Poon, 1988; Hialager, 1997; Lynn, 2004) and administration (Jafari, 1981; Hialager, 2005). In this process, the goal is to increase business performance (Tajeddini, 2010; Chen and Chiu, 2018) and to have an administration which is open to innovations (Sipe, 2016). Increasing performance through time is considered to be in parallel to developing the quality of service and responding to customers' demands, needs and expectations. This caused businesses to focus on such types of innovation as product, process, service, technological and social innovations (Hialager, 2010; Kuscer, 2013; Guttentang, 2015). Tourism sector which has made progress in business performance and service quality has become aware of the fact that the environment was an important factor in sustainable tourism, and it offered activities about eco, rural and environmental tourism-mainly about green innovation. Hjalager (1997) classifies innovation taking Schumpeter's grouping of innovation into consideration. Hjalager (2002), who performed a new conceptual study to make up the deficiency of innovation in the sector of tourism, adapted the innovation model available in the study conducted by Aberthany and Clark (1985) to determine the effects of competitive innovations of the automotive sector into tourism sector and thus divided innovation into five. Accordingly, innovations are classified as architectural (structural), regular, niche and revolutionary innovations. Architectural innovations do not only imply changes in the industry and also describe the changes in the society where they are used. Regular innovations are the ones which are the least radical. Niche innovations tend to be against cooperative structures except for core competence. Researchers and practitioners in the field of tourism focus on the opportunities this category offers. Revolutionary innovations have radical effects on competence without changing external structures. In this, respect, architectural innovations tend to change all the structures and they form new rules changing the concept of tourism (Hjalager, 2002).

A review of literature on tourism and innovation shows that product and service innovation increases performance in England (Viladimirov and Williams, 2018), service innovation in Wales has positive impacts on sustainability (Warren, Becken and Coghlan, 2018), the right strategies of innovation in Taiwan provides competitive advantages and have positive

effects on operational performance (Chen et al., 2018).

A review of literature on tourism and innovation shows that product and service innovation increases performance in England (Viladimirov and Williams, 2018), service innovation in Wales has positive impacts on sustainability (Warren, Becken and Coghlan, 2018), the right strategies of innovation in Taiwan provides competitive advantages and have positive effects on operational performance (Chen et al., 2018), innovative solutions can be found in Sweden in terms of immigrants' adaptation into rural tourism (Carson and Carson, 2018), green innovation application is necessity in Turkey (Dinçer et al., 2017), micro-small businesses in tourism in Spain accelerate the process of adaptation into innovation (Perez et al., 2015), it is necessary to analyse correctly the correlations between knowledge, network and innovations in tourism in England (Zach and Hill, 2017), it is necessary to set up the associations between eco-innovation, sustainability, culture and climate in Mexico correctly (Rosario et al., 2017), the right management of service innovation in Taiwan leads to an increase in the quality of travel agents (Chen et al., 2017), social innovation increases in the tourism sector in Croatia (Alkier et al., 2017) and innovation triggers positive influences in the tourism sector in New Zealand (Henderson et al., 2017).

4.1. General Findings

This study includes the relations between tourism and innovation which have been published in top 50 journals ranked according to "ISI Journal Rankings on Tourism, Leisure and Hospitality 2010" and in other indexed journals which are still issued by Social Sciences Citation Index (SSCI), Science Citation Index (SCI), Science Citation Index-Expanded (SCI-E), Emerging Sources Citation Index (ESCI) and SCOPUS.

After a review of literature on tourism and innovation, 235 studies in total which had been indexed in Social Sciences Citation Index (SSCI), Science Citation Index (SCI), Science Citation Index-Expanded (SCI-E), Emerging Sources Citation Index (ESCI) and SCOPUS were reached. The studies were divided into five themes. Aiming to compile the studies on tourism-innovation relations in international literature, this study divides the studies into themes labelled as product innovation, process innovation, management innovation, service innovation and organizational innovation according to the types of tourism. The distribution of the studies according to years is shown in Chart 1 below.

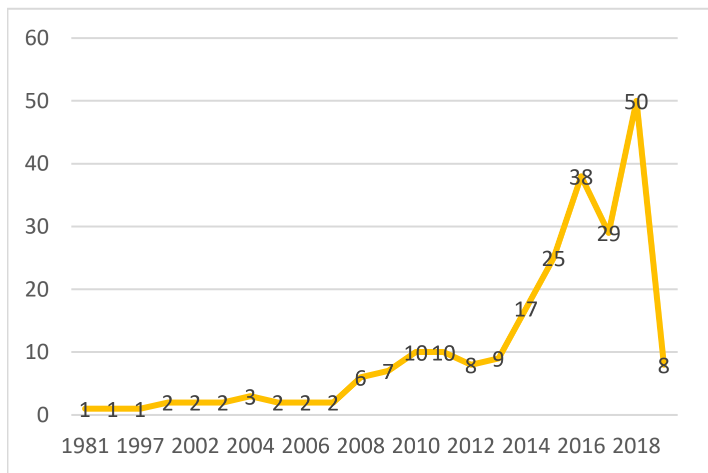

Figure 1: *Distribution of the studies*

According to chart 1, the number of studies on tourism and innovation has increased in the last ten years and international literature has focussed more on the subject in the last five years. These data were obtained by analysing a total of 72 journals. The number of studies on tourism and innovation published in these journals has been analysed and the first eleven journals and article frequencies are shown in Chart 2.

It is seen that most of the studies on this subject are published in Tourism Management (34 articles), International Journal of Hospitality Management (27 articles) and International Journal of Contemporary Hospitality Management (22 articles).

Chart 3 shows the number of publications related to the theme of tourism and innovation according to the citation indexes. It was seen that the majority of the studies included in the study (178) were published in SSCI indexed journals.

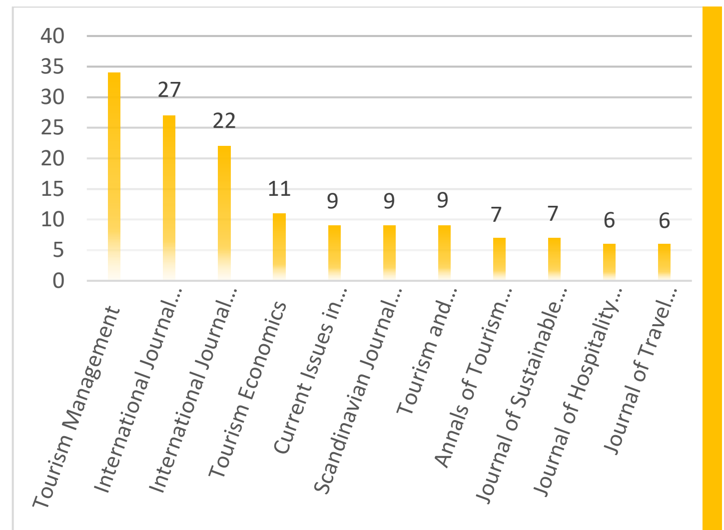

Figure 2. *Distribution of the number of studies according to journals*

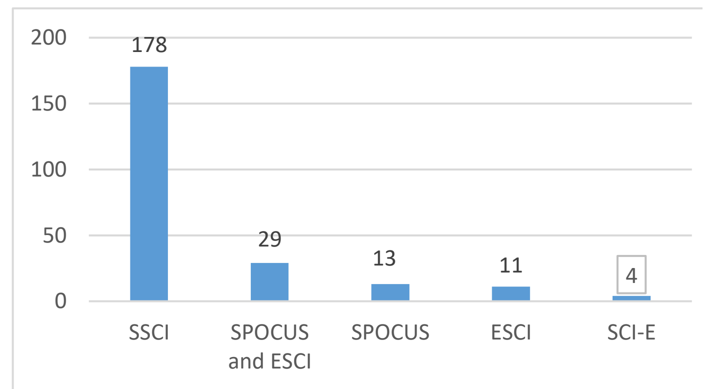

Figure 3. *Distribution articles according to citation indexes*

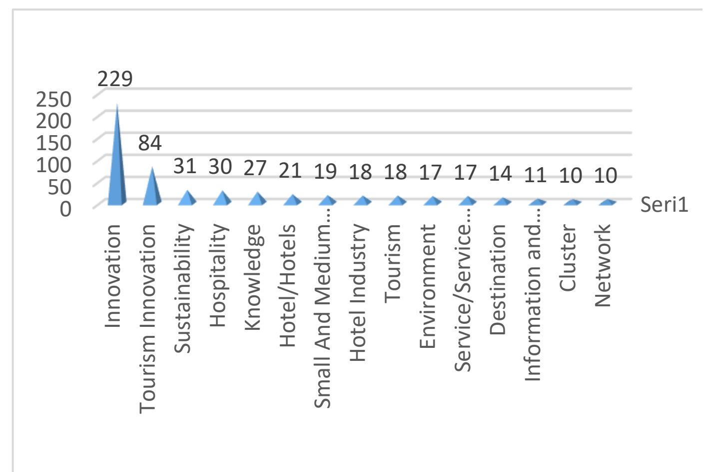

Figure 4. *Distribution of articles according to keywords (top 15).*

Graph 4 shows the results of the analysis of keywords in tourism and innovation-themed articles. The total number of keywords subject to this graph is 1116. Among these keywords, in the studies on the relationship between tourism and innovation, it was found that *innovation* (229) and *tourism innovation* (84) were the most commonly used keywords. It was concluded that the other frequently used keywords are sustainability, hospitality, knowledge, hotel/hotels, small and medium enterprises (SMES), hotel industry, tourism, environment, service/service innovation, destination, information and communication technology (ICT), cluster and network.

4.1.1. Findings Regarding the Product Innovation Theme

Twenty-six (26) studies have been reached under the theme of product innovation. Further information on the articles in this theme can be found in Appendix 1. The distribution of the journals in which these studies were published (top 3) is given in Table 1 below.

Table 1: *Top 3 Journals which published articles about Product Innovation*

No	Journal Name	Number of Articles
1	Tourism Management	4
2	International Journal of Contemporary Hospitality Management	3
3	Annals of Tourism Research	2
	Journal of Travel Research	2
	Scandinavian Journal of Hospitality and Tourism	2
	Tourism Economics	2

When Table 1 is examined, the names of the publications related to the theme of product innovation and the journals in which they are published are seen. Most of the articles on the theme of product innovation have been published in the journals indexed by SSCI such as *Tourism Management, International Journal of Contemporary Hospitality Management, Annals of Tourism Research, Journal of Travel Research, Scandinavian Journal of Hospitality and Tourism,* and*, Tourism Economics*. Apart from these journals, there were also articles related to product innovation in the journals such as *Current Issues in Tourism, International Journal of Hospitality and Tourism Administration International Journal of Hospitality Management, International Journal of Materials Engineering Innovation, International Journal of Tourism Research, Journal of Hospitality and Tourism Management, Journal of Hospitality and Tourism Technology, Journal of Teaching in Travel and Tourism, RAI Revista de Administração e Inovação, The Service Industries Journal,* and*, Tourism Planning and Development.*

Table 2: Number of articles by index

Index	Frequency
SSCI	21
SCOPUS and ESCI	4
SCOPUS	1

Table 2 shows the distribution of articles within the theme of product innovation according to indexing. As a result of the research, it is seen that the studies within the theme of product innovation were mostly published in the journals indexed by SSCI. A total of 97 keywords were identified in 26 articles under the theme of product innovation. These keywords are classified under 57 topics.

Table 3: *Distribution of keywords (Top 5)*

No	Keywords	Frequency
1	Innovation	18
2	Tourism Innovation	7
3	Knowledge	5
4	Hospitality	6
5	Product	3

Table 3 presents the most commonly used keywords for publications related to the theme of product innovation.

The top keywords in publications related to the theme of product innovation are;

- Innovation (innovativeness, innovation configuration, innovation impacts, innovativeness, open innovation, process innovation, technological innovation),
- Tourism Innovation (tourism clusters, tourism community, tourism education, tourism innovation, tourism innovation, typology, tourism industry)
- Knowledge (knowledge bases, knowledge management, knowledge transfer, knowledge-based destination),
- Hospitality (hospitality sector, hospitality industry), Product (product advantage, product development, product innovation)

Apart from these keywords, keywords such as Brand, Hotel, Information and Communication Technology (ICT), Small and Medium Enterprises (SMEs) were found to be used in the articles within the theme of product innovation.

When the initial studies on product innovation were examined, it was found that the definition of product development (Tseng, et al., 2008) and the complexity of product development (Rodgers, 2008) were emphasized. In subsequent studies, it was stated that product development can be improved with the effective use of technology in this process (Racherla, et al., 2008; Liburd and Hjalager, 2010; Aldebert, et al., 2011). The results of the studies showed that product innovation has positive relationship with business performance (Sandvik, et al., 2011; Sipe, 2017; Viladimirow and Williams, 2018). In addition, cooperation between organizations (Romero, et al., 2018) and open innovation (Sanchez, et al., 2019) have been reported to contribute positively to new product development. Therefore, it can be said that when it comes to innovation, it is necessary for enterprises to suppress their feelings of competition and exchange information with each other about new product development.

4.1.2. Findings regarding the Process Innovation Theme

Eighty-two (82) articles were reached under the theme of process innovation. Further information on the articles in this theme can be found in Appendix 1. The distribution of the articles and the top 5 journals in this theme are given in Table 4 below.

Table 4. *Top 3 Journals which published articles about Process Innovation*

No	Journal Name	Number of Articles
1	Tourism Management	11
2	International Journal of Hospitality Management	10
3	Current Issues in Tourism	6
4	Annals of Tourism Research	5
5	Journal of Sustainable Tourism	4
	Tourism and Hospitality Research	4

Most of the work on the theme of process innovation has been published in the journals indexed by SSCI, SCOPUS and ESCI such as Tourism Management, International Journal of Hospitality Management, Current Issues in Tourism, Annals of Tourism Research, Journal of Sustainable Tourism, Tourism and Hospitality Research (Table 5).

Table 5: *Number of articles by index*

Index	Frequency
SSCI	65
SCOPUS and ESCI	9
SCOPUS	5
ESCI	2
SCI-E	1

Table 5 presents the distribution of the articles in the process innovation theme according to the indexing. As a result of the analysis, it is seen that the studies reached within the theme of process innovation have been published in the journals which were indexed in SSCI. When the keywords of 82 studies under the theme of process innovation were examined, a total of 394 keywords were identified. These keywords are classified under 191 topics.

Table 6. *Distribution of Keywords*

No	Keywords	Frequency
1	Innovation	71
2	Tourism Innovation	35
3	Sustainability	12
4	Environment	11
5	Knowledge	9
	Small and Medium Enterprises (SMEs)	9

Table 6 presents the most commonly used keywords for publications related to the theme of product innovation. The top 6 used keywords in publications related to the theme of process innovation are;

- Innovation (innovation economy, innovation in services, innovation journey, innovation management, innovation networking, innovation performance, innovation process, innovation system, innovations, innovative, innovative capabilities, innovative firm, innovativeness etc.),
- Tourism Innovation (tourism, tourism and hospitality, tourism clusters, tourism complexity, tourism development, tourism firms, tourism innovation, tourism innovation systems, tourism industry, tourism marketing, tourism organizations etc.),
- Sustainability (sustainability, sustainability culture and climate, sustainability transitions, sustainable development, sustainable tourism, sustainable),
- Environment (environment, environmental innovation, environmental management, environmental performance, environmental responsibility, environments),
- Knowledge (knowledge, knowledge management, knowledge network, knowledge transfer),
- Small and Medium Enterprises (SMEs) (micro and small enterprises (MSEs), micro organizations, microenterprise, small enterprises, small firms, smart specialization, SMEs collaboration)

Apart from these keywords, the keywords such as Destination, Hotel, Cluster, Cultural Tourism, Hospitality, Network, Regional tourism, Rural tourism, community, Entrepreneurship, Experience, Eco-innovation, Information and Communication Technology (ICT), Management, Marketing, Social capital, Customer, Ecotourism, Local Tourism, Mountain Destinations, Nature-Based Tourism, Social Network, Social Enterprise, Social Exchange were found to be used in the articles within the theme of product innovation.

The studies on process innovation have been found to be mostly related to sustainability (Carlsen and Edvard, 2008; Huibin and Marzuk, 2012; Kuscer, 2013; Ali and Frew, 2014; Spenceley and Snyman, 2017; Aquino, et al., 2018), environment (Hernandez and Leon, 2001; Andereck, 2009; Lawton and Weaver, 2010; Razumova, et al., 2015; Kuscer, et al., 2016; Batle, et al., 2018) and eco-tourism (Almeida, 2016; Pozo, et al., 2016; Rosario, et al., 2017; Buijtendijka Blomb, et al., 2018). The results also showed that innovations within the scope of process innovation have an impact on consumer behavior and satisfaction (Ali and Frew, 2014; Hjalager, 2015; Wang, et al., 2018).

4.1.3. Findings Regarding the Management Innovation

Forty-four (44) articles were reached under the theme of management innovation. Further information on the articles in this theme can be found in Appendix 1. The distribution of the articles and top 4 journals in this theme are given in Table 7 below.

Table 7. *Top 4 Journals which published articles about Management Innovation*

No	Journal Name	Number of Articles
1	International Journal of Hospitality Management	9
2	Tourism Management	8
3	International Journal of Contemporary Hospitality Management	5
4	Annals of Tourism Research	2
	Current Issues in Tourism	2
	Journal of Sustainable Tourism	2
	Tourism Analysis	2

Most of the work on the theme of management innovation has been published in the journals indexed by SSCI, SCOPUS and ESCI such as International Journal of Hospitality Management, Tourism Management, International Journal of Contemporary Hospitality Management, Annals of Tourism Research, Current Issues in Tourism, Journal of Sustainable Tourism, Tourism Analysis (Table 7).

Table 8. *Number of articles by index*

Index	Frequency
SSCI	34
SCOPUS and ESCI	5
ESCI	3
SCOPUS	1
SCI-E	1

Table 7 presents the distribution of the articles in the management innovation theme according to the indexing. As a result of the analysis, it is seen that the studies reached within the theme of management innovation have been published in the journals which were indexed in SSCI. When the keywords of 44 studies under the theme of management innovation were examined, a total of 214 keywords were identified. These keywords are classified under 133 topics.

Table 9: *Distribution of Keywords*

No	Keywords	Frequency
1	Innovation	38
2	Tourism	11
3	Hotel/Hotels	10
4	Hotel Industry	6
5	Sustainability	5

Table 9 presents the most commonly used keywords for publications related to the theme of management innovation. The top 5 used keywords in publications related to the theme of product innovation are;

- Innovation (innovation, innovations, innovation adoption theory, innovation behavior, innovation management, innovation policy, innovation practices, innovation results, innovation strategy, innovation regional development, innovativeness, performance expectancy),

- Tourism (tourism, tourism companies, tourism complexity, tourism complexity, tourism sector),
- Hotel Industry (hotel industry, hotel sector),
- Hotel/Hotels (hotel management, hotel services),
- Sustainability (sustainable development, sustainable HRM, sustainable tourism)

Apart from these keywords, keywords such as Customer Orientation/Satisfaction, Management Innovation, Hospitality, Leadership, Performance, Balearic Islands, Competitiveness, Green Innovation / Practices, Social Responsibility were found to be used in articles within the theme of product innovation.

When the studies on process innovation were examined, it was found that, unqualified personnel (Jakop, et al., 2003), resistance to change within the company (Jakop, et al., 2003), deficiencies in the managers' understanding of innovation (Ros and Sintes, 2009, Eide, et al., 2017) and lack of consensus (Smerecnik and Andersen, 2010, Louh, 2014), were obstacles to innovation. On the contrary, it has shown that innovation has a positive effect on the business practices (Ros and Sintes, 2012) and has a positive effect on enterprise performance (Martín and Herrero, 2012; Grissemann, et al., 2013; Compo, et al., 2014, Lee, et al., 2016; Sipe, 2017).

4.1.5. Findings Regarding the Service Innovation Theme

Forty-four (44) articles were reached under the theme of service innovation. Further information on the articles in this theme can be found in Appendix 1. The distribution of the articles and the top 5 journals in this theme are given in Table 10 below.

Table 10: *Top 5 Journals which published articles about Service Innovation*

No	Journal Name	Number of Articles
1	Tourism Management	11
2	International Journal of Contemporary Hospitality Management	9
3	International Journal of Hospitality Management	9
4	Scandinavian Journal of Hospitality and Tourism	6
5	Tourism Economics	5

Most of the work on the theme of service innovation has been published in the journals indexed by SSCI such as Tourism Management, International Journal of Contemporary Hospitality Management, International Journal of Hospitality Management, Scandinavian Journal of Hospitality and Tourism, Tourism Economics (Table 11).

Table 11: Number of articles by index

Index	Frequency
SSCI	57
SCOPUS and ESCI	11
ESCI	5
SCOPUS	4
SCI-E	2

Table 12 presents the distribution of the articles in the service innovation theme according to the indexing. As a result of the analysis, it is seen that the studies reached within the theme of service innovation have been published in the journals which were indexed in SSCI. When the keywords of 44 studies under the theme of service innovation were examined, a total of 383 keywords were identified. These keywords are classified under 207 topics.

Table 12: *Distribution of Keywords*

No	Keywords	Frequency
1	Innovation	59
2	Tourism Innovation	24
3	Service/Service Innovation	17
4	Hospitality	12
5	Sustainability	11

Table 12 presents the most commonly used keywords for publications related to the theme of service innovation. The top 5 used keywords in publications related to the theme of product innovation are;

- Innovation (innovation, innovation behavior, innovation capacity, innovation diversity, innovation gaps, innovation image, innovation impacts, innovation market dynamism, innovation process, innovation research, innovation system, innovative behavior, innovative solution, innovativeness, social innovation, radical innovation, open innovation, strategic innovation
- Tourism Innovation (tourism accommodation establishments, tourism community, tourism competitiveness, tourism education, tourism firms, tourism history, tourism impact, tourism innovation, tourism management, tourism methodology, tourism planning, tourism spin-offs, tourism strategy, tourist hotels),
- Service/Service Innovation (service, service experiences, service innovation, service innovation culture, service innovation performance, service innovativeness, service improvement, service industries, service innovative behavior, service-dominant logic),
- Hospitality (hospitality sector, hospitality industry),
- Sustainability (sustainability, sustainability innovations, sustainable development, sustainable development, sustainable tourism)

Apart from these keywords, keywords such as Hotel Industry, Knowledge, Destination, Cluster, Social capital, Competitive Advantage, Diffusion of Innovations, Ecotourism, Experience Economy, Green innovation, Hotel/Hotels, Marketing, New Product Development, Airbnb, Capabilities, Co-creation, Content analysis, Cultural Tourism, Disruptive Innovation, Eco-Innovation, Evolutionary game theory, Information and Communication Technology (ICT), Leadership, Learning Orientation, Performance, Proactive Personality, Small firms, SMEs were found to be used in the articles within the theme of product innovation.

The first study on service innovation was seen by Poon (1988) and stated that the all-inclusive system positively affected the performance of the enterprise. Recent days, the all-inclusive system has been the number one topic of the debates concerning with service quality and sustainability. But in earlier researches, this system was seen as an innovation. In another study, Hjalager (2005) stated that innovation in tourism developed parallel to the other sectors. Sintes et al. (2005) found that high category hotels were more innovative than low category hotels. Otenbacher (2007) found that market performance affects service performance within the scope of service innovation. Racherla et al. (2008) stated that the use of innovative information and communication technologies plays an important role in the development of destinations. Hu et al. (2009) found that knowledge sharing, and team culture have a significant impact on service innovation performance. Hjalager (2010) and Chen (2011) found that lack of skills was the biggest obstacle to innovation, while Iplik et al. (2014) consider costs as the reason for this. In the following period, the relationship between service innovation and customer satisfaction was examined and the relationship between the two variables was found to be positive (Su, 2011; Čivre and Omerzel, 2015; Jin, et al., 2016; Bharwani and Mathews, 2016; Tajeddini, et al., 2017; Sipe, 2018; Verreynne, et al., 2019).

4.1.4. Findings Regarding the Organizational Innovation Theme

Forty-eight (48) articles were reached under the theme of organizational innovation. Further information on the articles in this theme can be found in Appendix 1. The distribution of the articles and the top 5 journals in this theme are given in Table 13 below.

Table 13. *Top 5 Journals which published articles about Product Innovation*

No	Journal Name	Number of Articles
1	Tourism Economics	4
2	Tourism Management	4
3	International Journal of Contemporary Hospitality Management	3
4	Journal of Hospitality and Tourism Management	3
5	Current Issues in Tourism	2
	European Planning Studies	2
	International Journal of Hospitality Management	2
	Journal of Sustainable Tourism	2
	Procedia Economics and Finance	2
	The Service Industries Journal	2
	Tourism and Hospitality Research	2
	Tourism Geographies	2
	Tourism Management Perspectives	2

Most of the work on the theme of organizational innovation has been published in journals indexed by SSCI, ESCI and SCOPUS such as Tourism Economics, Tourism Management, International Journal of Contemporary Hospitality Management, Journal of Hospitality and Tourism Management, Current Issues in Tourism, European Planning Studies, International Journal of Hospitality Management, Journal of Sustainable Tourism, Procedia Economics And Finance, The Service Industries Journal, Tourism and Hospitality Research, Tourism Geographies, Tourism Management Perspectives (Table 14).

Table 14. *Number of articles by index*

Index	Frequency
SSCI	35
SCOPUS and ESCI	6
SCOPUS	4
ESCI	3

Table 15 presents the distribution of the articles in the organizational innovation theme according to the indexing. As a result of the analysis, it is seen that the studies reached within the theme of organizational innovation have been published in the journals which are indexed in SSCI. When the keywords of 48 studies under the theme of organizational innovation were examined, a total of 229 keywords were identified. These keywords are classified under 122 topics.

Table 15. *Distribution of Keywords*

No	Keywords	Frequency
1	Innovation	43
2	Tourism Innovation	25
3	Environment	6
4	Knowledge	6
5	Competition Network	5 5

Table 15 presents the most commonly used keywords for publications related to the theme of organizational innovation. Top 6 used keywords in the publications related to the theme of product innovation are;

- Innovation (innovation, innovation behavior, innovation configuration, diffusion of innovation, marketing innovation, organizational innovation, technological innovation, consumer innovativeness, social innovation, innovation diffusion model, innovation management, innovation networking, innovation strategy, innovation systems, innovations networks),
- Tourism Innovation (tourism cluster, tourism companies, tourism development, tourism innovation, tourism innovation systems, tourism learning, tourism planning, tourism sector),
- Environment (environment, environmental innovation, environmental responsibility, environments),
- Knowledge (knowledge, knowledge management, knowledge network, knowledge sharing, knowledge transfer),
- Competition (competition, competitive advantage, competitiveness),
- Network (networking, networks, social networks)

Apart from these keywords, the keywords such as Hospitality, Hotel Industry, Information and Communication Technologies (ICT), Small and Medium Enterprises (SMEs), Community, Sustainability, Cluster, Business Model Innovation, Destination Competitiveness, Model Development, National Government, Regional Competitiveness, Social Network Analysis were found to be used in the articles within the theme of product innovation.

When the studies on organizational innovation are examined, it is seen that clustering (Tseng, et al., 2008; Fundeanu, 2015; Backman, et al., 2017), developing cooperation between state and private sector (Mei, et al., 2015; Alegre and Berbegal-Miraben, 2016; Giacosa, et al., 2016; Booyens and Rogerson, 2017), increasing cooperation and knowledge sharing between enterprises (Kim and Shim, 2018) and business-to-business network (Sorensen, 2007; Romerio and Costa, 2010; Booyens, 2016; Patluang, 2017; Koflera, et al., 2018) are important factors to accomplish organizational innovation.

5.Conclusion

In this study, the articles on tourism and innovation concepts are examined under five classes as: (1) product innovation, (2) service innovation, (3) process innovation, (4) management innovation and, (5) organizational innovation. This classification is also accepted as an instrument to understand innovation activities in the tourism sector.

It is emphasized that keeping up with the developing technology within the scope of product development is an extremely important point. When the results of the studies are examined, it is seen that there is a positive relationship between product innovation and business performance. This shows how important product innovation is to achieve business objectives. Service innovation has come to the forefront as another type of innovation that is important in the tourism sector. In the labor-intensive tourism sector, businesses can achieve a competitive advantage by differentiating their services. At this point, it is important to work with a team with high innovation skills. When the results of the studies are examined, it is seen that there is a positive relationship between service innovation and customer satisfaction. This emphasizes the importance of service innovation in achieving business objectives.

Process innovation addresses all processes related to business activities. Improvement of the processes will ensure the smooth running of operational activities. Another important aspect of process innovation is its multiplier effect on other types of innovation. Collaboration is the basis of organizational innovation. The cooperation between the private sector and the state or the cooperation between private sector enterprises is important for achieving economic goals. In today's highly competitive business environment, it is ironically necessary to achieve a competitive advantage through knowledge sharing and collaboration. The biggest obstacle to innovation is the enterprise itself. Negative factors such as resistance to change in business components and conflicts of ideas also affect the success of innovation negatively. Management innovation aims to eliminate these negative factors.

Innovation is a key concept for the realization of highly popular approaches such as competitive advantage, sustainability, internal entrepreneurship and learning organization. The advantages innovation offers firms can be listed as an increase in efficiency, superiority in sustainable competition, solutions to the problems encountered in the balance of payments, raising awareness of social responsibility in the society and improving it, expanding the range of

institutionalisation and branding and directing firms into good quality output promised by research and development.

In addition to all the study results, it is seen in the literature that, innovation approaches in tourism research is highly influenced by conventional manufacturing industries. This can be accepted as the main finding of this study. It is seen in this review that there are few studies on the experience, which is the most important product of tourism.

Research gaps and an agenda for future research

The journey of the idea of this article started by considering the fact that tourism enterprises needed innovation in dealing with their customers' demands and needs. Thus, it was stated by several researchers in international literature that tourism industry is often innovated so that it could operate as a labor-intensive sector, so that businesses could compete and so that they could differ from others and have competitive advantage (Işık, 2019). In this context, considering the place innovation occupies and the significance it has, this article is believed to be reflective of the situation in the tourism sector in terms of innovation. This study, which compiled the studies concerning the correlations between tourism and innovation and published in international journals aimed to investigate the level of studies on innovation in tourism and the issues which they focus.

This study, like other studies, had a number of restrictions and research gaps. The research was limited to the studies using the keywords of tourism, innovation, hotel and innovation which had been published in 50 high ranking tourism journals which were indexed by SSCI, SCI, SCI-E, ESCI and SCOPUS. This study is expected to shed light on the future researchers intending to perform a study on the correlations between tourism and innovation which has been studied in this study and how often they have been studied in the literature and what topics have been studied less often, and to save time. In other words, it is believed that this study will guide researchers on the topics which need to be studied in terms of innovation in tourism. This study confined itself to analyzing a certain number of journals- which is a limitation of this study. The number of journals to be analyzed could be increased, all the studies could be reached, and a complete portrait of the area could be drawn.

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No	Authors	Year	Title	Country / City	Variables	Methods	Results	Theme	Keywords	Journal Published	Indexing
1	Busser, Shulga and Kang (2019)	2019	Customer Disposition to Social Exchange in Co-Innovation	United States Las Vegas	Customer Disposition, Social Exchange, Co-Innovation	Survey, Exploratory factor, Multivariate Analysis of Variance	Findings showed that customers experienced higher loyalty and trust when the tourism and hospitality provider-initiated co-innovation. Overall, the results demonstrated that co innovations' initial interaction added to the success of relationship development between customers and a company.	Process Innovation	Co-innovation, Social exchange ideology, Satisfaction, Loyalty, Trust	International Journal of Hospitality Management	SSCI
2	Wikhamn (2019)	2019	Innovation, Sustainable HRM and Customer Satisfaction	Sweden Gothenburg	Innovation, Customer Satisfaction, HRM	Survey, Chi-Square, Variance Analyses	The study concludes that sustainable HR practices enhance a hotel's capability to innovate and to have satisfied customers. The relationship between sustainable HR practices and innovation is discussed.	Management Innovation	Sustainable HRM, Innovation, Customer satisfaction, Hotels, Sweden	International Journal of Hospitality Management	SSCI
3	Martin-Rios and Ciobanu (2019)	2019	Hospitality Innovation Strategies: An Analysis of Success Factors and Challenges	Switzerland Lausanne	Technological and Non-technological Innovation, Innovation Strategies, Performance	Survey, Linear Regression Analyses, Univariate Anova	The study concludes that the level of innovation varies from sector to sector and that innovation strategies can have different effects on performance depending on the sector.	Management Innovation	Innovation strategy, Innovation management, Innovation practices, Non-technological innovation, Technological innovation, Hospitality, Service firms, Sales turnover, Performance, CIS data	Tourism Management	SSCI
4	Hoarau-Heemstra and Eide (2019)	2019	Values and Concern: Drivers of Innovation In Experience-Based Tourism	Iceland, Norway	Differentiation in Tourism, Innovation, Value, Concern	Document Review, Interview, Content Analysis		Organizational Innovation	Innovation, Drivers, Experience-based tourism, Values, Concern	Tourism and Hospitality Research	SCOPUS and ESCI
5	Garcia, Cortes, Lajara, Lillo and Saez (2018)	2018	Continuous Innovation in The Hotel Industry: The Development Of Organizational Ambidexterity Through Human Capital And Organizational Culture in Spanish Hotels	Spain	Performance, High performance work system, Organizational ambidexterity, Ambidextrous organizational culture	Partial Least Squares	The results of the research confirm that HPWSs exert a direct influence on organizational ambidexterity.	Management Innovation	Performance, High performance work system, Organizational ambidexterity, Ambidextrous organizational culture	International Journal of Contemporary Hospitality Management	SSCI

6	Kallmuenzer (2018)	2018	Exploring Drivers of Innovation in Hospitality Family Firms	Western Austria	Collaboration, Innovation, Family business, Qualitative, Hospitality	Qualitative Text Analysis	Results show that the entrepreneurial family and employees are key drivers for innovation as actors internal to the firm, but also the guests and regional competitors as external drivers provide comprehensive innovation input.	Organizational Innovation	Collaboration, Innovation, Family business, Qualitative, Hospitality	International Journal of Contemporary Hospitality Management	SSCI
7	Kim and Shim (2018)	2018	Social Capital, Knowledge Sharing and İnnovation of Small and Medium-Sized Enterprises in A Tourism Cluster	South Korea	Innovation, Social capital, Knowledge sharing, Tourism cluster, SME	Correlation and Bootstrapping Analysis	This study confirms that knowledge sharing positively affects SME performance through innovation.	Organizational Innovation	Innovation, Social capital, Knowledge sharing, Tourism cluster, SME	International Journal of Contemporary Hospitality Management	SSCI
8	Marasco, De Martino, Magnotti and Morvillo (2018)	2018	Collaborative Innovation in Tourism and Hospitality: A Systematic Review of The Literature	Italy	Collaborative innovation, Thematic analysis, Tourism and hospitality, Systematic review.	Literature review	Based on a qualitative thematic analysis, five groups of articles were identified: cooperative behavior of innovating firms, co-creation, collaborative networks for innovation, knowledge transfer and innovation policies.	Process Innovation	Collaborative innovation, Thematic analysis, Tourism and hospitality, Systematic review.	International Journal of Contemporary Hospitality Management	SSCI
9	Nieves and Meneses (2018)	2018	Knowledge Sources and Innovation in The Hotel Industry: Empirical Analysis on Gran Canaria Island, A Mature Mass-Tourism Destination	Spain Gran Canaria	Innovation, Radical innovation, Hotel industry, Knowledge management, Incremental innovation, Intra-organizational knowledge, Sources of external knowledge.	Descriptive statistics, Principal component analysis, Multiple regression analysis.	The findings suggest a dissociation between innovations adopted by directly incorporating the specific knowledge provided by external agents and innovations that require the mediation of intraorganizational collaboration for their development.	Service Innovation	Innovation, Radical innovation, Hotel industry, Knowledge management, Incremental innovation, Intra-organizational knowledge, Sources of external knowledge.	International Journal of Contemporary Hospitality Management	SSCI
10	Nysveen, Oklevik and Pedersen (2018)	2018	Brand Satisfaction: Exploring the Role of Innovativeness, Green Image and Experience in the Hotel Sector	Norway	Brand innovativeness, Hotel, Green image, Brand experience, Guests' satisfaction	Coleration Analysis	The study also shows a positive influence of perceived brand innovativeness on perceived green image.	Product Innovation	Brand innovativeness, Hotel, Green image, Brand experience, Guests' satisfaction	International Journal of Contemporary Hospitality Management	SSCI
11	Wikhamn, Armbrecht and Wikhamn (2018)	2018	Innovation in Swedish Hotels	Sweden	Innovation, Hotels, Hospitality, Sweden	Chi-square Test, Regression Analysis	Most common are service/product and marketing innovations. A hotel's likelihood of innovating depends largely on structural independence (non-chain), having an explicit	Product Innovation	Innovation, Hotels, Hospitality, Sweden	International Journal of Contemporary Hospitality Management	SSCI

							innovation strategy and investing in non-traditional R&D.				
12	Kallmuenzer and Peters (2018)	2018	Innovativeness and Control Mechanisms in Tourism and Hospitality Family Firms: A Comparative Study	Austria Innsbruck	THFF Tourism/Hospitality Family Firms, Non-THFF, Innovativeness, Financial performance	Content Analysis	Findings show that innovativeness in Tourism/Hospitality Family Firms (THFF) is as relevant for performance as in non THFF. However, only in non-THFF control mechanisms show to be relevant, but have a significant negative moderating effect on the innovativeness-performance relationship.	Process Innovation	Tourism, Hospitality, Family business, Innovativeness, Control mechanisms, Social embeddedness, Quantitative	International Journal Of Hospitality Management	SSCI
13	Kim, Tang and Bosselman (2018)	2018	Measuring Customer Perceptions of Restaurant Innovativeness: Developing and Validating A Scale	USA Blacksburg	Customer Perceptions, Restaurant Innovativeness, Measuring	Interviews, Confirmatory Factor Analysis	The study illuminates the procedure for developing a complete scale for future hospitality research.	Process Innovation	Innovativeness, Restaurant innovativeness, Customer perceptions, Scale development	International Journal of Hospitality Management	SSCI
14	Kuo, Tseng and Chen (2018)	2018	Choosing Between Exiting or Innovative Solutions For Bed and Breakfasts	Taiwan	Bed and Breakfast Businesses, Innovative Solution, Exit	Interviews, A Grounded Theory		Service Innovation	Bed and breakfast, Exit strategy, Innovative solution, Grounded theory	International Journal of Hospitality Management	SSCI
15	Liu & Cheng (2018)	2018	Exploring Driving Forces of Innovation in The MSEs: The Case of The Sustainable B&B Tourism Industry	Taiwan Nantou	Tourism Innovation, Micro and Small Enterprises (Mses), Bed and Breakfast Industry	In-depth Interviews, Documentary Research	The results show that the B&B owners' lifestyles and customers are key drivers of innovation. On the other hand, employees, family and friends are less frequently mentioned.	Process Innovation	Tourism Innovation, Micro and Small Enterprises (Mses), Bed and Breakfast Industry	International Journal of Hospitality Management	SSCI
16	Uen, Chang, McConville and Tsai (2018)	2018	Supervisory Mentoring and Newcomer Innovation Performance in The Hospitality Industry	Taiwan	Supervisory Mentoring Function, Newcomers, Innovation Performance	Survey, Correlation	The conclusion is that mentoring is a powerful strategy that can be used to encourage innovation and also firms innovation performance will enhanced when organizations develop their mentoring processes.	Process Innovation	Mentoring function, Newcomer, Innovation performance, Social capital theory, Hospitality industry	International Journal of Hospitality Management	SSCI
17	Akgunduz, Alkan and Gök (2018)	2018	Perceived Organizational Support, Employee Creativity and Proactive Personality: The Mediating Effect of Meaning of Work	Turkey Izmir	Proactive Personality, Employee Creativity, Meaning of Work, Perceived	Structural Equation Model	It was stated that the creativity of the employees is positively related to the occupancy level.	Organizational Innovation	Proactive personality, Employee creativity, Meaning of work, Perceived organizational support	Journal of Hospitality and Tourism Management	SSCI

					Organizational Support.						
18	Zopiatis and Theocharous (2018)	2018	PRAXIS: The Determining Element of Innovation Behavior in the Hospitality Industry	Cyprus	Praxis Innovation, Human capital	Structural Equation Modeling	Praxis, which is defined as action informed by theory and experiences, is a vital element of innovation behavior in the hospitality industry.	Process Innovation	Praxis, Innovation, Human capital, SEM, Mediation analysis	Journal of Hospitality and Tourism Management	SSCI
19	Aquino, Lück & Schänzel (2018)	2018	A Conceptual Framework of Tourism Social Entrepreneurship For Sustainable Community Development	New Zealand Auckland	Tourism, Social Entrepreneurship, Sustainable Community Development	Content Analysis, Literatür Review	This conceptual framework demonstrates TSE for sustainable community development as a process and activity led by tourism social entrepreneurs engaging with local communities, institutions, and decision-makers.	Process Innovation	Community capitals framework, Community development, Conceptual framework, Social enterprise, Social innovation, Tourism social entrepreneurship	Journal of Hospitality and Tourism Management	SSCI
20	Panzer-Krause (2018)	2018	Networking Towards Sustainable Tourism: Innovations Between Green Growth and Degrowth Strategies	Germany Hildesheim	Green Growth, Burren Ecotourism Network, Innovations	Documentary Research, Interviews, Survey, Content Analysis, Social Network Analysis	As a consequence, members on the modernists' side tended to engage more often in conventional entrepreneurial activities making use of socio-ecological arguments to raise revenue. On the other hand, Burren Ecotourism Network members on the conservatives' side were likely to show commitment in voluntary working groups.	Process Innovation	Regional Sustainability Transition, Networks, Evolutionary Approach, Green Growth, Degrowth, Business-Led Grassroots İnnovations	Regional Studies	SSCI
21	Chen and Chiu (2018)	2018	Correlation between Innovation Strategy and Operational Performance in Tourism based on Competitive Advantage	Taiwan Taichung	Tourism, Innovation Strategy, Competitive Advantage, Operational Performance.	Correlation Analysis		Organization al Innovation	Tourism, Innovation Strategy, Competitive Advantage, Operational Performance.	Revista de Cercetare si Interventie Sociala	SSCI
22	Pons-Morera, Cano´s-Daro´s and Gil-Pechuan (2018)	2018	A Model of Collaborative Innovation between Local Government and Tourism Operators	Spain	Collaborative Innovation, Public Private Partnership , Technological Services , Tourism	Concept Mapping, Cluster Analysis, Method of Linkage, Ward's Method		Process Innovation	Collaborative Innovation, Public Private Partnership , Technological Services , Tourism	Service Business	SSCI

23	Weidenfeld (2018)	2018	Tourism Diversification and Its Implications for Smart Specialisation	England Coventry	Tourism Diversification, Smart Specialisation, Tourism Innovation	Dokümant Research, Literatür Review	Diversification strategies should be approached at product / market, regional and sectoral levels. Diversification and sectoral focus are proposed in the context of lack of resources to collect information on economic growth and new markets.	Process Innovation	tourism diversification, smart specialisation, tourism innovation, related variety	Sustainability	SSCI
24	Jung and Yoon (2018)	2018	Improving Frontline Service Employees' Innovative Behavior Using Conflict Management in The Hospitality Industry: The Mediating Role of Engagement	Republic of Korea Seoul	Conflicts, Engagement, innovative behavior	Survey	The results show that, the conflict management, as perceived by frontline employees, significantly affects their levels of engagement and innovative behavior.	Service Innovation	Conflict management, Engagement, Innovative behavior, Frontline employee, Hospitality industry,	The Mediating Role of Engagement. Tourism Management	SSCI
25	Bağıran Özşeker (2018)	2018	Towards a Model of Destination Innovation Process: An Integrative Review	Turkey İzmir	Innovation in Tourism, Cluster Theory, Innovation Systems	Integrative, Literature Review		Process Innovation and Organizational Innovation	Innovation İn Tourism, Cluster Theory, Innovation Systems, Networks, Knowledge Management	The Service Industries Journal	SSCI
26	Henderson, Avis and Tsui (2018)	2018	Testing Discontinuous Innovations in The Tourism Industry: The Case of Scenic Airship Services	New Zealand Queenstown	Discontinuous Innovation, Scenic Tourism, Consumer Interest, Product Development	Focus Group Interview, Descriptive Analysis, T-test, Chi-square Analysis, Simple Linear Regression Analysis, Wilcoxon and Friedman Test Analysis	Significant consumer interest was shown for scenic airship services and a descriptive model of what drove this interest was created for the tourism market of Queenstown, New Zealand.	Product Innovation	Discontinuous innovation, Scenic tourism, Consumer interest, Product development, Scenic airship services	Tourism Management	SSCI
27	Divisekera and Nguyen (2018)	2018	Determinants of innovation in tourism evidence from Australia	Australia Melbourne	Determinants of Innovation, Inputs and Outputs of Innovation	Survey, Chi-Square, Logistic Regression	Consequently, firms taking part in collaboration are more likely to introduce innovations than are firms that do not collaborate and a highly qualified and well-trained workforce is more likely to recognise the value of previously unexploited knowledge, opportunities, and ideas that lead to the generation of innovation.	Service Innovation	Tourism, Determinants of innovation, Innovation process, Service innovation, Marketing innovation, Logistic regression, Australia	Tourism Management	SSCI

28	Makkonen, Williams, Weidenfeld and Kaisto (2018)	2018	Cross-Border KnowledgeTransfer and Innovation in The European Neighbourhood: Tourism Cooperation at The Finnish-Russian Border	Finland Tampere	EU Funding, Knowledge Transfer, innovation	İnterwiev	While language issues, and differences in business culture and administrative/legislative systems between the two countries, constitute barriers for practical cross-border cooperation, it is cross-border differences in culture and technological capabilities that drive cross-border knowledge transfer and innovation in the cross-border region.	Process Innovation and Organization al Innovation	Cross-border region, European neighbourhood, Finland, Innovation, Knowledge transfer, Russia, Tourism	Tourism Management	SSCI
29	Pikkemaat, Peters & Chan (2018)	2018	Needs, Drivers and Barriers of Innovation: The Case of an Alpine Community-Model Destination	Austria Innsbruck	Need of Innovation, Drivers of Innovation, Obstacles of Innovation, Destination Management Organizations	Interview	The results demonstrate the importance of cooperation and networking of small and medium enterprises in destinations.	Organization al Innovation	Alpine tourism, Barriers of innovation, Community-model destination, Drivers of innovation, Needs of innovation, Small and medium enterprises (SMEs)	Tourism Management Perspectives	SSCI
30	Reid (2018)	2018	Wonderment in Tourism Land: Three Tales of Innovation	Sweden Helsingborg	Entrepreneurship, Innovation, Story-Telling	Open In-depth Interviews, Content Analysis	The study highlights the importance of knowledge in innovation, also illuminating an important relationship to entrepreneurial passion.	Product Innovation and Process Innovation	Entrepreneurship, Entrepreneuring, Innovation, Tourism, Narrative, Story-Telling	Journal of Teaching in Travel & Tourism	SCOPUS and ESCI
31	Zuniga-Collazos (2018)	2018	Analysis of Factors Determining Colombia's Tourist Enterprises Organizational Innovations	Colombia	Organizational Innovations, Tourist Enterprises	Correlation Matrix, Regression Analysis	The findings show that ''Directing and Management (The way of directing and managing company)'' and ''Commercialization and Sales (The way to directing and managing the commercialization and sales of a company)'' have a significant relationship with Colombia ´s tourist enterprises organizational innovations.	Organization al Innovation	Tourism, Innovation, Organizational İnnovation, Colombia	Tourism and Hospitality Research	SCOPUS and ESCI
32	Weaver (2018)	2018	Creative Periphery Syndrome? Opportunities For Sustainable Tourism Innovation in Timor-Leste, An Early Stage Destination	China Liaoning	Tourism Innovation, Sustainable	Case Study		Service Innovation	Timor-Leste, Small Islands, Peripherality, Sustainable Tourism, Tourism Planning	Tourism Recreation Research	SCOPUS and ESCI
33	Alfiero, Giudice and	2017	Street Food and Innovation: The Food Truck Phenomenon	Italy	Innovation, Street Food, Efficiency Performance,	Data Envelopment Analysis		Service Innovation	Innovation, Data Envelopment analysis, Street Food, Efficiency Performance,	British Food Journal	SCI-E

	Bonadonna (2017)				Gourmet Food Truck, Traditional Food Truck				Gourmet Food Truck, Traditional Food Truck		
34	Victoria, Puig and Loureiro (2017)	2017	Clustering, Innovation and Hotel Competitiveness: Evidence from the Colombia Destination	Colombia	Competitiveness, Hotel industry, Mediation, Cluster, Management innovation	Structural Modeling and Partial Least Squares.	Clustering has a positive direct impact on hotel competitiveness and innovation, and there is a positive effect of innovation on competitiveness.	Management Innovation	Competitiveness, Hotel industry, Mediation, Cluster, Management innovation	*International Journal of Contemporary Hospitality Management*	SSCI
35	Zebryte and Jorquera (2017)	2017	Chilean Tourism Sector "B Corporations": Evidence of Social Entrepreneurship and Innovation	Chile Temuco	Latin America, Social entrepreneurship, Social innovation, Business models, B Corporation	Case Study, In-depth interviews.	The three businesses analyzed in this paper work in permanent cooperation with each other in order to more positively impact vulnerable communities.	Process Innovation and Service Innovation	Latin America, Social entrepreneurship, Social innovation, Business models, B Corporation	International Journal of Entrepreneurial Behavior & Research	SSCI
36	Presenza, Abbate, Casali and Perano (2017)	2017	An Innovative Approach to The Intellectual Property in Haute Cuisine	Australia	Culinary Innovation Process, Creativity Protection	Survey	The paper identifies five barriers against imitation by competitors: "listening to clients' needs"; "chef's own creativity", "systematic approach to creativity"; "knowledge based feasibility" and "accumulated professional skills".	Product Innovation	Creativity protection, Idea generation, Idea transformation, Michelin starred chefs, Professional skills, Systematic approach	International Journal of Hospitality Management	SSCI
37	Claudino, Dos Santos, Cabral and Pessoa (2017)	2017	Fostering and Limiting Factors of Innovation in Micro and Small Enterprises	Brazilian Picos	Innovation, Micro and Small Enterprises (MSE), Fostering and limiting factors of innovation	Interwiev		Product Innovation	Innovation, Micro and Small Enterprises (MSE), Fostering and limiting factors of innovation	RAI Revista de Administração e Inovação	SSCI
38	Liu (2017)	2017	Creating Competitive Advantage: Linking Perspectives of Organization Learning, Innovation Behavior and Intellectual Capital	NetherlandsAmsterdam	Exploratory and Exploitative Learning, Innovation Behavior, Human Capital, Hotel Managers	Survey, Mediation-Moderation Model	Intellectual Capital theory confirmed that social capital and relational capital will strengthen the relationship between innovation behavior and human capital.	Service Innovation and Organizational Innovation	Learning orientation, Innovation behavior, Intellectual capital, Opportunity capture, Competitive advantage,	Sustainability	SSCI
39	Erkuş and Öztürk (2017)	2017	Related Variety and Innovation: Evidence from The Tourism Industry	Turkey Antalya	Related Variety, Unrelated Variety, Innovation, Tourism	Correspondence and Chi-square	The findings show a significant difference in the relationship between company innovations and the two proxies for related variety, unrelated variety and intra-industry relations, namely	Process Innovation	Related Variety, Unrelated Variety, Innovation, Tourism	Tijdschrift voor Economische en Sociale Geografie	SSCI

							investment behaviour and recruitment of personnel.				
40	Booyens and Rogerson (2017)	2017	Networking and Learning for Tourism Innovation: Evidence from The Western Cape	South Africa	Tourism innovation, Tourism planning, İnnovation networking Knowledge, Tourism Innovation Systems, Regional competitiveness	Interwiev	This investigation demonstrates that even though tourism firms mostly use internal resources for innovation, external, non-local knowledge is significant for enhancing novel innovation.	Process Innovation and Organizational Innovation	Tourism Innovation, Tourism Planning, Tourism Learning, Innovation Networking, Knowledge, Tourism Innovation Systems, Regional Competitiveness, South Africa	Tourism Geographies	SSCI
41	Zach and Hill (2017)	2017	Network, Knowledge And Relationship Impacts On Innovation In Tourism Destinations	ABD Washington	Innovation, Networks	Survey, Coleration Analysis	Results show that promoters of innovation within a destination should leverage brokerage position to improve the in-flow of ideas while encouraging the firms that share knowledge and trust to collaborate to apply those ideas.	Process Innovation	Destination management, Innovation, Network structure, Knowledge, Relational trust,	Tourism Management	SSCI
42	Eide, Fuglsang and Sundbo (2017)	2017	Management Challenges With the Maintenance of Tourism Experience Concept Innovations: Toward A New Research Agenda	Denmark Roskilde	Management, Innovation, Repair (maintenance), Experience Concept, Experience System, Responsibility, Experience Based Tourism.	Experience Theory, Experience System, Internal Participation and External Participation, Analytical Model	In addition to the problems arising from the lack of competence and understanding of the managers, it was stated that the management system stemmed from both the experience system and the shortcomings in internal and external relations.	Management Innovation	Management, Innovation, Repair (maintenance), Experience Concept, Experience System, Responsibility, Experience Based Tourism.	Tourism Management	SSCI
43	Gu, Duverger and Yu (2017)	2017	Can Innovative Behavior Be Led By Management? A Study From The Lodging Business	China Beijing	Organizational Commitment, Leadership, Employee Innovative Behavior	Survey	Organizational commitment mediated the relationship between leadership and innovative behavior.	Management Innovation	Leadership, Innovative behavior, Organizational commitment, Tenure, Moderated mediation	Tourism Management	SSCI
44	Li, Wood and Thomas (2017)	2017	Innovation İmplementation: Harmony and Conflict in Chinese Modern Music Festivals.	United Kingdom Leeds	Chinese Modern Music Festivals, Implementation of Innovation,	Case Studie	The findings of six detailed case studies show identity, equality, guanxi, and a range of specific contextual factors, affect innovation implementation, notably by influencing the acquisition and use of	Process Innovation	Innovation, Events, Social Exchange, Guanxi	Tourism Management	SSCI

							knowledge and other resources essential to the process.				
45	Spenceley and Snyman (2017)	2017	Protected Area Tourism: Progress, Innovation and Sustainability	South Africa Johannesburg	Innovation, Sustainability	Theoretical Analysis, Quantitative Research		Process Innovation		Tourism and Hospitality Research	SCOPUS and ESCI
46	Patluang (2017)	2017	Network Mining for Marketing Innovation: Evıdence from Tourism Community Enterprises	Thailand	Community enterprise, Knowledge network, marketing Innovation, Microenterprise, Social network, Thailand, Tourism.	Factor Analysis, Hierarchical regression analysis.	Findings from quantitative analyses of data of Thai tourism communityenterprises point to significant positive effects of networks on the innovation.	Process Innovation and Organization al Innovation	Community enterprise, Knowledge network, marketing Innovation, Microenterprise, Social network, Thailand, Tourism.	Polish Journal Of Management Studies	ESCI
47	Sakdiyakorn and Sivarak (2016)	2016	Innovation Management in Cultural Heritage Tourism:Experience from the Amphawa Waterfront Community, Thailand	Thailand	Cultural Heritage, Innovation Management	Case Study	The “willingness” and “capability” of those involved in a community-based cultural heritage initiative are key to fostering a multitude of innovations.	Process Innovation	Cultural Heritage, Innovation , Management, Sustaniable, Tayland	Asia Pacific Journal of Tourism Research	SSCI
48	Narduzzo and Volo (2016)	2016	Tourism Innovation: When Interdependencies Matter	Italy Brunico, BZ	Innovation management, Tourism complexity, Interdependencies.	Literature review	Innovation in settings characterized by interdependencies is an underresearched area, and tourism suffers the same condition.	Process Innovation and Management Innovation	Innovation management, Tourism complexity, Interdependencies.	Current Issues in Tourism	SSCI
49	Torrent-Sellens, Ficapal-Cusı´, Boada-Grau, Vigil-Colet (2016)	2016	Information and Communication Technology, Co-Innovation, and Perceived Productivity In Tourism Small and Medium Enterprises: An Exploratory Analysis	Spain Catalonia	Perceived Firm Productivity, Innovation, Tourism Small and Medium Enterprises (Smes)	Exploratory Factor Analysis		Process Innovation	Perceived Firm Productivity, ICT, Co-Innovation, Tourism Small And Medium Enterprises (Smes), Questionnaire, Statistical Evaluation	Current Issues in Tourism	SSCI
50	Perez, Villaverde and Elche (2016)	2016	The Mediating Effect of Ambidextrous Knowledge Strategy between Social Capital and Innovation of Cultural Tourism Clusters Firms	Spain	Innovation, Hospitality, Social capital, Cluster, Cultural tourism, Ambidextrous knowledge strategy	Partial Least Squares	The combination of bonding and bridging capital yields higher innovation performance through ambidextrous knowledge strategy.	Process Innovation and Service Innovation	Innovation, Hospitality, Social capital, Cluster, Cultural tourism, Ambidextrous knowledge strategy	International Journal of Contemporary Hospitality Management	SSCI

51	Sipe (2016)	2016	How Do Senior Managers Influence Experience Innovation? Insights From A Hospitality Market Place.	USA San Diego	Senior Managers, Innovation	An Exploratory Sequential Mixed Method	Findings from executives in four segments of a hospitality marketplace suggest three organizational capacities are associated with continuous innovation of memorable experiences.	Management Innovation	Experience economy, Innovation, Leadership, Hospitality, Measures	International Journal of Hospitality Management	SSCI
52	Sanjeev (2016)	2016	Innovations Mount up in the Indian Hospitality Industry: Summing up	India	Innovation, Hospitality, Customer Service, Technology, Culinary, Revenue Management	Interview		Organizational Innovation	Innovation, Hospitality, Customer Service, Technology, Culinary, Revenue Management	Worldwide Hospitality and Tourism Themes	ESCI
53	Tang (2016)	2016	Making Innovation Happen Through Building Social Capital and Scanning Environment	Taiwan	Environmental Scanning, Social Capital Building	Survey	The results show that environmental scanning and social capital fully mediate the relationship between proactive personality of managers and capacity for service innovation	Service Innovation	Proactive personality, Social capital, Scanning environment, Service innovation, Service improvement	International Journal of Hospitality Management	SSCI
54	Booyens and Rogerson (2016)	2016	Tourism Innovation in the Global South: Evidence from the Western Cape, South Africa	South Africa Cape Town	Tourism Innovation Typology, Firm Level Tourism Innovation, Tourism Systems	Interview, Literature Review		Product Innovation	Tourism Innovation Typology, Firm Level Tourism Innovation, Tourism Systems	International Journal of Tourism Research	SSCI
55	Booyens and Rogerson (2016)	2016	Unpacking The Geography of Tourism Innovation in Western Cape Province, South Africa.	South Africa West Cape	Tourism Innovation, Local Tourism, Innovation Networks	Interview, Survey, Frequency Analysis		Process Innovation	Tourism Innovation, Local Tourism Innovation Networks, Nature-Based Tourism, External Networking, Local Embeddedness.	International Journal of Tourism Research	SSCI
56	Zach (2016)	2016	Collaboration For Innovation in Tourism Organizations: Leadership Support, Innovation Formality, and Communication.	USA Washington	Leadership Support, Innovation, Cooperation	Survey, Correlation Analysis		Process Innovation and Service Innovation	Innovation, Leadership, Interorganizational Relationships, Micro Organizations, Destination Marketing Organizations	Journal of Hospitality & Tourism Research	SSCI
57	Kuščer, Mihalič and Pechlaner (2016)	2016	Innovation, Sustainable Tourism And Environments in Mountain Destination Development: A Comparative Analysis Of Austria, Slovenia And Switzerland	Austria Slovenia Switzerland	Mountain Destinations, Innovation, Environments, Tourism Development, Sustainability	Kruskal-Wallis, Mann-Whitney U/Post-Hoc, Tek Yönlü Varyans Analizi,		Process Innovation and Organizational Innovation	Mountain Destinations, Innovation, Environments, Tourism Development, Sustainability	Journal of Sustainable Tourism	SSCI

58	Liu, Yen, Tsai and Shuo Lo (2016)	2016	A Conceptual Framework for Agri-Food Tourism as an Eco-Innovation Strategy in Small Farms	Taiwan Kaohsiung	Agrifood, Eco-Innovation, Tourism	Qualitative Research, Case Study		Service Innovation	Agri-Food; Eco-Innovation; Supply Chain; Tourism	Sustainability	SSCI
59	Tugores and Valle (2016)	2016	Innovation, Hotel Occupancy, and Regional Growth	Spain Balears	Hotel Occupancy, Innovation, Tourism Impact	Interviews Descriptive analysis Regression models		Service Innovation	Hotel Occupancy, Innovation, Tourism Impact	Tourism Economics	SSCI
60	De la Peña, Núñez-Serrano, Turrión and Velázquez (2016)	2016	Are Innovations Relevant For Consumers in The Hospitality Industry? A Hedonic Approach For Cuban Hotels.	Cuba Holguín	Innovative Activity, Willingness to Pay	Content Analysis, Variance Decomposition, Hedonic Price Function	The results shows two lines of action for tourism businesses, First it seems evident that policies leading to increased quality greater diversity in tourism activities, Second, in order to provide more conclusive results, qualitative variables on the innovative activity of hotels and the educational attainment of employees should also be considered.	Product Innovation	Innovation, Hospitality industry, Prices, Hedonic pricing method	Tourism Management	SSCI
61	Dhar (2016)	2016	Ethical Leadership And İts İmpact on Service Innovative Behavior: The Role of LMX and Job Autonomy	India Uttarakhand	Ethical Leadership,Service Innovative Behavior	Survey, Hierarchical Regression	Findings of the study revealed that ethical leadership promoted service innovative behavior of the hotel employees mediated through leader-member exchanges. Further, it was also found that the level of service innovative behavior was commensurate to the perception of employee job autonomy.	Service Innovation	Ethical leadership, Leader–member Exchange, Service innovative behavior, Job autonomy, Tourist hotels, India	Tourism Management	SSCI
62	Erkuş-Öztürk and Terhorst (2016)	2016	Innovative Restaurants in A Mass-Tourism City: Evidence from Antalya	Turkey Antalya	Inovation, Location, Restourants	Interview, Correspondence, Chi-Square Analysis.	The main result of the empirical research is that high-quality restaurants, visited by a mix of locals and tourists, and are located in a specific urban places, are most innovative.	Service Innovation	Restaurants, Innovation, Mass-tourism cities, Diversification, Area differentiation	Tourism Management	SSCI
63	Varma, Jukic, Pestek, Shultz and Nestorov (2016)	2016	Airbnb: Exciting Innovation or Passing Fad ?	USA Chicago	Airbnb, Hotels, Lodging choice.	Online Survey, In-Depth Interview, Factor analysis,A Principal Component	There are significant differences between the type and motivation of customers that book Airbnb compared to those that book traditional hotels.	Management Innovation	Airbnb, Hotels, Lodging choice.	Tourism Management Perspectives	SSCI

						Analysis, ANOVA test.					
64	Booyens (2016)	2016	Global–Local Trajectories For Regional Competitiveness: Tourism Innovation in The Western Cape	South Africa Cape Town	Information Networks, Tourism Innovation, Regional Competitiveness	Case Study, Content Analysis	The results of this investigation point to the critical need for regional policy to focus on strategic networking linkages to access global knowledge flows, as well as the need to develop tourism as core regional competency, and to strengthen the capacity of local institutions to foster regional innovation, competitiveness and growth in the Western Cape economy.	Organizational Innovation	Core Competencies, Extra-Regional Networking, Regional Competitiveness, Regional Innovation, Tourism Innovation, Western Cape	Local Economy	SCOPUS and ESCI
65	Čivre and Omerzel (2015)	2015	The Behaviour of Tourism Firms in The Area of Innovativeness	Slovenian	Tourism Firms, Market Orientation, Entrepreneurial Orientation, Innovativeness, Performance	Descriptive Statistics, Structural Equation Modelling, Explorative and Confirmative Factor Analysis	The results of the study reveal the positive impact of a market and entrepreneurial orientation on innovativeness, the positive relationship of innovativeness with firm performance, and the importance of antecedents of innovativeness and their impacts on performance.	Service Innovation	Tourism, Tourism Firms, Market Orientation, Entrepreneurial Orientation, Innovativeness, Performance	Economic Research-Ekonomska Istraživanja	SCOPUS
66	Duverger (2015)	2015	Crowdsourcing Innovative Service Ideas: The Effect of Negative Interactions on Ideation Forums' Effectiveness	USA Maryland	Ideation Forums, Negative Interactions, Crowdsourcing, Innovative Service Ideas, Hoteliers	Survey, Correlation	The results demonstrate that mood-incongruent interactions have different effects on different groups of participating customers. Negatively worded innovative ideas are rated lower by satisfied customers, despite their superior merit.	Product Innovation and Service Innovation	Tourism, Groupthink, User-generated content, Ideation Forums, Negative Interactions, Crowdsourcing,	Journal of Hospitality and Tourism Technology	SCOPUS and ESCI
67	Román, Tamayo, Gamero and Romero (2015)	2015	Innovativeness and Business Performances in Tourism Smes	Spain Andalusia	Tourism industry, Innovative firm, Innovativeness, Profitability.	A multiple linear regression, Two-stage interactive model, Exploratory analysis, Z-Fisher test.	The model has undergone various hypothesis tests, thus demonstrating its validity, the importance of the main explanatory variables and the existence of a positive linear relationship between innovative outcomes in products and processes, and business profitability.	Product Innovation and Process Innovation	Tourism industry, Innovative firm, Innovativeness, Profitability.	Annals of Tourism Research	SSCI
68	Mei, Arcodia and Ruhanen (2015)	2015	The National Government as The Facilitator of Tourism Innovation: Evidence from Norway	Norway	Tourism innovation, Destination competitiveness, National government,	Case study, In-depth interviews, Thematic analysis.	The results verify the fact that the national government does have a key facilitating role to play in terms of providing the framework in which the private sector can innovate although true innovation and successful outcomes will depend on the	Process Innovation and Organizational Innovation	Tourism innovation, Destination competitiveness, National government, Facilitator, Norway.	Current Issues in Tourism	SSCI

					Facilitator, Norway.		involvement and drive from actors in both the private and public sectors.				
69	Kessler, Pachucki, Stummer, Mair and Binder (2015)	2015	Types of Organizational Innovativeness and Success in Austrian Hotels	Austrian	Innovation, Success, Hotel industry, Austria, Innovation results, Organizational innovativeness	Factor and Cluster Analysis.	Results show that a balanced configuration of organizational innovativeness combined with a cautious approach is connected with greater (innovation) success.	Management Innovation	Innovation, Success, Hotel industry, Austria, Innovation results, Organizational innovativeness	International Journal of Contemporary Hospitality Management	SSCI
70	Qin, Li and Yu (2015)	2015	Management Innovations in a Chinese Hotel Company: The Case of 7 Days Inn	China	Organizational culture, Strategic advantage, Management innovation, 7 Days Inn	Interview, Content Analysis	This study identified seven major innovative management practices developed by 7 Days Inn. Most of these innovations arose from the company's idiosyncratic collective mindset.	Management Innovation	China, Hotels, Organizational culture, Strategic advantage, Management innovation, 7 Days Inn	International Journal of Contemporary Hospitality Management	SSCI
71	Fundeanu (2015)	2015	Innovative Regional Cluster, Model of Tourism Development	Romania Oltenia	Tourism, Cluster, Model Development, Regional Development	Literature Review, Four Clover Leaves Model		Process Innovation and Organization al Innovation	Tourism, Cluster, Model Development, Regional Development, Competition	Procedia Economics And Finance	SCOPUS
72	Hjalager (2015)	2015	100 Innovations That Transformed Tourism	Denmark	History of Tourism, Product Innovation	Qualitative Research Literature Study, Reflection and Sampling		Product Innovation and Process Innovation	History Of Tourism, Innovation Dissemination, Product Innovation, Process Innovation, Institutional Change	Journal of Travel Research	SSCI
73	Eriksen (2015)	2015	Experience Innovation for Small Food and Tourism Firms	Zealand	Experience Innovation, Experience Economy, Food, Tourism, SMEs.	Empirical material consist of observations, Semi-structured interviews, Documents	The findings suggest that the two experiments included elements that support the emergence of an idea generation process.	Process Innovation and Service Innovation	Experience Innovation, Experience Economy, Food, Tourism, SMEs.	Scandinavian Journal of Hospitality and Tourism	SSCI
74	Mathisen and Garnes (2015)	2015	Boards of Directors in Tourism Organizations: Roles and Innovative Climates	Norway Oslo	Ttourism, Boards of directors, Board roles, Innovation, Climate for innovation.	Descriptive statistics, T-test, Multivariate analysis of variance.	The results of our study demonstrate a statistically significant difference between directors from limited liability companies and other tourism organizations regarding board roles.	Management Innovation	Tourism, Boards of directors, Board roles, Innovation, Climate for innovation.	Scandinavian Journal of Hospitality and Tourism	SSCI

75	Fraj, Matute and Melero (2015)	2015	Environmental Strategies and Organizational Competitiveness in The Hotel Industry: The Role of Learning and Innovation as Determinants of Environmental Success	Spain Zaragoza	Environmental Strategies, Organizational Capabilities, Competitiveness	Interview, Structural Equation Modeling, Partial Least Squares, Correlation	The findings confirm that a proactive environmental strategy and innovation favor organizational competitiveness. However, a learning orientation does not directly predict organizational competitiveness	Management Innovation	Proactive environmental strategy, Learning orientation, Innovativeness, Organizational performance, Hotel industry	Tourism Management	SSCI
76	Maravic, Križaj and Lesjak (2015)	2015	Innovation In Slovenian Tourism Organisations	Slovenia	Innovation, Innovation Climate, Tourism Organisations, Tourism	Descriptive Statistical Methods		Process Innovation	Innovation, Innovation Climate, Tourism Organisations, Tourism , Slovenia.	Tourism and Hospitality Management	SCOPUS and ESCI
77	Joppe, Brooker and Thomas (2015)	2015	Drivers of Innovation in Rural Tourism: The Role of Good Governance and Engaged Entrepreneurs	Canada Ontario	Rural Tourism, Governance, Innovation	Qualitative Research, Survey		Service Innovation	Rural Tourism, Governance, Engaged Entrepreneur, Innovation, Leadership	Journal of Rural and Community Development	ESCI
78	Ali and Frew (2014)	2014	Technology Innovation And Applications in Sustainable Destination Development	England	Information and Communication Technology, Sustainable Tourism, Innovation, Destination Management	Interview, Online Survey, Descriptive Analysis		Process Innovation and Service Innovation	Information and Communication Technology, Sustainable Tourism, eTourism, Innovation, Destination Management	Information Technology and Tourism	SCOPUS and ESCI
79	Halkias, Pizzurno, De Massis and Fragoudakis (2014)	2014	Halal Products and Services in The Italian Tourism and Hospitality Industry: Brief Case Studies of Entrepreneurship and Innovation	Italy Bergamo	Halal Tourism, Hotel Services, Innovation	Case Study	The study shows that Islamic societies tend to visit Muslim countries because they feel comfortable. However, a consideration of other matters hints at practical 'barriers,' such as the size of accommodation units.	Service Innovation	Halal, Islamic tourism, Italy, Hospitality	Journal of Developmental Entrepreneurship	SCOPUS and ESCI
80	Rodriguez, Williams and Hall (2014)	2014	Tourism Innovation Policy: Implementation and Outcomes.	Spain Alicante	Applications of Innovation Policies, Types and Results of Innovation, Obstacles	Content Analysis, Document Analysis	The findings show the contradictions of this hybrid model of implementation with mixed outcomes of successful collaborations and abandoned trajectories.	Management Innovation	Applications of Innovation Policies, Types and Results of Innovation, Obstacles	Annals of Tourism Research	SSCI
81	Luoh, Tsaur and Tang (2014)	2014	Empowering Employees: Job Standardization and Innovative Behavior	Taiwan	Psychological empowerment, Frontline employee, Innovative	Regression Analyss	The results show that job standardization had a negative effect on employee innovative behavior.	Management Innovation	Tourism, Hotel, Taiwan, Psychological empowerment, Frontline employee,	Empowering Employees: International Journal of Contemporary	SSCI

					behavior, Job standardization				Innovative behavior, Job standardization	Hospitality Management	
82	Cassel and Pashkevich (2014)	2014	World Heritage and Tourism Innovation: Institutional Frameworks and Local Adaptation	Swedish Falun	Innovation, World Heritage, Tourism	Interview, Content Analysis		Organization al Innovation	Innovation, World Heritage, Tourism, Institutional Frameworks, Local Adaptation	European Planning Studies	SSCI
83	Campo, Díaz and Yagüe (2014)	2014	Hotel Innovation and Performance in Times of Crisis	Spain	Performance, Innovation, Spain, Crisis, Hotel sector	Reliability and Validity Analysis	The results obtained indicate that the tendency of a hotel to innovate does not contribute directly and positively on short term performance.	Management Innovation	Performance, Innovation, Spain, Crisis, Hotel sector	International Journal of Contemporary Hospitality Management	SSCI
84	Kasim, Gursoy, Okumus, Wong (2014)	2014	The Importance of Water Management in Hotels: A Framework for Sustainability Through Innovation	Malaysia Langkawi	Tourism, Hotel management, Innovation	Case Study		Management Innovation	corporate environmentalism, responsible tourism, hotel management	Journal of Sustainable Tourism	SSCI
85	Brooker and Joppe (2014)	2014	Developing a Tourism Innovation Typology: Leveraging Liminal Insights.	Kanada Ontario	Tourism Innovation, Typology	Interview, Content Analysis, Interpretive Methods	Article suggest a three-level typology, the concept of liminality and its role in the search for tacit knowledge through weak network ties; and the need to ask ultimate (why) rather than proximate (what, how) questions.	Process Innovation	innovation, liminality, artist, liminal innovation, typology	Journal of Travel Research	SSCI
86	Carson, Carson, and Hodge (2014)	2014	Understanding Local Innovation Systems in Peripheral Tourism Destinations	Austria Burra	Networking, Collaboration, Information Exchange	Interview, Observation, Content Analysis	The paper concludes that effective regional destination development in peripheral areas needs to be better informed by more detailed understandings of local tourism systems and their capacities to engage.	Process Innovation	local innovation system, regional innovation system, spatial scale, peripheral areas, rural tourism, destination boundaries, South Australia, Clare Valley	Tourism Geographies	SSCI
87	Aarstad, Ness and Haugland (2014)	2014	Innovation, Uncertainty, and Inter-Firm Shortcut Ties in A Tourism Context	Norway	Uncertainty, Innovation	Interview	Innovating firms that perceive uncertainty have network ties across destinations, which can contribute to increased learning and adoption of best practices beyond a local destination.	Management Innovation	Destination, Innovation, Inter-firm networks, Path-length, Shortcut ties, Uncertainty	Tourism Management	SSCI
88	Thomas and Wood (2014)	2014	Innovation in Tourism: Re-Conceptualising and Measuring The Absorptive	United Kingdom	Innovation, Innovation Policy, Absorption Capacity, Information	Frequency Analysis, Confirmatory Factor Analysis	The expected four factors (acquisition, assimilation, transformation and exploitation) emerged from the data, indicating that this absorptive capacity	Management Innovation	Innovation, Innovation Policy, Absorption Capacity, Information Management, Hotels.	Tourism Management	SSCI

			Capacity of The Hotel Sector		Management, Hotels.		was qualitatively different in the hotel sector.				
89	Carvalho and Sarkar (2014)	2014	Market Structures, Strategy And Innovation in Tourism Sector	Portugal Évora	Market Structures-Strategies, Innovations	PCA, Factor Analysis		Management Innovation	Strategy, Innovation, Tourism, Portugal, Market structures, Service sector	International Journal of Culture Tourism and Hospitality Research	ESCI
90	Grissemann, Plank and Sperdin (2013)	2013	Enhancing Business Performance of Hotels: The Role of Innovation and Customer Orientation	Alpine	Innovation Behavior, Innovativeness, Customer Orientation, Financial Performance, Customer Retention Reputation	Correlation Analysis	Mediation analysis shows that innovation behavior partially mediates the effect of customer orientation on business performance	Management Innovation	Innovation Behavior, Innovativeness, Customer Orientation, Financial Performance, Customer Retention Reputation	International Journal of Hospitality Management	SSCI
91	Mattsson and Orfila-Sıntes (2012)	2013	Hotel Innovation and Its Effect on Business Performance	France Denmark Spain	Business Performance, Innovation	Descriptive and Descriptive Statistics, Correlation Analysis, Regression Analysis		Management Innovation	Business Performance, Innovation	International Journal of Tourism Research	SSCI
92	Dinica (2013)	2013	International Sustainability Agreements: Are They Politically Influential for Tourism Governance Innovations?	Finland Oulu	International Sustainability Agreements, Innovations, National Tourism Sectors, Governance	Document Analysis Literature Review, Content analysis.	The challenge for governance innovation addressed is that of horizontal policy integration across four policy domains: environmental protection, nature conservation, recreation, and tourism. The international agreements are assessed as having the effect of Persuasion techanisms on both political decision makers..	Management Innovation	International Sustainability Agreements, Innovations, National Tourism Sectors, Governance	Tourism Analysis	SCOPUS and ESCI
93	Muñoz and Collazos (2013)	2013	Tourism And Innovation in China And Spain: A Review Of Innovation Research On Tourism	Çin İspanya	Tourism Innovation, China and Spain Comparison	Comparison-Meta Analysis	Spanish innovation needs are more focused on improving tourist competitiveness and expanding the range of tourist experiences and segments. China, however, might be more interested in innovation activities contributing to the development of the tourist offer through innovation, paying special	Service Innovation	tourism innovation, innovation research, tourism competitiveness, China, Spain	Tourism Economics	SSCI

							attention to efficiency, service quality and sustainability.				
94	Romão, Rodrigues and Guerreiro (2013)	2013	Innovative Integration in Tourism	Southwest Europe	Tourism, Innovation, Differentiation, Nature, Regional Tourism	Panel Data Model Analysis	The most important conclusion that arises from this analysis is that the conditions for innovation in tourism activities play an important role on the attractiveness of tourism destinations of Southwest Europe. A positive statistical relation between the efforts on innovation and the regional touristic attractiveness suggests that regions with more developed innovation networks are using this competitive advantage in order to create innovative tourism products.	Management Innovation	Tourism, Innovation, Differentiation, Nature, Regional Tourism	Journal of Spatial and Organizational Dynamics	ESCI
95	Grissemann, Pikkemaat and Weger (2013)	2013	Antecedents of Innovation Activities in Tourism: An Empirical Investigation of The Alpine Hospitality Industry.	Austria Innsbruck	Innovation Behavior, Antecedents, Hospitality Firms	Survey, Regression Analysis, Factor	Analysis revealed firm and firm internal dimensions influencing innovation behavior: Employee engagement, customer participation, information technologies, innovation management, and innovation networks.	Management Innovation	innovation management; hotels; new service development; Alpine tourism	Turizam: međunarodni znanstveno-stručni časopis	SCOPUS and ESCI
96	Hjalager and Flagestad (2012)	2012	Innovations in Well-Being Tourism in the Nordic Countries	Norway Oslo	Innovation, Diversification, Technology	Empirical and Case Study		Management Innovation	innovation, diversification, technology, institutions, Nordic countries, well-being	Current Issues in Tourism	SSCI
97	Ros and Sintes (2012)	2012	Training Plans, Manager's Characteristics and Innovation in The Accommodation Industry	Spain Madrid	Innovation, Hotels, Training, Managerial characteristics.	Descriptive statistics, Empirical analysis.	Results suggest that training plans positively affect innovation-related decisions and the extent of their implementation	Management Innovation	Innovation, Hotels, Training, Managerial characteristics.	International Journal of Hospitality Management	SSCI
98	Tajeddini and Trueman (2012)	2012	Managing Swiss Hospitality: How Cultural Antecedents Of Innovation and Customer-Oriented Value Systems Can İnfluence Performance in The Hotel İndustry	Switzerland	Cultural Dimensions, Customer Orientation, Innovativeness, Hospitality Industry	Structural Equation Modeling		Management Innovation	Cultural dimensions, Customer orientation, Innovativeness, Hospitality industry	International Journal of Hospitality Management	SSCI

99	Martín and Herrero (2012)	2012	Influence of The User's Psychological Factors on The Online Purchase Intention in Rural Tourism: Integrating Innovativeness to The UTAUT Framework	Spain	Online purchase intention Innovativeness Performance expectancy Effort expectancy Social influence Facilitating conditions Rural tourism	Corellation Analyss	The innovativeness construct has a moderating effect on the relationship between performance expectancy and online purchase intention.	Management Innovation	Online purchase intention, Innovativeness Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Rural tourism	Tourism Management	SSCI
100	Plaza, Galvez and Flores (2011)	2011	Orchestrating Innovation Networks in E-Tourism: A Case Study	Spain	Innovations networks, SMEs, knowledge transfer, learning processes, R&D management, ICTs, e-tourism.	Case Study, Interview	E-tourism innovation networks, although composed of micro-firms, can exert international reach, to the extent that intra network peer coaching and Knowledge Intensive Business Services (KIBS) play a key role in innovation transfer to SMEs.	Organizational Innovation	Innovations networks, SMEs, knowledge transfer, learning processes, R&D management, ICTs, e-tourism.	South African Journal of Business Management	SCOPUS
101	Williams and Shaw (2011)	2011	Internationalization and Innovation in Tourism	England Londra	Tourism, Internationalization, Innovation	Document Analysis Content Analysis		Process Innovation	Tourism, Internationalization, Innovation	Annals of Tourism Research	SSCI
102	Eraqi (2010)	2010	Social Responsibility as An Innovative Approach for Enhancing Competitiveness of Tourism Business Sector in Egypt	USA Maryland	Corporate Social Responsibility, Tourism Business Sector	Survey, Z test, ANOVA	The research results explained that tourism business sector managers' attitudes towards CSR (Corporate Social Responsibility) criteria are positive. They actually have defined policies regarding CSR and practice activities regarding CSR issues.	Management Innovation	COMPETITIVENESS, EGYPT, INDICATORS, MEASUREMENTS; SOCIAL RESPONSIBILITY; TOURISM	Tourism Analysis	SCOPUS and ESCI
103	Paget, Dimanche and Mounet (2010)	2010	A Tourısm Innovation Case an Actor-Network Approach	France	Winter sports resorts, Destination management, SME, case study research, Qualitative research.	A Multi-Methods Research, A Content Analysis, A thematic analysis.	The company's growth is related to the implementation of new associations between actors and non-human entities	Management Innovation	Winter sports resorts, Destination management, SME, case study research, Qualitative research.	Annals of Tourism Research	SSCI
104	Erkuş-Öztürk (2010)	2010	The Significance Of Networking and Company Size In The Level of Creativeness of Tourism Companies: Antalya Case	Turkey Antalya	Networking, Company Size,Creativeness, Tourism Companies	Survey,Correspondence analysis, chi-square	The findings of the paper reveal that there is a relationship not only between the associational and global levels of networking and creativeness, but also between the size of a tourism company and its level of creativeness.	Organizational Innovation	Networking, Company Size,Creativeness, Tourism Companies	European Planning Studies	SSCI

105	Tajeddini (2010)	2010	Effect of Customer Orientation and Entrepreneurial Orientation on İnnovativeness: Evidence from the Hotel İndustry in Switzerland	Switzerland	Customer Orientation, Entrepreneurship, Innovativeness, Hotel Industry	Descriptive Statistics, Factor Analysis, Chi-Square Difference Tests, Reliability Analysis	Specifically, customer orientation, entrepreneurial orientation coupled with innovativeness was found to have a significant and positive effect on performance in the long-term.	Process Innovation	Customer orientation, Entrepreneurship, Innovativeness, Hotel industry, Switzerland	Tourism Management	SSCI
106	Hall (2009)	2009	Innovation and Tourism Policy in Australia and New Zealand: Never The Twain Shall Meet?.	New Zealand Christchurch	Tourism, Innovation, National Policies	Document Analysis Conten Analysis	It is concluded that in spite of tourism's economic significance to both countries, broader innovation policy also does not recognise tourism as being neither a particularly innovative field, nor an area which can contribute to innovation and competitiveness.	Organizational Innovation	Australia; New Zealand; innovation; policy; competitiveness	Journal of Policy Research in Tourism, Leisure and Events	SCOPUS and ESCI
107	Lopez (2009)	2009	Innovation In The Spanish Tourism Industry: Factors Determining The Innovative Capacity of The Spanish Hotel Sector, Using The Approach of The Strategic Management Process	Spain Huelva		Strategic Management Model	It was stated that the factors determining the strategic management process have a positive effect on innovation.	Process Innovation	**Innovation, Spanish Tourism Industry, Factors Determining, Innovative Capacity, Strategic Management Process**	Emerging Markets Finance and Trade	SSCI
108	Moscardo (2008)	2008	Sustainable Tourism İnnovation: Challenging Basic Assumptions	Austria Townsville	Sustainability, Tourism Innovation	Content Analysis		Management Innovation	sustainable development, sustainable tourism, innovation, regional development	Tourism And Hospitality Research	SCOPUS and ESCI
109	Novelli, Schmitz and Spencer (2006)	2006	Networks, Clusters And İnnovation İn Tourism: A UK Experience	England Eastbourne	Clustering, Networks, Healthy Lifestyle Tourism	Content Analysis		Process Innovation	Network, Cluster Innovation, Inter-firm synergies, Knowledge transfer, SMEs collaboration, Healthy Lifestyle Tourism	Tourism Management	SSCI
110	Peters and Pikkemaat (2006)	2006	Innovation in tourism	Austria Innsbruck	Tourism, Innovation	Documant Analysis Content Analysis		Service Innovation	Tourism, Innovation	Journal of Quality Assurance in Hospitality & Tourism	ESCI
111	Hjalager (2005)	2005	Innovation in Tourism from a Welfare State Perspective	Denmark	Social Tourism, History of Tourism	Qualitative Research, Case Study		Service Innovation	Social tourism, innovation, welfare, regulations, history of	Scandinavian Journal of	SSCI

									tourism, internationalisation	Hospitality and Tourism	
112	Sintes, Cladera and Ros (2005)	2005	Innovation Activity in The Hotel Industry: Evidence from Balearic Islands	Spain Balearic Islands	Services innovation, Hotel industry, Balearic Islands.	Descriptive analysis	The results show as higher-categories hotels are more innovative than lower-categories hotels.	Service Innovation	Services innovation, Hotel industry, Balearic Islands.	Tourism Management	SSCI
113	Grant (2004)	2004	Innovation in Tourism Planning Processes: Action Learning to Support a Coalition of Stakeholders for Sustainability	England Bristol	Strategic Planning, Sustainability	Observation		Service Innovation	İnnovation, Strategic Planning Processes, Coalition of Stakeholders Sustainability,	Tourism and Hospitality Planning & Development	SCOPUS
114	Lynn (2004)	2004	E-innovation: Internet Impacts on Small UK Hospitality Firms	United Kingdom	Innovation, Internet, Small enterprises, Entrepreneurialism, Hospitality services,	Qualitative Research	These small hospitality firms have adopted the Web and used it; as a result they have changed business processes and personal expectations.	Process Innovation	Innovation, Internet, Small enterprises, Entrepreneurialism, Hospitality services, United Kingdom	International Journal of Contemporary Hospitality Management	SSCI
115	Jacob, Tintore, Agulo, Bravo and Mulet (2003)	2003	Innovation in The Tourism Sector: Results From A Pilot Study in The Balearic Islands	Spain Mallorca	Tourism Enterprises, Innovation	Case Study		Management Innovation	innovation, tourism sector, pilot study, Balearic Islands	Tourism Economics	SSCI
116	Hassanien and Baum (2002)	2002	Hotel Innovation Through Property Renovation	UK Walsall	Egyptian hotel industry, innovation practices, renovation	Survey, Frequency Analysis	To conclude, the hotel owners do not fully realize the importance of renovation as an effective marketing tool, and its potential for attracting new markets.	Service Innovation	Innovation, new product development, renovation, marketing, hotels, hospitality	International Journal of Hospitality & Tourism Administration	SCOPUS and ESCI
117	Hjalager (2002)	2002	Repairing İnnovation Defectiveness in Tourism	Denmark, Aarhus	Types of Innovation, Innovation Model for Tourism	Content Analysis		Process Innovation	Innovation, Driving forces, Knowledge, Transfer processes, Policies	Tourism Management	SSCI
118	Hjalager (1997)	1997	Innovation Patterns in Sustainable Tourism: an Analytical Typology	Denmark, Aarhus	Sustainability, Environment, Tourism, Innovation	Content Analysis		Process Innovation	environmental innovations, typology, reverse product cycle	Tourism Management	SSCI
119	Poon (1988)	1988	Innovation and The Future of Caribbean Tourism	Barbados, Jamaica, Trinidad and Tobago (Caribbean)	Caribbean tourisminnovationa ll-inclusive holidays	Descriptive Analysis	With their 'all-inclusive' innovation, Super Club's performance has far outstripped that of traditional multinational corporations affiliated hotels.	Service Innovation	Caribbean tourism, innovation, all-inclusive holidays	Tourism Management	SSCI

120	Jafari (1981)	1981	Innovations in Tourism Research and Marketing	USA	Tourism Marketing, Innovation	Qualitative Analysis, Case Study		Process Innovation	Tourism Marketing, Innovation	Annals of Tourism Research	SSCI
121	Luu (2019)	2019	Can Diversity Climate Shape Service Innovative Behavior in Vietnamese and Brazilian Tour Companies? The Role of Work Passion.	Australia Hawthorn	Diversity Climate, Employees, Service Innovative Behavior	Survey	Two types of work passion, harmonious passion and obsessive passion, were found to mediate for diversity climate and employees' service innovative behavior.	Organization al Innovation	Diversity climate, Service innovative behavior, Work passion, Group diversity	Tourism Management	SSCI
122	Presenza, Petruzzelli and Sheehan (2019)	2019	Innovation trough tradition in hospitality. The Italian case of Albergo Diffuso	Italy Termoli	Tradition, Innovations, hospitality Industry	Content Analysis, in-depth Interviews	The findings indicate that identifying and combining tangible and intangible attributes of tradition from various time periods may improve the value of an innovation, especially when it is perceived to enhance the authenticity of the experience for guests.	Process Innovation	Albergo diffuso, Innovation, Tradition Sources of tradition, Authenticity	Tourism Management	SSCI
123	Verreynne, Williams, Ritchie, Gronum and Betts (2019)	2019	Innovation Diversity and Uncertainty in Small And Medium Sized Tourism Firms.	Australia Brisbane	Innovation Diversity, Uncertainty, (SME) Performance	Survey	Innovation diversity mediates the negative direct effect of uncertainty on (SME) performance however, more sales to tourists increases the performance benefit from innovation diversity.	Service Innovation	Innovation Diversity, Uncertainty, SME Performance	Tourism Management	SSCI
124	Sanchez, Correia and Maldonado (2019)	2019	Challenges of Open Innovation in the Tourism Sector	Spain Portugal	Open innovation, New service development (NSD), Social media, Tourism sector, Cocreation environment.	A Cluster Analysis, Analysis of Variance, Multivariate analysis, Descriptive analysis.	The results show positive impact of open innovation in new product development, moreover results derived in terms of turnover and competitiveness improve	Product Innovation	Open innovation, New service development (NSD), Social media, Tourism sector, Cocreation environment.	Tourism Planning and Development	SCOPUS and ESCI
125	Batle, Orfila-Sintes and Moon (2018)	2018	Environmental Management Best Practices: Towards Social Innovation	Spain Mallorca	Environmental Management, Social Innovation, Tourism Hospitality	Survey, İnterwiev Descriptive Analysis	It is stated that social innovation is related to environmental care.	Process Innovation	Environmental Management, Social Innovation, Tourism Hospitality	International Journal of Hospitality Management	SSCI
126	Buijtendijka Blomb, Vermeer and Duim (2018)	2018	Eco-Innovation For Sustainable Tourism Transitions As A Process Of Collaborative Co-Production: The Case Of A Carbon Management Calculator For The Dutch Travel Industry	Netherlands	Travel Industry, Eco-Innovation, Carbon Management, Climate Change	Interviews Content Analysis Case Study		Process Innovation	Actor-network theory, carbon management, climate change, corporate social responsibility, eco-innovation, sustainability transitions	Journal of Sustainable Tourism	SSCI

127	Wang, Cole and Chen (2018)	2018	Tourist Innovation in Air Travel	USA Hattiesburg	Tourist Innovation, Air Service,	Survey, İnterwiev, Confirmatory Factor Analysis		Process Innovation	Tourist Innovation, Air Service	Journal Of Travel Research	SSCI
128	Meged and Zillinger (2018)	2018	Disruptive Network Innovation in Free Guided Tours	Copenhagen	Sharing Economy, Disruptive Network Innovation, Free Guided Tours	Interview, Online Documents Analysis,	The free guided tours based on tips orchestrated within the frame of the sharing economy are not merely a product innovation. They entail disruptive market innovations that circumvent traditional industry structures and ultimately produce disruptive organizational innovations where trust in network is the crux.	Product Innovation	Free guided tours, disruption, networked innovation, sharing economy, trust	Scandinavian Journal of Hospitality and Tourism	SSCI
129	Montresor (2018)	2018	Innovation in Tourism: A Diverging Line of Research in Need of A Synthesis	Italy	Innovation, Services, Tourism.	Literature review	The definitions and conceptualizations of tourism innovation have ended up with having weak reference to the degree of novelty and economic relevance that are required for a change to be considered actual innovation.	Service Innovation	Innovation, Services, Tourism	Tourism Economics	SSCI
130	Romero, Gomez and Zabala (2018)	2018	Cookpetition: Do Restaurants Coopete To Innovate	Spain Sevilla	Restaurant of Enterprises, Innovation	Logistic Regression		Product Innovation	coopetition, hospitality, innovation, restaurant, SME, Spain	Tourism Economics	SSCI
131	Viladimirov and Williams (2018)	2018	Hotel Innovations and Performance – The Mediating Role Of Staff Related Innovations	United Kingdom	Innovation, Performance, Staff	Literature Search, Model Analysis	Innovations and other factors have both direct and indirect effects on performance.	Product Innovation	Innovation, Performance, Staff	Tourism Management	SSCI
132	Sipe (2018)	2018	Towards An Experience Innovation Canvas: A Framework for Measuring Innovation in the Hospitality and Tourism Industry	USA Southern California	Innovation Business Performance.	Interview		Service Innovation	Experience economy, memorable experiences, innovation, measurement, hospitality	International Journal of Hospitality & Tourism Administration	SCOPUS and ESCI
133	Séraphin, Gowreesunka r,Chim, Duplan, and	2018	Tourism Planning and Innovation: The Caribbean Under The Spotlight	ABD Florida Karayipler	Caribbean, Tourism, Cluster, Tourism Planning, Marketing.	Clustering Method	In the Caribbean, the way of clustering targets has meant capacity to attract visitors and geographically closed destinations to bring together similar performance or potential locations.	Process Innovation	Caribbean, Tourism, Cluster, Tourism Planning, Marketing.	Journal of Destination Marketing & Management	SCOPUS

No	Author(s)	Year	Title	Country	Keywords	Method	Findings	Innovation Type	Key Concepts	Journal	Index
	Korstanje (2018)										
134	Chiao, Chen & Huang (2018)	2018	Examining The Usability of An Online Virtual Tour-Guiding Platform For Cultural Tourism Education	Taiwan Taipei	Reality Tour-Guiding Platform, Technology Acceptance,Technology Innovation	Survey	Results indicated learning effectiveness and technology acceptance within the education system. Interaction was an exogenous variable that has an indirect effect on technology use, implying the importance of interaction between people and devices within a digital tour environment.	Process Innovation	Virtual reality, Technology use, Digital tour-guiding, Game-based learning, Cultural tourism, Experience-based tourism	Journal of Hospitality, Leisure, Sport & Tourism Education	SCOPUS
135	Fuglsang and Nordli (2018)	2018	On Service Innovation as an Interactive Process: A Case Study of the Engagement with Innovation of a Tourism Service	Norway	Innovation, Service innovation, Engagement theory, Narrative method, Interactive capabilities.	Case study analysis	The case study shows how combining a variety of types of engagement may be important to the innovation process. It also shows the key role of familiar engagement in service innovation, where actors grasp the environment by means of what is familiar and desirable to them personally.	Service Innovation	Innovation, Service innovation, Engagement theory, Narrative method, Interactive capabilities.	Social Science	SCOPUS
136	Nieves and Quintana (2018)	2018	Human Resource Practices And Innovation in The Hotel Industry: The Mediating Role of Human Capital	Spain	Human Resource Management, Innovation, Recruitment and Selection, Training and Development	Kolmogorov–Smirnov,Correlations Analysis, Regression Analysis	In the hotel industry, some human resource management practices (training, development) affect innovation through their influence on human capital. Recruitment and selection human resource management practices, however, do not enhance the level of human capital of the firms studied, although they do determine their innovation performance.	Process Innovation	Human Resource Management, Innovation, Recruitment and Selection, Training and Development	Tourism and Hospitality Research	SCOPUS and ESCI
137	Spila, Torres, Lorenzo and Santa (2018)	2018	Social Innovation and Sustainable Tourism Lab: An Explorative Model	Spain	Work-based learning, Social innovation, Sustainable tourism, Agile research.	Conceptual paper, SISTOUR-LAB, Agile research model.	As a result of the application of agile research methodology, in the following sections the design of the SISTOUR-LAB is detailed from the standpoints of its key elements (governance, research, learning and innovation) and the dynamics of its social innovation (exploration, experimentation, exploration and evaluation) which promote them.	Process Innovation	Work-based learning, Social innovation, Sustainable tourism, Agile research.	Higher Education, Skills and Work-Based Learning	SCOPUS and ESCI

138	Koflera, Marchera, Volggerb and Pechlaner (2018)	2018	The Special Characteristics of Tourism Innovation Networks: The Case of The Regional Innovation System in South Tyrol	İtalya Otonom Eyaleti Güney Tirol	Innovation, Network, Social Network Analysis, South Tyrol, Tourism.	Social Network Analysis	They expressed the assumption that regional linking could be a distinguishing feature of tourism innovation networks.	Organizational Innovation	Innovation, Network, Social Network Analysis, South Tyrol, Tourism.	Journal of Hospitality and Tourism Management	SSCI
139	Bowie (2018)	2018	Innovation and 19th century hotel industry evolution	UK Oxford	Innovations, English Hotel Evolution	Multi-Level Perspective Methodology	By the end of the century, the English hotel industry had adopted domestic and international innovations, to improve service quality and comfort.	Service Innovation	Hotel industry history, Niche cumulation, Technological transition, Tourism methodology, 'Tourism history	Tourism Management	SSCI
140	Gardiner and Scott (2018)	2018	Destination Innovation Matrix: A Framework for New Tourism Experience and Market Development	Australia Gold Coast	Destination Marketing, Destination Management Destination Competitiveness, Tourism Strategy, Tourism Innovation, Domestic Tourism.	Target Innovation Matrix Model, Focus Group, Analysis Case Study	It is stated that the focus of the existing markets or the focus on the new market is to focus on the innovation strategy of the target.	Service Innovation	Destination Marketing, Destination Management Destination Competitiveness, Tourism Strategy, Tourism Innovation, Domestic Tourism.	Journal of Destination Marketing & Management	SCOPUS
141	Sipe (2017)	2017	Leadership Innovation Outputs and Business Performance: A Mixed Methods Study of Senior Managers in the Attractions Industry	USA	İnovasyon Türleri, İşletme Performansı	Descriptive Statistics, Correlations Analysis, Multiple Regression Analysis		Product Innovation and Management Innovation	attractions industry, experience economy, innovation, leadership, mixed methods	International Journal of Hospitality & Tourism Administration	SCOPUS and ESCI
142	Sanchez and Williams and Brotons (2017)	2017	The Innovation Journey of New-to-Tourism Entrepreneurs	Spain	Innovation, Innovation task	Qualitative Research Case Study, Survey		Process Innovation	innovation process, innovation journey, new-to-tourism entrepreneur, start-up, innovation task, sub-process	Current Issues in Tourism	SSCI
143	Chen, Kerr, Chou and Ang (2017)	2017	Business Co-Creation For Service Innovation in The Hospitality and Tourism Industry	Taiwan Malaysia	Travel Agencies, Suppliers, Customers	Explanatory Factor Analysis, Multiple Regression	All the proposed effects were found significant in which trust enhanced the effect of elements of innovation for Taiwan travel agencies.	Service Innovation	Co-Creation dynamic , Service-dominant logic, Service Innovation, relational view	International Journal of Contemporary Hospitality Management	SSCI

144	Sarmah, Kamboj and Rahman (2017)	2017	Co-creation in Hotel Service Innovation Using Smart Phone Apps: An Empirical Study	India Uttarancal	Service Innovation, Hotel, Smart Phone Apps	Structural Equation Modeling, Survey		Service Innovation	India, Co-creation, Service Innovation, Smart Phone Apps, Luxury hotel	International Journal of Contemporary Hospitality Management	SSCI
145	Guttentag and Smith (2017)	2017	Assessing Airbnb as a Disruptive Innovation Relative to Hotels: Substitution and Comparative Performance Expectations	Canada	Airbnb, Sharing economy, Peer-to-peer short-term rentals, Disruptive innovation.	Online survey, Chi-square tests, T-test.	This study found that Airbnb is used almost exclusively as a substitute for existing accommodations, and primarily for hotels.	Service Innovation	Airbnb, Sharing economy, Peer-to-peer short-term rentals, Disruptive innovation.	International Journal of Hospitality Management	SSCI
146	Tajeddini, Altinay and Ratten (2017)	2017	Service Innovativeness and The Structuring of Organizations: The Moderating Roles of Learning Orientation and İnter-Functional Coordination	NetherlandsAmsterdam	Organizational Structure, Service İnnovativeness, Learning Orientation, İnter-Functional Coordination,Hospitality Sector	Survey, Regression Analysis	Study show that higher levels of service innovativeness are positively related to higher levels of hotel business performance.	Service Innovation	Organizational Structure, Service İnnovativeness, Learning Orientation, İnter-Functional Coordination,Hospitality Sector	International Journal of Hospitality Management	SSCI
147	Backman, Klaesson and Öner (2017)	2017	Innovation in The Hospitality Industry: Firm or Location	Sweden Stockholm	Company, Location, Innovation	Logistic Regression	The results provide important insights regarding firm- versus location-placed innovation policies.	Organizational Innovation	firm characteristics, hospitality industry, innovation, location characteristics	Tourism Economics	SSCI
148	Dzhandzhugazova (2017)	2017	Crowdfunding as a Tool for Promotion and Development of Tourism-related Innovation Projects	Russia Moscow	Innovation economy, Crowdfunding, Tourism, Tourism-related crowdfunding projects.	Methods of desk social study	On the basis of the comparative analysis of Boomstarter.ru crowdfunding projects of 2013-2016 we make a conclusion that despite a small share of tourismrelated crowdfunding projects they have high average values of key figures, which shows their success and adequacy.	Process Innovation	Innovation economy, Crowdfunding, Tourism, Tourism-related crowdfunding projects.	Journal of Environmental Management and Tourism	SCOPUS
149	Fatima, Ghandforoush, Khan and Masico (2017)	2017	Role Of Innovativeness And Self-Efficacy in Tourism M-Learning	Bangladesh Dhaka	Mobile learning, Tourism education, Self-efficacy, Innovativeness, Structural 33 Equation Modeling, Technology acceptance model	Structural Equation Modeling	The findings confirmed the antecedent effect of self-efficacy on the 15 intention to adopt m-learning, the moderating effect of innovativeness was not found to be16 as significant for the attitude–intention link.	Service Innovation	Mobile learning, Tourism education, Self-efficacy, Innovativeness, Structural 33 Equation Modeling, Technology acceptance model	Tourism Review	ESCI

150	Villaverde, Elche, Perez, Ortega (2017)	2017	Determinants of Radical Innovation in Clustered Firms of the Hospitality and Tourism İndustry	Spain	Social Capital, Innovation Market Dynamism, Hospitality, Cultural Tourism, Cluster	Regression Analysis	Specifically, the negative effect of structural social capital on radical innovation worsens when market dynamism perception is higher.	Service Innovation	Social Capital, Innovation Market Dynamism, Hospitality, Cultural Tourism, Cluster	International Journal of Hospitality Management	SSCI
151	Mifli, Hashim and Zainal (2017)	2017	Managing Menu Innovation in A Saturated Market: An Empirical Evidence From The Chain Restaurants in Malaysia	Malaysia Klang Valley	Menu Innovation Process, New Product Development	Yapısal Eşitlik Modellemesi		Service Innovation	Menu innovation process, new product development, product innovation orientations, partial least squares, Klang valley, Malaysia	Tourism and Hospitality Research	SCOPUS and ESCI
152	Cruz, Martines, Hincapie and Torres (2016)	2016	Innovation in Tourism Companies, Where Are They And Where Are They Going? An Approach To The State Of Knowledge	Mexican	Innovation, Tourism Companies, Themes, State of Knowledge	Literature Review	The review shows that papers are concentrated in six broad categories: a) organizational innovation, b) innovation strategies, c) innovation in products and processes, d) technological innovation, e) knowledge management in innovation and f) innovation models.	Management Innovation and Organization al Innovation	Innovation, Tourism Companies, Themes, State of Knowledge	Intangible Capital	SCOPUS
153	Jin, Line and Merkebu (2016)	2016	Examining the Impact of Restaurant Innovativeness on Relationship Quality in Luxury Restaurants	USA	Perception of Restaurant Innovativeness	Confirmatory Factor Analysis, Squared Correlation, Structural Parameter		Service Innovation	innovation image, luxury restaurants, relationship quality, satisfaction	International Journal of Hospitality & Tourism Administration	SCOPUS and ESCI
154	Alegre and Berbegal-Miraben (2016)	2016	Social Innovation Success Factors: Hospitality and Tourism Social Enterprises	Spain Barcelona	Social Innovation, Hospitality, Social Tourism Initiatives	Case Study		Organization al Innovation	Social Innovation, Hospitality and Tourism sector, Social Enterprises, Social business models	International Journal Of Contemporary Hospitality Management	SSCI
155	Omerzel (2016)	2016	A Systematic Review of Research on Innovation in Hospitality and Tourism	Slovenia Koper	Competitiveness, Innovation, Tourism, Bibliometric analysis, Small firms, Hospitality.	Literature review, Bibliometric Analysis.	Reviewing the literature, it was found that, in their studies, many authors mainly addressed innovation in manufacturing, while focused on innovation in the service industry.	Service Innovation	Competitiveness, Innovation, Tourism, Bibliometric analysis, Small firms, Hospitality.	International Journal of Contemporary Hospitality Management	SSCI
156	Pikkemaat and Zehrer (2016)	2016	Innovation And Service Experiences in Small Tourism Family Firm	Netherlands	Medium and Small Family Business, Innovation	Literature Review		Service Innovation	Innovation, Service Experiences, Small Businees, Family Businesses	International Journal Of Contemporary	SSCI

									Hospitality Management	
157	Pace (2016)	2016	How do Tourism Firms Innovate for Sustainable Energy Consumption? A Capabilities Perspective nn The Adoption of Energy Efficiency in Tourism Accommodation Establishments	Malta	Environmental innovation, Capabilities, Engineering consulting firms, Energy efficiency, Tourism accommodation establishments,	Face-to-face interviews.	The findings demonstrate different patterns of innovation adoption amongst the firms in terms of the range of energy technologies and measures adopted that are contingent on the firms' particular combination of capabilities to solve problems around energy efficiency	Service Innovation	Environmental innovation, Capabilities, Engineering consulting firms, Energy efficiency, Tourism accommodation establishments,	Journal of Cleaner Production	SCI-E
158	Clarke, Murphy and Adler (2016)	2016	Celebrity Chef Adoption and Implementation of Social Media, Particularly Pinterest: A Diffusion of Innovations Approach	United States Harrisonburg	Celebrity Chefs, Social Media, Diffusion of innovations	Survey	The study found that of the top 48 chefs, all adopted Facebook, closely followed by 47 adopting Twitter; just 17 adopted Pinterest. The chefs' social media and Pinterest implementation varied widely.	Service Innovation	Celebrity Chefs, Social Media, Diffusion of innovations, Pinterest	International Journal of Hospitality Management	SSCI
159	Bharwani and Mathews (2016)	2016	Customer Service Innovations in The Indian Hospitality Industry	Indian	Innovation, Hospitality, Competitive advantage, Experience economy, Customer service	Interview, Literature Review		Service Innovation	Innovation, Hospitality, Competitive advantage, Experience economy, Customer service	Worldwide Hospitality and Tourism Themes	ESCI
160	Binder, Mair, Stummer and Kessler (2016)	2016	Organizational Innovativeness and Its Results: A Qualitative Analysis of SME Hotels in Vienna.	Austria Wien	Organizational Innovativeness, Innovation Results	Interviews, Content Analysis, Detailed Structure Analysis	The study shows that systematic renewal is promoted by a combination of all dimensions of organizational innovativeness (willingness to innovate, ability to innovate, and possibility of innovation).	Organization al Innovation		Journal of Hospitality & Tourism Research	SSCI
161	Farsani, Sadeghi, Shafiei and Sichani (2016)	2016	Measurement of Satisfaction With Ict Services Implementation and Innovation in Restaurants (Case Study: Isfahan, Iran)	Iran Isfahan	Information and Communication Technology (ICT), Innovation, Restaurant, Tourist behavior	Descriptive Analysis, One Sample t-Tests, Chi-Square Tests.	That tourists and restaurant managers in the city of Isfahan are interested in exploiting the application of innovation and ICT in hotel restaurants.	Management Innovation	Information and communication technology (ICT), innovation, restaurant, tourist	Journal of Travel & Tourism Marketing	SSCI
162	Giacosa, Giachino, Stupino and	2016	A Tour Operator With A Global, Innovative Spirit: The Case of Alpitourworld	Italy Brescia	Tourism sector, Tour operator, AlpitourWorld,	Case study	The research results illustrate that an integrated management of the production and supply chains in the tourist sector can provide a winning approach, making it possible to control	Organization al Innovation	Tourism sector; Tour operator; AlpitourWorld;	Tourism Analysis	SCOPUS and ESCI

	Mazzoleni (2016)				Comprehensive tourist product .		each stage of the process and to create a highly satisfactory product for the client.		Comprehensive tourist product		
163	Nieves, Quintana and Osorio (2016)	2016	Organizational Knowledge, Dynamic Capabilities and Innovation ın The Hotel Industry	Spain Gran Canaria	Organizational Knowledge, Innovation	Descriptive Statistics, Correlation Analysis,	The knowledge and knowledge-based processes play an outstanding role to foster innovation in the hotel firms.	Process Innovation	Organizational knowledge, dynamic capabilities, product innovation, process innovation, hotel industry	Tourism and Hospitality Research	SCOPUS and ESCI
164	Bell and Ruhanen (2016)	2016	The Diffusion and Adoption Of Eco-Innovations Amongst Tourism Businesses: The Role of The Social System	Australian	Eco-Innovations, Tourism Businesses Social System	Interview, Content Analysis		Service Innovation	Innovation, diffusion, so cial system, ecotourism, accr editation	Tourism Recreation Research	SCOPUS and ESCI
165	Lu and Liu (2016)	2016	Cultural Tourism O2O Business Model Innovation-A Case Study of Ctrip	China Beijing	Business Model, Innovation Strategy, Tourism	Qualitative Research, Case Study		Management Innovation	Business Model, Cultural, Innovation Strategy, O2O, Tourism	Journal of Electronic Commerce in Organizations	ESCI
166	Wooliscroft and Wooliscroft (2016)	2016	Diffusion of Innovation: The Case of Ethical Tourism Behavior	New Zealand	Ethical behavior, Diffusion of innovation, Rasch Modeling, Consumer innovativeness, Tourism.	Rasch Modeli	Using the Rasch Model, this research studies the underlying structure of ETB and provides a link between relatively static individual innovativeness and the Diffusion of Innovation's dynamic aspects, a result that future longitudinal studies will have to confirm.	Organization al Innovation	Ethical behavior, Diffusion of innovation, Rasch Modeling, Consumer innovativeness, Tourism.	Journal of Business Research	SSCI
167	Lee, Hallak and Sardeshmukh (2016)	2016	Innovation, Entrepreneurship,and Restaurant Performance: A Higher-Order Structural Model	Australia Adelaide	Innovation, Restaurant performance, Entrepreneurship, Hospitality, Partial Least Squares Structural Equation Modelling.	Post hoc Analysis, Correlation Analysis, Structural Equation Model, Chi-square test, Factor Analysis.	The restaurant's innovation activities have a positive impact on restaurant performance. The introduction of innovation in products, services, and marketing allows restaurants to increase their sales by attracting new customers while retaining their current customer base.	Management Innovation	Innovation, Restaurant performance, Entrepreneurship, Hospitality, Partial Least Squares Structural Equation Modelling.	Tourism Management	SSCI
168	Guttentag (2015)	2015	Airbnb: Disruptive Innovation and The Rise of an Informal Tourism Accommodation Sector	Canada West Waterloo	Disruptive Innovation, Informal Accommodation	Case Study, Content Analysis	Consequently, achieving a greater understanding of Airbnb's disruptive emergence will offer tremendous practical value, and there is every reason to believe that such knowledge will only increase in importance as Airbnb continues to prominently and firmly establish itself within the	Service Innovation	Airbnb, short-term rentals, peer-to-peer accommodation, disrupt ive innovation, informal economy	Current Issues in Tourism	SSCI

							worldwide tourism accommodation sector.				
169	Razumova, Ibáñez and Palmer (2015)	2015	Drivers Of Environmental Innovation in Majorcan Hotels	Spain Majorca	Environment, Process Innovation	Logistic Regression, Hierarchical Regression		Process Innovation	hotels, environmental innovations, Porter hypothesis, Majorca	Journal of Sustainable Tourism	SSCI
170	Gössling and Lane (2015)	2015	Rural Tourism and The Development of Internet-Based Accommodation Booking Platforms: A Study in The Advantages, Dangers and Implications of Innovation	Sweden Helsingborg	Rezervation Platform, Innovation, Rural Tourism	Interview, Comparative Analysis	Results indicate that Booking.com now has a significant role in reservations in rural Norway, with a range of implications for destinations and businesses.	Service Innovation	accommodation, rural tourism, tourism management	Journal of Sustainable Tourism	SSCI
171	Couture, Arcand, Sénécal and Ouellet (2015)	2015	The Influence of Tourism Innovativeness on Online Consumer Behavior	Canada Quebec	Tourism Innovativeness, Consumer Behavior	Descriptive Statistics, Linear Regression	Tourism innovativeness is positively related to the frequency and density of site visits, downloading of information brochures, use of the online purchasing mode, and the volume of online purchases.	Service Innovation	innovativeness, online consumer behavior, buying behavior, information search behavior, communicatio n	Journal of Travel Research	SSCI
172	Chao, Izard and Sellens (2015)	2015	Information and Communication Technologies, Innovation, and Firm Productivity in Small and Medium-Sized Travel Agencies: New Evidence from Spain	Spain Barcelona	Information and Communication Technologies, Innovation	Qualitative Research, Survey		Organization al Innovation	Information and communication technologies (ICT), innovation, firm productivity, small and medium enterprises (SMEs), travel agencies, partial least square–structural equation modeling (PLS-SEM), Spain	Journal of Travel Research	SSCI
173	Jernsand, Kraff and Mossberg (2015)	2015	Tourism Experience Innovation Through Design	Norway Nordland	Experience Innovation, Experience Design	Qualitative Analysis, Empirical		Service Innovation	experience innovation, experience design, experiencescape , prototyping	Scandinavian Journal of Hospitality and Tourism	SSCI
174	Tang, Wang and Tang (2015)	2015	Developing Service Innovation Capability in The Hotel Industry	Taiwan	Social Capital, Knowledge Sharing, Service Innovation Capability	Correlation Analysis, Reliability and Validity Analysis,		Service Innovation	Social Capital, Knowledge Sharing, Service Innovation Capability	Service Business	SSCI

					Structural Model Analysis				
175	Tugores and García (2015)	2015	The Impact Of Innovation On Firm's Performance: An Analysis Of The Hotel Sector In Majorca	Spain Mallorca	Innovation, Performance	Descriptive Statistics, Correlation, Regression	Non-environmental innovations and only some particular environmental innovations are found to have a positive impact on hotel performance, and to contribute to an understanding of their relative performance, even when controlling for quality or human capital variables.	Organizational Innovation	innovation; hotel industry; performance impact	Tourism Economics	SSCI
176	Booyens and Rogerson (2015)	2015	Creative Tourism in Cape Town: An Innovation Perspective	South Africa Cape Town	Creative Tourism, Creative Cities, Urban Regeneration, Cape Town	Interview		Process Innovation	Creative Tourism, Creative Cities, Urban Regeneration, Cape Town	Urban Forum	SCOPUS
177	Omerzel (2015)	2015	Innovativeness in Tourism: Model Development	Slovenia Koper	Innovation, Tourism, Model Development	Model Development	With the developed model, it has been stated that it should clarify the concept of innovation in tourism and develop a valid and versatile innovation structure.	Organizational Innovation	Innovation, Tourism, Model Development	Procedia Economics And Finance	SCOPUS
178	Souto (2015)	2015	Business Model Innovation and Business Concept Innovation as The Context of Incremental Innovation and Radical Innovation	Spain	Tourism innovation Hotel innovation Business model innovation Business concept innovation Non-technological innovation Technological innovation Innovation strategy	İnterviews	The findings show the effects of business model innovation and business concept innovation. The adoption of new models and concepts that support innovation are shown to be important.	Organizational Innovation	Tourism innovation Hotel innovation Business model innovation Business concept innovation Non-technological innovation Technological innovation Innovation strategy	Tourism Management	SSCI
179	Naidu, Chand and Southgate (2014)	2014	Determinants of Innovation in The Handicraft industry of Fiji and Tonga: An Empirical Analysis From a Tourism Perspective	Oceania Region Fiji, Tonga	Innovation, Handicraft Industry	Interviews, Probit Regression Model, Tobit Regression Model	The results of this study show that eight factors; namely, value adding, design uniqueness, new product development, cultural uniqueness, advanced technology, experience of owner, ability of owner to adapt to trends in market and quality of raw materials have significant impact on level of innovation in handicraft industry of Fiji and Tonga.	Process Innovation and Organizational Innovation	Innovation, Handicraft Industry	Journal of Enterprising Communities: People and Places in the Global Economy	SCOPUS and ESCI

180	Hoarau (2014)	2014	Knowledge Acquisition and Assimilation in Tourism-Innovation Processes	Norway Nordland	Case Study, Qualitative Research	Case Study, Qualitative Research		Product Innovation and Service Innovation	knowledge, innovation, absorptive capacity, nature-based tourism	Scandinavian Journal of Hospitality and Tourism	SSCI
181	İplik, Topsakal and Doğan (2014)	2014	Strategic Innovation: An Empirical Study On Hotel Firms Operating In Antalya Region	Turkey Antalya	Strategic Innovation, Competitive Advantage, Hotel Firms	Frequency Analysis, Reliability Analysis, Factor Analysis, Correlation Analysis		Service Innovation	Strategic Innovation, Competitive Advantage, Hotel Firms, Antalya	Advances in Hospitality and Tourism Research (AHTR)	ESCI
182	Ropret, Jakulin and Likar (2014)	2014	The Systems Approach To The Improvement of InnovationIin Slovenian Tourism	Slovenia Koper	Innovation, Sustainable Development, Tourism, Social Responsibility, Slovenia, Systems Approach.	Causal Loop Diagram, Qualitative System Model.	Tourism development model, the development of Slovenia as an isolated system, to achieve the goal of the desired tourism destination, CSR principles, not only in tourism, but in general in the society in the twenty-first century will become an important legal area for the said.	Management Innovation	Innovation, Sustainable Development, Tourism, Social Responsibility, Slovenia, Systems Approach.	Kybernetes	SCI-E
183	Nicolau and Santa-María (2013)	2013	The Effect Of Innovation on Hotel Market Value	Spaın Alicante	Innovation, Hotel Industry	Qualitative Analysis, Literature Study		Management Innovation	Innovation, Hotel Industry	International Journal of Hospitality Management	SSCI
184	Kuscer (2013)	2013	Determining Factors of Mountain Destination Innovativeness	Slovenia	Destination development, Innovativeness, Mountain destinations, Sustainability.	Exploratory Factor Analysis, Factor Correlation Matrix.	The results show that mountain destination innovativeness incorporates the factors of sociocultural sustainability and stakeholder participation, environmental sustainability (natural environment) a nd proactiveness.	Process Innovation	Destination development, Innovativeness, Mountain destinations, Sustainability.	Journal of Vacation Marketing	SSCI
185	Makkonen and Hokkanen (2013)	2013	ICT Innovation and Local Economy: Mobile Game as a Tourist Attraction	Finlandia Lieksa	Attraction, ICT innovation, Tourism, Visitor expenditure.	Corelattion Analysis, T-tests.	The results show that visitors of the location itself (Pielinen Museum) have a considerable income and employment impact on the local economy of Lieksa	Organizational Innovation	Attraction, ICT innovation, Tourism, Visitor expenditure.	Scandinavian Journal of Hospitality and Tourism	SSCI
186	Camisón and Monfort-Mir (2012)	2012	Measuring Innovation in Tourism From The Schumpeterian And The Dynamic-Capabilities Perspectives	Spain Valencia	Innovative Capabilities, Tourism Performance	Survey, Content Analysis, Schumpeterian Theory,	Study present that serious biases and anomalies hindering the understanding of the situation at the micro level and complicating the issue of international comparability.	Process Innovation	Innovative capabilities, Innovativeness, Innovation performance,Tourism firms	Tourism Management	SSCI

						Dynamic Skills Approach					
187	Huibin and Marzuk (2012)	2012	Community Participation of Cultural Heritage Tourism from Innovation System Perspective	Malaysia	Cultural Heritage Tourism, Innovation System	Case Study		Process Innovation and Organization al Innovation	community participation; cultural heritage tourism; CHT; innovation system; tourism development; Penang.	International Journal of Services Technology and Management	ESCI
188	Mei, Arcodia and Ruhanen (2012)	2012	Towards Tourism Innovation: A Critical Review of Public Polices at The National Level	Norway	Innovation, Destination competitiveness, Public policy, National government Norway.	Content and Systematic analysis.	The findings indicate that the policies are mostly general and superficial.	Organization al Innovation	Innovation, Destination competitiveness, Public policy, National government, Norway	Tourism Management Perspectives	SSCI
189	Gebeshuber and Majlis (2011)	2011	3D Corporate Tourism: A Concept for Innovation in Nanomaterials Engineering.	Malaysia Selangor	Nanomaterials, Innovation, Nanotechnology	The Biomimicry Innovation Methodis	The "3D Tourism" concept seems to be especially interesting for development of novel functional nanomaterials and contributes to overcoming the first two of the three gaps between the world of ideas, inventors, innovators and investors as well as the market as introduced for accelerated scientific and technological breakthroughs to improve the human condition.	Product Innovation	bioinspiration, biomimetics, production methods, natural materials, biological engineering, biomimicry, innovation, nanomaterials, nanotechnology, nanofabrication, design, corporate tourism (3) (PDF) 3D Corporate Tourism: A Concept for Innovation in Nanomaterials Engineering. Available from: https://www.researchgate.net/publication/45893977_3D_Corporate_Tourism_A_Concept_for_Innovation_in_Nanomaterials_Engineering [accessed Jul 17 2019].	International Journal of Materials Engineering Innovation	SCOPUS
190	Chen (2011)	2011	Innovation in Hotel Services: Culture and Personality	Taiwan	Service Innovation Culture, Proactive Personality,	Literature Review, Reliability Analysis, Confirmatory		Service Innovation	Service Innovation Culture, Proactive Personality,	International Journal of Hospitality Management	SSCI

					Innovation, Hotel Service	Factorial Analysis, Structural Equation Modeling (SEM) via LISREL 8, Correlation Analysis			Innovation, Hotel Service		
191	Smerecnik and Andersen (2010)	2011	The Diffusion Of Enyironmental Sustainabilit, Innoyations in North American Hotels And Ski Resorts	America California	Environmental Sustainability, Extension of Innovation	Factor Analysis, Correlation Analysis		Management Innovation	sustainable tourism, sustainable development, diffusion of innovations, tourism management, hotel, ski	Journal of Sustainable Tourism	SSCI
192	Sandvik, Arnett, and Sandvik (2011)	2011	The Effects of New Product Development Proficiency on Product Advantage and Tourism Business Performance: Evidence from the Norwegian Hotel Industry	Norway	Product Development, Product Advantage, Tourism Performance	Correlation Analysis, Structural Equation Modeling		Product Innovation	new product development proficiency, product advantage, business performance, hotel industry	Journal of Travel Research	SSCI
193	Su (2011)	2011	The Role of Service Innovation and Customer Experience in Ethnic Restaurants	Taiwan	Customer Experience, Service Innovation, Behavioural Intention, Experiential Marketing, Ethnic Restaurant	Descriptive Statistics, Exploratory Factor Analysis, Correlation Analysis, Hierarchical Regression	The results suggest that service innovation has significant effects on behavioural intention and customer experience, and the mediating effect of customer experience on service innovation and customers' behavioural intention was supported.	Service Innovation	Customer Experience, Service Innovation, Behavioural Intention, Experiential Marketing, Ethnic Restaurant	The Service Industries Journal	SSCI
194	Fernández, Cala and Domecq (2011)	2011	Critical External Factors Behind Hotels' Investments in Innovation and Technology in Emerging Urban Destinations	Spain Madrid	Macro-Micro Environmental Innovation	Pestel Analysis		Product Innovation and Service Innovation	critical external factors; ICT; hospitality sector; innovationimpacts; PESTEL model; Porter's five forces model	Tourism Economics	SSCI
195	Aldebert, Dang and Longhi (2011)	2011	Innovation in The Tourism Industry: The Case of Tourism@	France Toulouse	Information Communication Technologies, Tourism Industry	Case Study, Document Analysis		Product Innovation	Tourism, Innovation, Sectoral system of production and innovation,Temporary cluster, Knowledge bases,ICT, Internet	Tourism Management	SSCI

196	Chang, Gong and Shum (2011)	2011	Promoting Innovation in Hospitality Companies Through Human Resource Management Practices	Republic of China Shenzhen	Incremental Innovation, Radical Innovation, Human Resource Management Practices	Frequency Analysis, Correlation Analysis, Regression Analysis		Management Innovation	Incremental innovation, Radical innovation, SelectionTraining, Human resource management practices	International Journal of Hospitality Management	SSCI
197	Weidenfeld, Williams and Butler (2010)	2010	Knowledge Transfer and Innovation Among Attractions	England Cornwall	Knowledge Transfer, Innovations, Tourism Clusters, Tourist Attractions	Framework Analysis		Product Innovation and Process Innovation	Knowledge Transfer, Innovations, Tourism Clusters, Tourist Attractions	Annals of Tourism Research	SSCI
198	Liburd and Hjalager (2010)	2010	Changing Approaches Towards Open Education, Innovation and Research in Tourism	Denmark	Web 2.0, Tourism education, Open Innovation, INNOTOUR	Empirical tests, Meetings and interviews.	We argue that there is a compelling need to build grounded theory and consolidated practice that will advance the quality and efficiency of tourism education through the use of a wide span of interactive technologies and committed teaching methods, facilitating dynamic, interdisciplinary and international learning experiences.	Product Innovation and Service Innovation	Web 2.0, Tourism education, Open Innovation, INNOTOUR	Journal of Hospitality and Tourism Management	SSCI
199	Jacob, Florıdo and Aguıló (2010)	2010	Environmental Innovation As A Competitiveness Factor in The Balearic Islands	Spain Mallorca	Environmental Innovation, Tourism Enterprises	Descriptive Statistics		Organization al Innovation	Environmental innovation, Competitiveness; Accommodation sector, Balearic Islands	Tourism Economics	SSCI
200	Hjalager (2010)	2010	A Review of Innovation Research in Tourism	Denmark	Innovation, Innovation Systems	Empirical study, Qualitative Analysis		Service Innovation	Innovation, Innovation systems, Knowledge, ClustersPolicy	Tourism Management	SSCI
201	Hjalager (2009)	2009	Cultural Tourism Innovation Systems – The Roskilde Festival	Denmark	Roskilde Festival, Innovation System	Case Study		Service Innovation	Roskilde Festival, Innovation system, Tourism spin-offs, Policy	Scandinavian Journal of Hospitality and Tourism	SSCI
202	Hu, Horng and Sun (2009)	2009	Hospitality Teams: Knowledge Sharing and Service Innovation Performance	Taiwan	Knowledge Sharing, Team Culture, Service Innovation Performance	Frequency Analysis, Correlation Analysis, Factor Analysis	Bilgi paylaşımı and takım kültProduct Innovationün, Service Innovation inovasyon performansı üzerinde önemli bir etkisi olduğu bulunmuştur.	Service Innovation	Knowledge Sharing, Team Culture, Service Innovation Performance	Tourism Management	SSCI

203	Doong, Law and Wang (2009)	2009	An Initial Investigation of Integrating Innovation Diffusion Models for Drawing First-time Visitors	Hong Kong	First-time visitors, Innovation diffusion model, Hong Kong, Marketing.	External Influence Model, Internal Influence Model, Mixed Influence Model, J test , P test.	Empirical results indicated that both the mixed and internal influence models exhibited a significant impact on first-time visitors, and that the mixed influence model had better goodnessof-fit than the internal model.	Process Innovation and Organizational Innovation	First-time visitors, Innovation diffusion model, Hong Kong, Marketing.	Journal of Travel & Tourism Marketing	SSCI
204	Ros and Sintes (2009)	2009	Innovation Activity in the Hotel Industry	Spain	Radical Innovation, Incremental Innovation, Hotel Services, Balearic islands	Empirical Analysis		Management Innovation	Radical Innovation, Incremental Innovation, Hotel Services, Balearic islands	Technovation	SSCI
205	Racherla, Hu and Hyun (2008)	2008	Exploring the Role of Innovative Technologies in Building a Knowledge-Based Destination	Philadelphia	Information and Communication technology, Innovation, Knowledge-based destination, Knowledge management, Tourism community, Wireless networks	The analysis of qualitative data		Product Innovation and Service Innovation	Information and Communication technology, Innovation, Knowledge-based destination, Knowledge management, Tourism community, Wireless networks	Current Issues in Tourism	SSCI
206	Rodgers (2008)	2008	Technological Innovation Supporting Different Food Production Philosophies in The Food Service Sectors	United Kingdom	Food manufacturing processes, Innovation, Fast foods, Fresh foods, Modelling	Model Review		Product Innovation	Food manufacturing processes, Innovation, Fast foods, Fresh foods, Modelling	International Journal of Contemporary Hospitality Management	SSCI
207	Tseng, Kuo and Chou (2008)	2008	Configuration Of Innovation and Performance In The Service Industry: Evidence From The Taiwanese Hotel Industry	Taiwan	Innovation, Innovation Configuration, Hotel Industry, Technological Innovation, Organisational Innovation	Factor Analysis, Reliability Analysis, Cluster Analysis, ANOVA And LSD Multiple Comparison Test		Product Innovation and Organizational Innovation	Innovation, Innovation Configuration, Hotel Industry, Technological Innovation, Organisational Innovation	The Service Industries Journal	SSCI
208	Sørensen (2007)	2007	The Geographies of Social Networks and Innovation in Tourism	Denmark Nykøbing Falster	Social Networks, Innovation, Tourism	Case Study		Process Innovation and	Tourism, Innovation, Social networks, Agglomerations,	Tourism Geographies	SSCI

								Organizational Innovation	Information, Province of Malaga		
209	Ottenbacher (2007)	2007	Innovation Management in The Hospitality Industry: Different Strategies for Achieving Success	Germany	Innovation, New service development (NSD).	Factor analysis, Multiple regression analysis.	This study obtained data on 185 hospitality innovations and identified three performance dimensions: market performance, financial performance, employee and customer relationship enhancement. Of the 23 potential success determinants, 12 were found to be drivers of performance.	Service Innovation	Innovation, New service development (NSD).	Journal of Hospitality & Tourism Research	SSCI
210	Stamboulisa and Skayannis (2003)	2003	Innovation Strategies and Technology for Experience-Based Tourism	Greece	Experience tourism; Innovation; Strategy; Information and communication technologies	Qualitative Research		Process Innovation and Organizational Innovation	Experience tourism; Innovation; Strategy; Information and communication technologies	Tourism Management	SSCI
211	Litvin, Kar and Goldsmith (2001)	2001	Travel Innovativeness and Self-Image Congruity	Singapore	Self-image, Innovator, Diffusion.	Istatistical Analysis, T-test.	The research finds that tourism innovators have a distinctly unique self-image when compared to late adopters and indicated that innovators see themselves as more rugged, exciting, dominating, contemporary, organized, rational, and liberal than do travel followers.	Organizational Innovation	Self-image, Innovator, Diffusion.	Journal of Hospitality and Tourism Management	SSCI
212	Hernandez and Leon (2001)	2001	The Adoption Of Environmental Innovations in The Hotel İndustry of Gran Canaria	Spain Gran Canaria	Environmental Innovation, Hotel Businesses	Descriptive Statistics, Regression Analysis		Process Innovation and Organizational Innovation	environmental innovation, tourism, firm behaviour, hotel services	Tourism Economics	SSCI
213	He, He, & Xu (2018)	2018	Evolutionary Analysis of Sustainable Tourism	China Nanjing	Green Innovation, Tourism Enterprises and Tourists, Government, Stakeholder	Content Analysis, Dynamic Differential Analysis Method	Study conclude that tourism enterprises' strategy can be affected by the decisions of both local governments and tourists and when visitor have higher green preference, tourism enterprises would adopt a green innovation strategy, even if local government do not implement supervision policy.	Process Innovation and Service Innovation	Sustainable tourism, Greenpreference, Green innovation, Government incentive mechanism, Evolutionary game theory	Annals of Tourism Research	SSCI

214	Horng, Liu, Chou, Tsai and Hu (2018)	2018	Developing a Sustainable service Innovation Framework for the Hospitality Industry	Taiwan	Innovation, Sustainable development, Hospitality industry, Service industries, Sustainability	FDM Analysis, DEMATEL	The findings of the DEMATEL result indicate that innovation diffusion has direct and indirect effects on dimensions of sustainable innovation and on organizational factors.	Service Innovation	Innovation, Sustainable development, Hospitality industry, Service industries, Sustainability	International Journal of Contemporary Hospitality Management	SSCI
215	Zach, Krizaj and McTier (2018)	2018	Learning From Press Releases: Implications for Hospitality Innovation	USA	Innovation, Cluster analysis, Content analysis, Event study, LBIO, Press releases	Cluster and Content Analyss	Cluster analysis identified four lodging innovation types: property and location, marketing, strategic development and guest experiences. The event study found that the typology was useful in determining the market value effects of an innovation.	Service Innovation	Innovation, Cluster analysis, Content analysis, Event study, LBIO, Press releases	International Journal of Contemporary Hospitality Management	SSCI
216	Singjai, Winata & Kummer (2018)	2018	Green Initiatives and Their Competitive Advantage for The Hotel Industry in Developing Countries	Australia Queensland	Green Innovation, Proactive Environmental Strategy, Hotel Industry	Partial Least Squares, Structural Equation Modeling	The results show that green strategies lead directly to positive environmental performance in terms of the consumption of utilities, waste management, and environmental risk management, leading to cost competitiveness and competitive advantage through differentiation.	Process Innovation	Proactive environmental strategy, Learning orientation, Innovativeness, Quality management, Environmental performance, Competitive advantage	International Journal of Hospitality Management	SSCI
217	Hjalager, Kwiatkowski and Larsen (2018)	2018	Innovation Gaps in Scandinavian Rural Tourism	Scandinavia Denmark Norway Sweden	Rural tourism, Customer demand, Innovation gaps, Innovation capacity, Scandinavia.	Factor Analysis, Statistical Analysis, Correlation Analysis.	The results also indicate the existence of several innovation gaps, as potential future tourists demonstrate demands for higher quality and product service variation than current customers.	Service Innovation	Rural tourism, Customer demand, Innovation gaps, Innovation capacity, Scandinavia.	Scandinavian Journal of Hospitality and Tourism	SSCI
218	He, He, Xu, & Shi (2018)	2018	Sustainable Tourism Modeling: Pricing Decisions and Evolutionarily Stable Strategies For Competitive Tour Operators	China Nanjing	Traditional Tourism Strategy, Green Tourism Innovation Strategy, Tour Operators	Content Analysis, A One-Shot Duopoly Game Model, Two Evolutionary Game models	Results show that when the environmental preference of tourists is sufficiently low, no tour operators's would adopt the strategy green tourism innovation; when it is moderate, only the tour operators with cost advantage would adopt when it is sufficiently high, both tour operators would select the strategy green tourism innovation.	Service Innovation	Evolutionary game theory, Government subsidy, Green tourism innovation, Hotelling model, Pricing	Tourism Economics	SSCI
219	Horng, Liu, Chou, Tsai	2017	From Innovation to Sustainability: Sustainability	Taiwan	Diffusion of Innovations, Environmental Marketing Strategy,	Corelattion Analysis	The present study found relationships among innovation diffusion, environmental marketing strategy and sustainability innovations, and a	Service Innovation	Diffusion of Innovations, Environmental Marketing Strategy, Hotel, Organizational	International Journal of	SSCI

	and Chung (2017)		Innovations of Eco-Friendly Hotels in Taiwan		Hotel, Organizational Environment , Sustainable Development, Sustainability Innovations		mediating effect of environmental marketing strategy.		Environment , Sustainable Development, Sustainability Innovations	Hospitality Management	
220	Rosario, Patrisia and Rene (2017)	2017	Eco-Innovation and Organizational Culture in the Hotel Industry	Mexico Oaxaca	Innovation Management, Sustainability Culture and Climate, Environmental Responsibility	Regression and Correlation Analyses	The implications of these results for firms tend towards the convenience of adopting an adhocracy culture, which facilitates the implementation of eco-innovation at different levels and potentiates both environmental and organizational results.	Process Innovation and Organization al Innovation	Innovation Management, Sustainability Culture and Climate, Environmental Responsibility	International Journal of Hospitality Management	SSCI
221	Del Rosario, Patricia and René (2017)	2017	Eco-Innovation and Organizational Culture in The Hotel Industry	Netherlands Amsterdam	Organizational Culture, Eco-Innovation	Survey, Regression, Correlation	The results show adopting an adhocracy culture provides implementation of eco-innovation at different levels and potentiates both environmental and organizational results.	Process Innovation and Organization al Innovation	Innovation management, Sustainability, Culture and climate, Environmental responsibility	International Journal of Hospitality Management	SSCI
222	Carson and Carson (2017)	2017	International Lifestyle Immigrants and their Contributions to Rural Tourism Innovation: Experiences from Sweden's far North	Australia Sweden	International Lifestyle Migration, Lifestyle Tourism Entrepreneurs, Local Tourism Innovation System, Rural Tourism, Social Network Analysis, Sparse Population North.	Case Study	It has been stated that immigrants emerge as important driving forces of new tourism products, processes and markets, and offer a range of new ideas, skills and external networks to the region.	Process Innovation and Service Innovation	International lifestyle migration, Lifestyle tourism entrepreneurs, Local tourism innovation system, Rural tourism, Social network analysis, Sparsely populated north	Journal of Rural Studies	SSCI
223	Nieves and Meneses (2016)	2016	Antecedents and Outcomes of Marketing Innovation: An Empirical Analysis in the Hotel Industry	Spain	Marketing, Innovation, Hotel Industry, Knowledge Management, Performance Measures	Structural equation modelling	Collective knowledge has a direct influence on marketing innovation and an indirect effect through the learning capability.	Service Innovation	Marketing, Innovation, Hotel industry, Knowledge Management, Performance measures	International Journal of Contemporary Hospitality Management	SSCI
224	Pozo, Ollero and Cappa (2016)	2016	ECO-İnnovation And Economic Crisis: A Comparative Analysis Of Environmental Good Practices And Labour	Spain	Hotel Eco-innovation Economic crisis Environmental	Descriptive Analysis	The two estimates of the production function for 2008 and 2012 show that the introduction of eco-innovative measures had a positive and significant influence on labour	Process Innovation	HotelEco-innovation, Economic crisis, Environmental	Journal of Cleaner Production	SCI-E

			Productivity İn The Spanish Hotel İndustry		Management Productivity		productivity, despite the fact of the economic crisis reduced the productivity growth observed for each additional eco-innovative practice implemented by the hotels from 8.15% in 2008e7.45% in 2012		management,Productivity		
225	Razumova, Rey-Maquieira and Lozano (2016)	2016	The Role of Water Tariffs As A Determinant of Water Saving Innovations in The Hotel Sector	Spain Mallorca	Water Tariffs, Water Saving Innovations, Hotels	Case Study	The results show that hotels in the areas with the highest water tariffs are more likely to implement water-saving innovations than hotels in other locations.	Process Innovation and Service Innovation	Water tariffs, Hotels, Environmental innovations, Majorca	International Journal of Hospitality Management	SSCI
226	Almeida, Rocafort and Borrajo (2016)	2016	Shedding Light on Eco-Innovation in Tourism A Critical Analysis	Spain Madrid	Eco-innovation, Qualitative Research Method, Content Analysis, Innovation, Ecology, Eco-tourism, Delphi Analysis, Hospitality.	Theoric	They stated that the tourism industry is mainly focused on product eco-innovations.	Process Innovation and Service Innovation	eco-innovation, qualitative methodology, content analysis, innovation, ecology, Delphi analysis, ecotourism, hospitality	Sustainability	SSCI
227	Lopez and Ramos (2015)	2015	Innovation in Services: The Case of Rural Tourism in Argentina	Argentina Patagonia	Rural Tourism, Innovation in Services, Social Innovation, Coordination Failures, Productive Development Policies	Factoral Analysis	The fact that Rural Tourism groups are formed by small and micro producers located in rural and often poorly connected areas is the main obstacle for innovation.	Process Innovation and Service Innovation	Rural Tourism, Innovation in Services, Social Innovation, Coordination Failures, Productive Development Policies	Emerging Markets Finance and Trade	SSCI
228	Tolstad (2014)	2014	Development of Rural-Tourism Experiences Through Networking: An Example From Gudbrandsdalen, Norway	Norway Gudbrandsdalen		Interviews Case Study	The analysis indicates that networking was beneficial for the firms, for several reasons. An economic benefit in the initial phase of the firms and of the network resulted from joint marketing.	Process Innovation	Innovation, Network, Rural tourism, Small firms	Norsk Geografisk Tidsskrift – Norwegian Journal of Geography	SSCI
229	Choua, Chena and Wang (2012)	2012	Green Practices in The Restaurant Industry From An Innovation Adoption Perspective: Evidence From Taiwan	Taiwan	Green Practices, Innovation	Structural Analysis	Attitude and perceived behavioural control have positive effects on behavioural intention while social influence is insignificant. Perceived innovation characteristics have direct positive effects on attitude and indirect positive impacts on behavioural intention to adopt green	Management Innovation	Green practices, Innovation adoption theory, Theory of planned behaviour, Green restaurant, Green innovation	International Journal of Hospitality Management	SSCI

							practices. Managerial implications are discussed.				
230	Romerio and Costa (2010)	2010	The Potential of Management Networks in The Innovation and Competitiveness of Rural Tourism: A Case Study on The Valle del Jerte (Spain)	Spain	Rural tourism, Co-management, Cooperation, Innovation	Case Study, Social Network Analyss	The results demonstrate that these networking structures contribute towards the creation of a cohesive destination, whereby the sharing of resources enables innovativelocal responses to the global market challenges.	Process Innovation and Organization al Innovation	Rural tourism, Co-management, Cooperation, Innovation, Social network analysis, Spain	Current Issues in Tourism	SSCI
231	Lawton and Weaver (2010)	2010	Normative and Innovative Sustainable Resource Management at Birding Festivals	Australia	Birding festivals, Sustainable tourism, Resource managemen, Ecotourism, Event management, Events, Festivals.	Cluster analysis, e-survey, Chi-squared test, Visual analysis.	We conclude that birding festivals, because of their 'green' attendee proclivities, identification with ecotourism, and non-profit orientation, are amenable to a higher level of SARM engagement more in keeping with the rhetoric of sustainability. Of particular interest is the experience of implementing radical innovations such as the prohibition of motorised vehicles and allowing visitors to participate in the production of recycled goods.	Process Innovation and Service Innovation	Birding festivals, Sustainable tourism, Resource management, Ecotourism, Event management, EventsFestivals	Tourism Management	SSCI
232	Andereck (2009)	2009	Tourists' Perceptions of Environmentally Responsible Innovations at Tourism Businesses	ABD Arizona Springerville Holbrook	Environment, Responsible Tourism, Nature-Based Tourism, Visitor Attitudes	Frequency Analysis, MANOVA, Bonferroni t-test, Chi-square Analysis, ANOVA test		Process Innovation and Organization al Innovation	Environment, Responsible tourism, Nature-based tourism, Visitor attitudes	Journal of Sustainable Tourism	SSCI
233	Carlsen and Edvard (2008)	2008	BEST EN Case Studies: Innovation for Sustainable Tourism	Arizona	Sustainable Tourism, Innovation	Case Study		Process Innovation and Service Innovation	Innovation, Sustainable Tourism, Case Study	Tourism and Hospitality Research	SCOPUS and ESCI
234	Prats, Guia and Molina (2008)	2008	How Tourism Destinations Evolve: The Notion of Tourism Local Innovation System	Spain	Networks, Clusters , Industrial Districts , Innovation Systems, Destinations	Model Analysis	Tourism Local Innovation System (TLIS) model can be used to assess the innovation capacity of tourism destinations and, also, to design relational network structures that favour innovation.	Service Innovation	Networks, Clusters, Industrial districts, Innovation systems, Destinations	Tourism and Hospitality Research	SCOPUS and ESCI

235	Macbeth, Carson and Northcote (2004)	2004	Social Capital, Tourism and Regional Development: SPCC as a Basis for Innovation and Sustainability	Australia	Social capital, Regional tourism, Impacts of tourism development, Innovation in tourism development, Sustainable development.	Literature review	This paper has argued the need to consider SPCC from two perspectives in order to conceptualise the ways in which communities can more effectively harness tourism for regional development purposes.	Process Innovation and Service Innovation	Social capital, Regional tourism, Impacts of tourism development, Innovation in tourism development, Sustainable development	Current Issues in Tourism	SSCI

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Novacene: The emergence of low cost microchip enabled information-economy from inexpensive petroleum based mass-production economy

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ABSTRACT

The text examines the main insights of the new sciences and disciplines, and shows how they reveal the flaws of orthodox NEOCLASSICAL ECONOMIC THEORY hacked from NEWTONIAN PHYSICS, in explaining and predicting the catastrophic events of the near economic history, and provides new ways of understanding the role of Alan Greenspan's monetary policy of the United States [1987-2006] in the emergence of unimpeded global dominance of plutocratic intangible economy of ASSET MANAGER CAPITALISM that simultaneously produced a decade long secular stagnation in the rich world with global sharp steady increases in inequality of wealth and income distribution during and after the 2008 financial crisis. A brief history of the transition from MANAGERIAL CAPITALISM of nation states of the post-World War II institutionalized with the BRETTON WOODS AGREEMENT, to global ASSET MANAGER CAPITALISM, is presented to enlighten CHIMERICA's evolution [China+America], and President Trump's attempts to dismember it by enabling the emergence of a bipolar world- TECHNOLOGY COLD WAR by weaponized global interdependence. The globally interdependent techno-sphere is shown as an enabled outcome of the implementation of WASHINGTON CONCENSUS of Anglo-American ASSET MANAGER CAPITALISM, that survived a comatose near death experience in 2007-2008. The major warriors and battlegrounds of THE TECHNOLOGY COLD WAR are identified. The text shows how GAIA THEORY sheds new light on economic growth, how fuzzy logic affects the national accounts, how accounting systems over-value the assets of publicly traded multinational companies balance sheets, and how network theory reveals the value of relationships, and argues that the economy needs to be viewed as a complex, chaotic system, as scientists view nature, not as an equilibrium seeking NEWTONIAN construct.

1. Mise en scene

In the self-regulating banking system, put in place with GRAMM-LEACH-BLILEY FINACIAL SERVICES MODERNIZATION ACT that with President Clinton's signature in 1999 repealed GLASS-STEAGALL BANKING ACT OF 1933 with FED's CHAIRMAN, Alan Greenspan's enthusiastic lobbying, 97% of money that were in the hands of the public consisted of bank deposits, and in the absence of a state-issued debt-free money, money needed for an economy to function, had to be borrowed from the banking sector, and hence the lender of last resort, the Central Bank.

After the implosion of NASDAQ's dot-com bubble in March 2000 that the GREENSPAN PUT was instrumental in inflating, Greenspan kept the benchmark price for money below 2% for too long at the beginning of 21st century, and thus enabled the residential real estate bubbles in the United States and in different scales in various parts of the world, and in 2007 the real estate bubble collapsed in the United States ushering in a full blown global financial crisis in 2008, and that led to massive bailouts of the global financial system by their central banks and by their governments.

During the 19 years [1987-2006] Alan Greenspan was at the helm of monetary policy, at every opportunity he had to address the law makers at the CAPITOL HILL, he lectured them on how unimpeded competitive markets deliver optimal welfare, and that the financial institutions which create money, and through which money is allocated, have no independent effect on the real equilibrium of the economy, but are only acting on behalf of well-informed sovereign consumers. Meanwhile, during his reign at unprecedented numbers Wall Street apparatchiks rewarded each other never before seen bonuses for the profits they made from NASDAQ's dot.com bubble Greenspan called "irrational exuberance", and "irrational exuberance" jump-started the intangible economy. And most of the law-makers, from the ways they voted, seemed to have bought in Greenspan's official storyline, even when, Greenspan's official storylines were in stark contrast to the radical structural transformations of the banking system as the bundling of Wall Street and commercial banking under CITIGROUP's roof, and the NEW YORK STOCK EXCHANGE's transformation from a relatively transparent mutual of 600+ unlimited partnerships of about equal size to profit seeking oligopolies of broker-dealer owned dark pools of fragmented markets served by proprietary high-speed computer trading firms as explained by Walter Mattli in DARKNESS BY DESIGN: HIDDEN POWER IN GLOBAL CAPITAL MARKETS[1] [Princeton University Press 2019].

After 200 years of not-for-profit, member-owned U.S. exchanges have transitioned to a for-profit model that has proven itself to be costly to investors, unfair to broker-dealers and rife with conflicts for the exchanges themselves. The exchanges geared to serve their shareholders had evolved to favor the high-frequency trader. Institutional investors moved into dark, opaque pools. In 2007, the NYSE launched a $500million initiative, PROJECT ALPHA, building a mammoth computer trading facility in Mahwah, New Jersey. With PROJECT ALPHA high-frequency trading had officially taken over the BIG BOARD. While the floor remained open for business, it was a shadow of its former self, a puppet show for TV as the NYSE share of trading fell to about 20% from 70-80% explained Scott Patterson in DARK POOLS: THE RISE OF THE MACHINE TRADERS AND THE RIGGING OF THE U.S. STOCK MARKET[1] [Patterson 2012]. According to The ECONOMIST[1], US equities trading market shares 5-day average to September 25, 2019 for Off exchange was 36%; NYSE was 21%; NASDAQ was 20%; CBOE was 19%; IEX was 4%. CBOE focuses on exchange-traded funds. Michael Lewis in FLASH BOYS: A WALL STREET REVOLT [Lewis 2014,2015][1] cast IEX as champions of ordinary investors against rigged markets with fair and simple fees. IEX also routes orders over a 'speed bump', a coil of fiber-optic cable that slows access to the market by 350 microseconds. By 2020 markets from Toronto to Moscow declared their intentions of using some sort of speed bumps championing the average investor.

Trading in 2019 in US equity markets is split between 12 public exchanges and many more off-exchange trading venues, including about 40 'dark pools' that match buy and sell orders but do not display quotations and over 200

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internalizing broker-dealers. This fragmentation is a feature not only of equity markets but also of other markets, including options, markets and FOREIGN EXCHANGE [FX] markets. UBS, CREDIT SUISSE, DEUTSCHE BANK, and BARCLAYS provided 43.5% of internalized dark pools of NEW YORK STOCK EXCHANGE in April-June 2016. The rest were provided by MORGAN STANLEY, JPMORGAN, CITIGROUP, BANK OF AMERICA MERILL LYNCH, and GOLDMAN SACHS. Dark pools are trading platforms that match buy and sell orders but do not display quotations. Dark pools report trade price and quantity after executing a trade. They enable institutional investors to buy and sell large orders of stocks, block orders, away from the publicly quoted market with minimal information leakage and price impact.

Fragmented capital markets and their high frequency and algorithmic trading are a growing reality in Europe as well as parts of Asia. In this hyper-fast fragmented global marketplace, algorithms battle algorithms for trading dominance, preferential trading execution, and most sophisticated trading supercomputers deal not only in securities but increasingly across assets classes, including futures, fixed income, currencies, and commodities, and across hundreds of markets and dozens of countries. GLOBAL ALGORITHMIC CAPITAL MARKETS: HIGH FREQUENCY TRADING, DARK POOLS, AND REGULATORY CHALLENGES [Oxford University Press 2019][1], edited by Walter Mattli shows how frenzied activity of traders on the trading floors of New York, London and Chicago has been replaced by algorithmic trading and supercomputers in gigantic data centers connected by proprietary fiber optics and microwaves became extraordinarily complex and opaque measured in milliseconds and microseconds beyond human perception. At the end of World War II, the average holding period for a stock was 4 years. By 2000, it was 8 months. By 2008, it was 2 months. By 2011 it was 22 seconds.

Gregory Zuckerman in THE MAN WHO SOLVED THE MARKET: HOW JIM SIMONS LAUNCHED THE QUANT REVOLUTION [Zuckerman, 2019][1] claims that "quant investors had emerged as the dominant players in the finance business. As of early 2019, they represent close to a third of all stock-market trades, a share that had more than doubled since 2013. …… Already, hedge-fund firm TWO SIGMA has built a computing system with more than 100 teraflops of power – meaning it can process 100 trillion calculations a second- and more than 11 petabytes of memory, the equivalent of 5 times the data stored in all academic libraries. …... In June 2019, RENAISSANCE managed a combined $65billion, making it one of the largest hedge-fund firms in the world, and sometimes represented as much as 5% of daily stock market trading volume, not including high-frequency traders," [Zuckerman 2019 p. 310 and 312 and 316].

In the first half of the first decade of 21st century, Alan Greenspan faced 4 challenges. The first was mostly his making, the bursting of the dot-com stock bubble in March 2000. Second was a cyclical recession beginning in March 2001, part of a slowdown in developed economies. Third were the 9/11 attacks that caused $40billion in insurance loss and a one-day 7.1% stock market decline that followed the longest trading suspension, 9/11-14, 2001 since 1933. Fourth, China's accession to full World Trade Organization [WTO] membership in December 2001 that opened world markets to the greatest agglomeration of cheap labor and abundant capital in history putting downward pressures on global prices that has not abated. Greenspan, to fight central bankers' nightmare, deflation, held FED FUNDS effective rate below 2% until November 2004, now criticized as "too low for too long". Low rates provided the funding for the housing bubble and subprime mortgage crisis that imploded in 2007. The following year saw the global financial crisis and near destruction of the banking sector and the international monetary system.

By holding the FED FUNDS RATE below the rate of inflation for 3 years, Greenspan virtually made a free gift to providers of home mortgages when the US government had already greased the housing industry by making mortgage interest tax deductible and eliminated most capital gains taxes on homes. Furthermore, the US government had also provided loan guarantees through the FEDERAL HOUSING ADMINISTRATION [FDA] and its own cheap mortgages through both the FEDERAL HOME LOAN BANKS and the private/public entities [FANNIE MAE] and [FREDIE MAC]. By the end of 2007, the government sponsored mortgages accounted for 81% off all the mortgage loans made in the US., and by 2010 this had risen to all. Hunter Lewis in CRONY CAPITALISM IN AMERICA: 2008-2012[1] [AC Books 2013] provides a detailed summary.

During Greenspan's reign, the forecasting models of the TREASURY and the FED lacked a financial sector. The assumption that future prices would move in line with current expectations removed any need to take precautions against financial collapse, despite a continuous history of financial manias and panics. Aiming to minimize regulation, DYNAMIC STOCASTIC GENERAL EQUILIBRIUM models of the economy ignored the financial sector.

Greenspan with the enthusiastic lobbying of Lawrence Summers, Robert Rubin and Arthur Levitt was able to convince the law-makers to liberate finance from regulations and down-size whatever regulators were left, and within a decade liberated finance span out of control, and imploded. But few months before the 2007-2008 implosion, Dick Chaney's and George W. Bush's WHITEHOUSE, with impeccable prophesy, put a very competent economic historian schooled in Milton Friedman's and Anna J. Swartz's A MONETARY HISTORY OF THE UNITED STATES SINCE 1867-1960 [Friedman and Swartz 1971][1], a play book for central banks on how to manage financial crisis, showing the central bank's management of the 1929 implosion as the wrong play-book, in charge of FED, Ben Bernanke. Bernanke's academic reputation was grounded in his study of the GREAT DEPRESSION, particularly the pivotal year of 1933, when Roosevelt succeeded Hoover as president of the United States.

The 2007-2008 FINANCIAL CRISIS started with some homeowners having bought homes they could not afford found it hard to make their monthly mortgage payments in some locations in the United States, and graduated into a first run on a British bank, NORTHERN ROCK, in 150 years. This inherent market instability was compounded by the financial regulators' failure to understand the built-in dynamics of banking networks. Before the crash, those regulators with Alan Greenspan's assurances worked on the assumption that networks always serve to disperse risk, and so the regulations that they devised only monitored the nodes in the networks - individual banks - rather than overseeing the nature of their interconnections.

But the crash made clear that a network's structure can be robust-yet-fragile, as Nassim Nicholas Taleb explained in ANTIFRAGILE: THINGS THAT GAIN FROM DISORDER [Taleb 2018][1]. Network structure usually behaves as a robust shock-absorber, but then its positive feedback - as the character of the network evolves – switches it to become a fragile shock-amplifier. And, that caused 5 pillars of American finance to vanish in 2008. Greenspan's predecessor, Ben Bernanke's first step was to lower the interest rate and lengthen the term on direct loans to banks from the FED's DISCOUNT WINDOW. As commercial banks were slow to respond, and as the liquidity situation worsened, FED announced the creation of TERM AUCTION FACILITY to make loans at its discount window cheaper and anonymous.

Institutions that posed systemic threats included not only commercial banks but also, if not primarily, investment banks as well as mortgage and insurance groups. They were desperately short of capital after decades of astronomical bonuses awarded to ever growing number of Wall Street apparatchiks. Investment banks' funding base has been most volatile without access to retail deposits last two decades before 2008. Their assets tended to be very risky while engaging in huge volume of transactions among themselves, with hedge funds, and with commercial banks. In 1980 financial sector debt was only 10% of non-financial debt. In 2008 it stood at 50%, turning investment banks into machines that trade heavily with each other and reported handsome profits that justified the bankers' astronomical bonuses, bankers received and kept.

Leverage ratios in the banking industry competed with those of hedge funds. Neither were governments themselves, and for that matter the national economy, free of leverage. Summing up federal, state, local government, company and household liabilities: for every productive $1 there were $3.7 debt in 2008. It became clear in retrospect after 2008, that debt financed US GDP growth for many years prior to 2008 was not sustainable.

In the immediate aftermath of the global financial crisis, all of the major central banks served as lenders of last resort in order to maintain functional settlement systems. Monetary easing via massive central bank injections of reserves was assumed to be essential to overcome the financial crisis, when lenders were immobilized by non-performing loan problems.

Emergency lending was made to banks, and currency swap agreements were drawn up with 14 different countries in order to ensure that they had access to the dollars they needed.

The most important outcome, however, was that key interest rates across the world dropped precipitously. US FED FUNDS TARGET RATE went from 5.25% in August 2007 down to 0.25% target by December 2008. Likewise Bank of England dropped its primary interest rate from 5.0% in October 2008 to 0.5% by March 2009. October 2008 saw the crisis intensify, which led to an internationally coordinated interest rate cut by 6 major central banks.

By 2016 monetary policy makers had dropped interest rates 637 times. As this continued through the post crisis period and established a low interest rate environment for the global economy, a key enabling condition for parts of today's digital economy began to arise. But at a price. The bailouts required governments around the world to rescue major global banks whose net worth had turned out to be fictitious, with the bailouts continuing to impose heavy social costs ten years on with imploded public debts, squeezed public budgets, heavy household debt and negative returns for savers.

Over the period 2008-2014 in the United States, Bernanke's FEDERAL RESERVE embarked on three different QUANTITATIVE EASING schemes, totaling $4.1trillion. In the UK, the BANK OF ENGLAND undertook 375billion pounds of QE between 2009 and 2012, and in Europe, the ECB committed 60billion euros per month from January 2015 to March 2017. By the end of 2016, central banks across the world had purchased more than $12.3trillion worth of worthless 'assets'. The primary argument for using quantitative easing was that it should lower the yields of other assets. If traditional monetary policy operates primarily by altering the short-term interest rate, quantitative easing is expected to affect the longer interest rates and the yields of alternative assets.

Granted that the assets are not perfect substitutes for one another, taking away or restricting supply of one asset should have some effect on demand for other assets. In particular, reducing the yield of US government bonds should increase the demand for other financial assets and raise the prices of stocks and subsequently create stockholder wealth, provided that the biggest holders of US government debt, IMF mandated 'independent' central banks of the world, do not sell, better yet are not allowed to sell. While the evidence is still not definitive, it does seem that quantitative easing has had an effect. Corporate bond yields have declined and stock markets have surged upwards until September 2018. That may have had an effect on all sectors of the US economy as well by making much of the economic recovery depend on $4.7trillion of new corporate debt since 2007.

FED announced its plans in September 2017 for a gradual unwinding of its $4.1trillion balance sheet that swelled during the previous decade as it engaged in QUANTITATIVE EASING to ease the pernicious effects of the global financial crisis. The plan was to set a path and proceed on autopilot. This it was hoped, would avoid the pace of unwinding being taken as a signal of the direction of interest rates. It would start slowly, just $10billion a month from October 2017, and smoothly pick up pace. By October 2018 it had quickened, as planned, to $50billion. That coincided with the start of a bout of market turbulence. The S&P 500 INDEX of leading shares fell by 14% in the final 3 months of 2018.

Bernanke's FED's expansion of balance sheet, in 2008, was announced to provide banks with liquidity they desperately needed; to signal to markets that monetary policy would remain loose for some considerable time, and to reduce the bond yields, encouraging investors to buy riskier assets. It came in three rounds. The first, QE1 ran from November 2008 through June 2010. The second, QE2 began in November 2010 and lasted until June 2011. The third, QE3 started in September 2012 and lasted until October 2014. As a result, base money supply, M0 in FED argot, increased from $800billion o $4.1trillion. The effects are still debated. Most agree QE1 was a proper response to the liquidity crisis that peaked with the Lehman Brothers bankruptcy on 9/15/2008. Some think that QE2 and QE3 were Bernanke's experiments with no historic precedent and uncertain outcomes.

Critics of QEs claiming that money supply explosion on this scale would produce massive waves of inflation were proven wrong. As Richard Koo in THE ESCAPE FROM BALANCE SHEET RECESSION AND THE QE TRAP: A HAZARDOUS ROAD FOR THE WORLD ECONOMY [Wiley 2015][1] explained both the investors and consumers were saving, paying off debt and rebuilding their balance sheets. There is an academic theory behind Bernanke's QEs, called the PORTFOLIO BALANCE CHANNEL. The idea is that investor money has to go somewhere. By purchasing long-term Treasury securities, the FED lowered their total return and made them less attractive to investors. In turn, this made stocks and real estate more attractive on relative basis. As investor funds flowed to equity and property channels, those assets would be worth more, and higher asset values would provide collateral for more borrowing.

By 2015, QE and zero-interest-rate policies ended. Critics were wrong about inflation and the FED was wrong about stimulus. Average growth in the US economy in 9 years after the end of recession in June 2009 was 2.2%, far below long-term trend growth, the weakest recovery in US history. Neither inflation nor the trend growth arrived. The ten-year episode of low interest rates and bloated balance sheets did not live up to the worst fears of critics or the great expectations of policy-makers. However, QE and zero rates did have one effect. It was the same effect Greenspan produced, dot-com and the real estate bubbles. Greenspan's real estate bubble was confined to mortgages. In contrast by late 2018, the bubbles were in equities, bonds, high-end real estate, emerging markets and Chinese credit.

How to unwind trillions of dollars of QEs without sending bond yields or exchange rates to damagingly high levels is the biggest challenge facing monetary authorities in the West and Japan. Proponents of QEs have emphasized their initial benefits while ignoring the potential high costs involved in mopping up the excess reserves later on. In comparison to economies that did not implement QE, those that did will probably end up recovering more slowly because of their higher interest and exchange rates they will endure in getting out of the QE trap.

Between 2010 and 2017, US auto loans outstanding surged from $650billion to $1.1trillion, of which $280billion were subprime. In the same period, delinquent auto loans increased by $23billion. Corporate credit was in no better shape than consumer credit. As of 2017, US corporate debt outstanding stood at $5.9trillion and US dollar denominated debt issued by emerging market companies exceeded $9trillion in 2017 according to BANK OF INTERNATIONAL SETTLEMENTS [BIS]. These equity and credit bubbles were visible on bank and corporate balance sheets. The 5 largest US banks held $157trillion of derivatives measured by gross notional value at the end of 2017, a 12% increase from comparable amount of derivatives before 2008 financial crisis. The 12% increase is not the complete picture, because trillions of derivatives have been moved to third-party clearinghouses. Clearinghouses do not eliminate risk. They merely move risk around in ways that make it difficult to discern. Where derivatives are concerned, the financial system is not smaller, not safer, and not more sound.

The most dramatic GREENSPAN PUT was in September and October of 1998 when he cut interest rates twice in three weeks, including an unscheduled emergency cut, to contain the damage from the collapse of LONG-TERM CAPITAL MANAGEMENT, a big American hedge fund. The BERNANKE PUTs were exhibited on numerous occasions, notably the launch of QE2 in November 2010, after QE1 failed to stimulate the economy, and the September 2013 of a taper in the FED's long-term asset purchases in reaction to an emerging-markets meltdown resulting from mere "taper talk" in May 2013. The YELLEN PUTs were when she delayed the first FED rate hike in nine years from September 2015 to December 2015 to calm markets after a Chinese currency devaluation and consequent US market meltdown in August 2015. YELLEN PUT was used again starting in March 2016, when FED delayed expected rate hikes until December 2016 in reaction to another Chinese currency devaluation and US market meltdown in January 2016.

The most extreme example was in 2008 when Bernanke and other regulators guaranteed every money market fund in America, guaranteed every bank deposit in America regardless of FDIC insurance limits, pushed interest rates to zero, printed money, acquired bad assets, and engineered over $10trillion of hidden currency swaps with the EUROPEAN CENTRAL BANK and other banks. The idea of free markets finding a level at which markets clear and bad banks fail is passe in the global monetary workings.

Once the most dangerous part of the crisis had been averted, a set of new and rather bleak post-2008 crisis problems came to dominate global economic debate. Arguably, the most pressing was how to fix the financial system that had so calamitously failed followed by the growing awareness of the inequality of income and wealth that had risen sharply during a decade of stubborn stagnation in productivity growth following the 2008-crisis. A fundamentally different intangible economy emerged in USA, UK, Sweden, and Finland. The share of investments in intangible assets were greater than tangible assets in total investments in 21st century in these economies.

GREENSPAN PUT induced dot.com bubble in the last half decade of the 20th century marks the beginning of the steady increases in investments in intangible assets, and thus the beginning of intangible economy in the United States.

Jonathan Haskel and Stian Westlake explain in CAPTIALISM WITHOUT CAPITAL: THE RISE OF THE INTANGIBLE ECONOMY[1] [Princeton University Press 2018]. Data is the new fuel for growth in manufacturing to retail to financial services. But unlike tangible assets, it does not necessarily fuel job growth, but fuels profit growth that tend to be diverted directly into executives and stock holders. A 2018 J.P. Morgan study found that most of the money brought back to US from overseas bank accounts following the 2016 Trump tax cuts went into stock buy-backs. Top 10 US tech companies spent more than $169billion purchasing their own stock in 2018 and the industry as a whole spent some $387billion[1]. Apple's financial engineering among the largest and most profitable multinational companies needs special mention. In 2018 Apple had $285billion in cash parked outside of the United States as well as $122billion debt on its consolidated statement. Most of its cash was in offshore bond portfolios over the past decade.

The buybacks have bolstered the top 10% of the US population that owns 84% of all stock. The stock buybacks have become the single largest use of corporate cash for over a decade since 2008 has buoyed markets, as it has also increased the wealth divide, which many believe is an important cause of slower-than-historic growth trend. Global income and wealth inequality, secular stagnation, according to Haskel and Westlake, is better understood by studying the structure and the workings of intangible economy.

Meanwhile, a seismic struggle is taking place as four principle sectors: the information and communications technology; the power and electric utility sector; the mobility and logistics sector, and the building sector are being decoupled from the fossil fuel industry in favor of adopting the cheaper new green energies. Jeremy Rifkin in THE GREEN NEW DEAL: WHY THE FOSSIL FUEL CIVILIZATIOIN WILL COLLAPSE BY 2028, AND THE BOLD ECONOMIC PLAN TO SAVE LIFE ON EARTH [Rifkin 2019][1] warns: "Increasing concern over climate change, loss of confidence in the long-term financial stability of the fossil fuel industry now facing the prospect of stranded assets, and the growing competitive advantage of emerging solar, wind, and other renewable energies are triggering a revaluation of funding priorities within the global financial sector, with an escalating number of funds transitioning capital away from fossil fuels into green energies and clean technologies of the 21st century." [Rivkin 2019, p.139] The result is that within the fossil fuel industry, "around $100trillion of assets could be carbon stranded," according to CITIGROUP in 2015.

The global monetary workings today are a patchwork of floating exchange rates, hard pegs, dirty pegs, currency wars, open and closed capital accounts with world money waiting in the wings. It is unanchored. It is incoherent. It is unknown when a new regime, "the rules of the game" in financial elites' jargon, will be forthcoming; in the midst of chaos in response to the next financial crisis; or after an international monetary conference, the last being at the LOUVRE in Paris on February 22, 1987; or the new regime will emerge as the gold standard did when countries imitated NEWTON's 1717 gold peg without an international agreement.

Before the Chinese RMB joined the SDR, the dollar price of gold and the SDR price of gold were volatile but highly correlated. After October 1, 2016, the date the Chinese joined, the dollar price of gold remained volatile, while the SDR price exhibited far less volatility. The trend line of SPECIAL DRAWING RIGHTS/GOLD is nearly a horizontal line since Chinese RMB joined SDR. SDR900= 1 ounce of pure gold looks like the new monetary benchmark, trading in the narrow range of SDR850 to SDR950, an 11% band with fluctuations of 5.5% above and below the SDR900 central tendency. SDR's basket of major currencies are the dollar, sterling, yen, euro, and RMB. The neat straight-line trend of SDT/GOLD horizontal trend line occurring randomly is infinitesimal. The SDR/GOLD horizontal trend line is an example of auto-regression. This appears only if there is a recursive function, a feedback loop, or manipulation.

Another scenario being scripted is in the past 10 years Russia and China have acquired more gold than any others. They have been most explicit about their unhappiness with the dollar based monetary payment arrangements where all SWIFT transactions are monitored by the United States after the enactment of PATRIOT ACT. Russia and China are each developing proprietary cryptocurrencies on a permissioned, heavily encrypted digital leger, and are well aware that neither the ruble nor the yuan have the needed elements for reserve currency status, including deep liquid bond markets and globally recognized rule of law. By placing their official gold on deposit in a Swiss non-bank vault governed by Swiss law, they can launch the new digital currency on their distributed ledger. Russia and China are not alone in pursuing cryptocurrencies on distributed ledgers. A new class of global cryptocurrencies on a permissioned distributed ledger controlled by the IMF and central banks is also in the works according June 2018 IMF Report, a manifesto for calling government controlled cryptocurrencies.

Recently, in addition to loose monetary policy, there has been a significant growth in corporate cash hoarding in tax havens. As of January 2016, $1.9trillion was held by American companies in cash and cash like assets mostly in tax havens. In the wake of the crisis, offshore wealth grew by 25% between 2008 and 2014, which resulted in an estimated $7.6trillion of household financial wealth being held in tax havens. With tax services provided by the BIG FOUR accounting firms, APPLE, FACEBOOK, AMAZON, and UBER seem to be the leaders of tax evasion schemes that give them use of the cash saved from the tax collector for mergers and acquisitions, that mostly centralizes existing capacity rather than building new.

Gabriel Zucman in THE HIDDEN WEALTH OF NATIONS: THE SCOURGE OF TAX HAVENS [The University of Chicago 2015][1] exposes the enabling role of the global financial centers and tax havens. The role of tax havens has also been starkly documented by the release of the PANAMA PAPERS and the PARADISE PAPERS, and in Brooke Harrington's CAPITAL WITHOUT BORDERS: WEALTH MANAGERS AND THE ONE PERCENT [Harrington 2016][1]. Without the creation of entire batteries of banking and legal services to serve and help tax evasion on a global scale would not have been possible. The growth of banks that specialize in high-net-worth individuals and of legal offices whose main role is to facilitate transfers of money happened simultaneously with globalization, specifically with liberalized global finance. Branco Milanovic in CAPITALISM ALONE: THE FUTURE OF THE SYSTEM THAT RULES THE WORLD [The President and Fellow of Harvard College, 2019][1] reports that "10% of global GDP was held in tax havens in 2008".[Milanovic 2019 p.161]

Nicholas Shaxson in TREASURE ISLANDS: UNCOVERING THE DAMAGE OF OFFSHORE BANKING AND TAX HAVENS [Shaxson 2011][1] writes "Some 85% of international banking and bond issuance takes place in the so-called Euromarkets, a stateless offshore zone. …Nearly every multinational corporation uses tax havens, and their largest users-by far- are on Wall Street." [Shaxson 2011 p. 11] "…the British Virgin Islands, with fewer than 25,000 inhabitants hosts over 800,000 companies, or more than 40% of foreign direct investment into India comes from Mauritius. Ricardo's theory [comparative advantage] loses its traction. Companies and capital migrate not to where they are most productive but to where they can get the best tax break. There is nothing "efficient" about any of this. The world contains about 60 secrecy jurisdictions, or tax havens, which can be divided roughly into 4 groups: a set of continental European haves, a British zone of influence centered on the City of London and loosely shaped around parts of Britain's former empire, a zone of influence focused on the United States, and a fourth category holding unclassified oddities like Somalia and Uruguay." [Shaxson 2011 p.16]

In THE TRIUMPH OF INJUSTICE: HOW THE RICH DODGE TAXES AND HOW TO MAKE THEM PAY[1] Emmanuel Saez and Gabriel Zucman claim that: "since 1980 the tax system has enriched the winners in the market economy and impoverished these wo realized few rewards from economic growth." [Saez and Zucman 2019p.ix] And add, "the break of a tax-avoidance industry that obscures income and wealth; the emergence, with globalization, of new loopholes exploited by multinational companies; the spiral of international tax competition that has led countries to slash their tax rates one after another." "were not sudden changes in taxation due to popular appetite for exempting the wealthy, but to forces that have prevailed without input from voters." [Saez and Zucman 2019 p.ix] "Today, close to 60% of the large and rising amount of profits made by US multinationals abroad are booked in low tax countries. ……Us firms have in 2016 booked more than 20% of their non-US profits in 'stateless entities', shell companies that are incorporated nowhere, and nowhere taxed." [Saez and Zucman 2019 p.77-78] 91 of 500 FORTUNE listed US corporations did not pay any corporate income tax in 2018 according to BLOOMBERG.

Moreover, in THE GREAT REVERSAL: HOW AMERICA GAVE UP ON FREE

MARKETS [Presidents and Fellows of Harvard College, 2019][1], Thomas Philippon shows that "since 2000, US industries have become more concentrated and American firm's profit margins have increased. At the same time, investment has been weak, despite high profit margins and low funding costs." [Philippon 2019 p.99] "The rise in profits, the rise in concentration, and the decline in labor share ... are phenomena specific to the US." [Philippon 2019 p.109]

Philippon summarizes these 21st century developments as: "Most US domestic markets have become less competitive, and US firms charge excessive prices to US consumers. Excess profits are used to pay out dividends and to buy back shares, not to hire and invest. At the same time, barriers to entry have increased, and antitrust enforcements have weakened. These trends in the US were not exported to Europe, and, in a stunning reversal of history, many European markets (airlines, cell phones, and internet providers, among others) are now more competitive and cheaper than their American counterparts." [Philippon 20019 p.151] And adds,"contrary to common wisdom, the main explanation is political, not technological: I have traced the decrease in competition to increasing barriers to entry and weak antitrust enforcement, sustained by heavy lobbying and campaign contributions." [Philippon 2019 p.205]

Tax evasion, austerity, and extraordinary monetary policies were all mutually reinforcing. The outcomes of bailouts a decade later seem as losses of wrong financial bets got nationalized, and profits of right bets got privatized, causing the public debt of rich economies to implode. Risks got socialized and rewards privatized as the global economy had begun a long-term transition from a mass-production economy based on cheap oil to an information economy based on cheap microchips.

Microchips are ubiquitous, embedded into most manufactured products from toasters and to ballistic missiles. WORLD SEMICONDUCTOR TRADE STATISTICS, a data provider, recons that the market for chips was worth $421billion in 2017, a rise of 1.6% on previous year[1]. If anything, these raw numbers understate the importance of chip-making. The global e-commerce is reckoned to have revenues over $2trillion a year, for example. If data are the new oil, microchips are the internal-combustion engines that turn them into something useful. The ubiquity of chips has led to the growth of a vast global industry when globalization was the center core of WASHINGTON CONSENSUS. Microchips have billions of components and are made in ultra-modern factories that required tens of billions of dollars of investment to build. Indeed, that such devices can be built at all is a living testament to global specialization and trade that was put in place with American leadership in the last two decades of the 20th century. These hugely complicated products have spawned an equally complex global know-how interdependence and supply chain involving thousands of specialized companies all around the world.

But in the age of MAKE AMERICA GREAT AGAIN, and MADE IN CHINA target dates, both China and the United States see the semiconductor technology as crucial to their future. For America, its lead in chip-making is a strategic asset. PENTAGON's guiding hand was instrumental in the development of the earlier uses of chips produced by Silicon Valley for the guidance systems of nuclear missiles. In 2014, China established the NATIONAL INTEGRATED CIRCUIT INDUSTRY INVESTMENT FUND to domestically supply its needs. In 2014, China's domestic supply capability was less than a third. The NATIONAL INTEGRATED INDUSTRY INVESTMENT FUND was set up to finance research and development for integrated circuit industry, and is planned to grow from $65billion in 2014 to $305billion by 2030 to supply its needs domestically and reduce China's dependence on foreign suppliers. It seems, President Trump has not welcomed China's plans.

A manifestation of the uneasiness of uncomfortable interdependence of CHIMERICA as summarized by Stephen Roach in UNBALANCED: THE CODEPENDENCE OF AMERICA AND CHINA [Roach 2014][1] is their technological competition in chip-making at a historical moment in 2019. For 50 years, progress in chip-making has been summarized by MOORE'S LAW, which state that the number of components that can be crammed onto a chip doubles every two years and thus, roughly, so does its computing power. But the law is breaking down, losing its predictive capability, and leaving the future of the industry looking fuzzy and less certain than at any time in the past. With the advent of ASSET MANAGER CAPITALISM, US monetary policy was set since 1987 under Maestro Greenspan's baton with low interest rates and ample credit fine-tuned to generate higher asset prices [GREENSPAN PUT] when the equity markets took a down-turn and create wealth effect to spark broader economic growth by making rich richer as chronicled by Bob Woodward's hagiography MAESTRO: GREEENSPAN'S FED AND THE AMERICAN BOOM [Woodward 2000][1]. The maestro fell short of achieving broader economic growth but was spot-on in creating the stock market bubble for dot.com startups followed it by enabling a residential real estate bubble after NASDAQ's crash and passed the baton to Ben Bernanke in 2006 for the finale. Hand-picked by Chaney-Bush WHITEHOUSE, the new maestro was one of the prominent disciples of Milton Friedman's interpretation of 1929 FINANCIAL CRISIS, perhaps, the most apprenticed in Friedman's historical causes of 1929 GREAT DEPRESSION in his generation for the finale: the 2007-2008 GLOBAL FINANCIAL CRISIS. The new maestro was not going to repeat FED's mishandling of 1929 as he promised to Milton Friedman on Friedman's birthday celebration.

Yet, the real the real US GDP between 1975 and 2017 roughly tripled, from $5.9trillion to $17.19trillion. During this period, productivity grew by about 60%. But from 1979 onwards, real hourly wages for the great majority of American employees have stagnated or even fallen. Ian Goldin and Chris Kutarna in AGE OF DISCOVERY: NAVIGATING THE RISKS AND REWARDS OF OUR NEW RENAISSANCE [Goldin and Kutarna 2016][1] write: "The S&P 500 companies as a group gave almost all their 2014 profits back to shareholders (via dividends and share buybacks), rather than bet on new projects and ideas." [Goldin and Kutarna 2016, p.5] In other words, for almost 4 decades a tiny elite has captured nearly all the gains from this expansion. Perhaps the greatest transfer of wealth in history, but certainly in the capitalist history not only in the United States but at differing rates in the world, took place and 6+ billion people watched 'eyes wide shut'.

According to 2017 OXFAM REPORT: AN ECONOMY FOR THE 99%[1], 62 men in 2016 owned the same amount of wealth as the poorest half of the world's population. In THE 2017 WORLD ECONOMIC FORUM REPORT ranking the quality of nations' infrastructures, the United States ranked 9th, behind countries like the Netherlands, Japan, France, Switzerland, and South Korea. Unfortunately, in relation to a key measure of the digital infrastructure, the United States ranked even worse, 19th, among the nations of the world in fixed-broadband internet subscriptions, with slower internet speeds. Meanwhile, the wealth of the 62 very richest individuals increased by 45% between 2010 and 2015, a jump more than half a trillion dollars in total. Over the same period, the wealth of the bottom half fell by just over a trillion dollars, a drop of 38%. In 2018, the world's top 26 billionaires owned as much as the poorest 3.8billion according to OXFAM[1], as the billionaires increased their fortunes by $2.5 billion per day, while the poorest half of humanity saw their wealth dwindle by 11% billionaires' riches increased by 12%. In 2018 the top 26 wealthiest people owned $1.4trillion, or as much as the 3.8billion poorest people. In 2017, it was the top 43 people. The mega wealthy have also become more concentrated, as the marginal benefits of economic growth have gone overwhelmingly to the rich while marginal costs have gone mainly to the poor.

Few weeks before the 2018 DAVOS WORLD ECONOMIC FORUM of select plutocrats who advocate markets' efficiency over governments' and globalism's superiority over nationalism, and some mega asset managers, BLOOMBERG announced that China produced 2 US $billionaires a week, about 100, in 2017, and updated the 2017 announcement to a US $billionaire every other day for 2018, about 180, few weeks before the 2019 DAVOS meeting. For more than 100 years, neoclassical economics ignored PARETO's explanation of the dynamics of wealth distribution, but embraced PARETO EFFICIENCY and OPTIMALITY.

The mainstream economic theory was neither able to offer convincing explanations of what, how, and why, nor was it able to predict these booms and busts, but the risk models of quantitative finance provided a mathematical cover-up helping many to watch the greatest transfer of wealth 'eyes wide open shut' as the digitally connected global financial network with capability to move money at the speed of light with its elite intact and firmer in charge was reorganized.

The last two decades of the 20th century witnessed the apparently boundless co-dependent rise of two forces: the information revolution and financial markets. The 21st century was inaugurated with FED's Alan Greenspan's fear mongering of possibility of global computers' crashing, and with claims about the advent of a "new economy" characterized by the flourishing of IT and financial markets capable of relentless growth. Global

computers did not crash but the possibility gave Greenspan to cut interest rates and flood the markets with easy credit to unsuccessfully prolong the dot.com bubble. But, Greenspan's interest rate cut and flooding the market with easy credit in 1997 to fight Asian flu was not a failure in keeping up the bubble. However, it was the coordinated efforts of World Health Organization that contained the epidemic, not Greenspan's rate cut. By October 1999, the market cap of 199 Internet stocks tracked by Morgan Stanley was $450billion, about the same size as the GDP of the Netherlands. The total sales of these companies were about $21billion, and their collective losses were $6.2billion. The dot.com bubble burst in March 2000. 8 years later, the 2008 FINANCIAL CRISIS spoiled the hyped bright expectations for 6+billion residents of planet Earth.

The 2008 economic crisis, a demon of our own design, was also a crisis for orthodox neoclassical economic theory, the theory of its design. If the origins of the crisis are thoroughly human, so must be its solutions. A decade of trauma has had a chastening effect among some peddlers of neoclassical economic theories. They started thinking old ideas, asking new questions, and occasionally welcoming heretics back into the fold. Some believed that what failed was not just a financial system, and a way of regulating that financial system, but a set of economic theories, and that we need to reject simplicities of neoclassical economics, reject overly mathematical economics, and revisit the insights of the past and try to do good science by learning how good science is done from disciplines that succeeded.

Before 1980 many people believed that the market was something that has always existed in a quasi-natural state, much like gravity. It seemed to enjoy a material omnipresence, sharing many characteristics of the forces of nature, warranting a science of its own. The science was first called 'political economy' and then, after roughly 1870, 'economics'. The modern orthodoxy of that science, the neoclassical tradition, has always taken the nature of the market as the central province of economics. In fact, an overview of the history of the first century of neoclassical economics would confirm that its adherents had been much more fascinated with the status and nature of agents than with the structure and composition of markets.

Most of the time, the concept of the market was offhandedly treated as a synonym for the phenomenon of exchange itself. Even, in the few instances when major thinkers in the tradition felt they should discuss the actual sequence of bids and asks in their models of trade - Leon Walras with his TATONNEMENT or Francis Edgewort with his RE-CONTRACTING PROCESS what becomes apparent is that they bore little relationship to the operation of any actual contemporary market. Mid-20th century attempts to develop accounts of price dynamics were, if anything, even further removed from the increasingly sophisticated diversity of market formats and structures, as well as the actual sequence of tasks that markets accomplish. The market in neoclassical economics came to be modeled as a relatively homogeneous and undifferentiated entity.

Yanis Varoufakis, Joseph Halevi and Nicholas J. Theocarakis in MODERN POLITICAL ECONOMICS: MAKING SENSE OF THE POST-2008 WORLD [Varoufakis, Halevi, and Theocarakis 2011][1] delve into major economic theories and map out the trajectories that MANAGERIAL CAPITALISM of the NEW DEAL embedded in BRETTON WOODS AGREEMENT's almost centrally coordinated stability's designed disintegration in the 1970s, and then to an intentional magnification of unsustainable imbalances of the 1980s delivered ASSET MANAGER CAPITALISM that globally privatized money creation during the 1990s and beyond to September 15, 2008. The authors' main finding is that any system of ideas whose purpose is to describe capitalism in mathematical or engineering terms lead to inevitable logical inconsistency. The only scientific truth about capitalism is its radical indeterminacy. NEWTONIAN science based economics is an illusion leading one closer to astrology than to astronomy and more akin to a mathematized religion than to mathematical physics.

The economic ideas have always been linked to politics, paradigm shifts in economic theory have been intertwined with configurations of the political landscape. Adam Smith's ideas helped inspire dramatic expansion in free trade in the 19th century. Karl Marx's theories provided the impetus for cataclysmic changes in the 20th century. The neoclassical paradigm laid the intellectual foundations of FINANCIAL CAPITALISM, as John Maynard Keynes's solutions to the GREAT DEPRESSION tempered FINANCIAL CAPITAL with the directorial role for the state and developed the foundations after World War II, state activism of MANAGERIAL CAPITALISM grew to new heights, until Ronald Reagan and Margaret Thatcher ushered in ASSET MANAGER CATIPALISM in the 1980s after falling under the spell of Milton Friedman's and Friedrich Hayek's versions of neoclassical paradigm explains Daniel Stedman Jones in MASTERS OF THE UNIVERSE: HAYEK, FRIEDMAN, AND THE BIRTH OF NEOLIBERAL POLITICS [Jones 2012][1] The KEYNESIAN regime ran into trouble in the STAGFLATIONARY 1970s and was superseded by MONETARISM, which was in fact a reversion to PRE-KEYNESIAN orthodoxy about both money and governments.

During the last 40 years the balance of power has shifted decisively from labor to capital; from working class to the business class; and from the old business elites to new financial elites, the ASSET MANAGERS. The homage, NEW CONSENSUS – mixture of 'new' CLASSICAL and 'new' KEYNESIAN economics - pays to power helped to render the power shift invisible.

Whether we consider the quantitative policies taken by Sweden's central bank in the 1980s and 1990s, or the policies of the central banks in the United States, Asian Countries, or Japan, the historic fact is that central banks have been at the center of the boom-and-bust cycles that have plagued the world economy as they increased their independence and decreased their accountability. The independent central banks were instrumental in delivering the shift of power from working class to business class, from the old business elites to new financial elites, the ASSET MANAGERS.

At the onset of the GREAT RECESSION, as house prices sank, and joblessness soared, many commentators concluded that the economic convictions behind the disaster would now be consigned to history. Instead a political class started to blame the government interventions for the disaster and demanded global drive for austerity, stagflation and an international sovereign debt crisis. Philip Mirowski in NEVER LET A SERIOUS CRISIS GO TO WASTE: HOW NEOLIBERALISM SURVIVED THE FINANCIAL MELTDOWN [Mirowski 2013][1] finds an apt comparison in this situation in classic studies of cognitive dissonance. He concludes that neoliberal thought has become so pervasive that any countervailing evidence only serves to further convince disciples of its ultimate truth. Once neoliberalism became a THEORY OF EVERYTHING providing a revolutionary account of self, knowledge, information, markets, and government, it could no longer be falsified by anything as mundane as data from the 'real' economy. After financial apocalypse, neoliberalism rose from the dead observes Philip Mirowski.

2. The birth of attention merchants' surveıllance capitalism

Fundamental shifts in human affairs come mostly in two guises, as low probability events that could in an instant "change everything", and as persistent, gradually unfolding trends that have no less far-reaching impacts in the long term. Fundamental changes come both as unpredictable discontinuities and as gradually unfolding trends as NIKOLAI KONDRATIEFF argued and paid with his life in Marxist-Leninist Russia in the first quarter of the 20th century. The gradually unfolding events deserves at least a brief acknowledgement. They are epoch making technical developments: incremental engineering progress, improvements in efficiency and reliability, reduction of unit costs, and gradual diffusion of new techniques, usually following fairly predictable logistic curves are very much in evidence, but they are punctuated by surprising, sometimes stunning discontinuities.

Economics, having taken its cue from ISAAC NEWTON's physics, is an equilibrium system, disturbances are to be short and self-correcting. It is centered on equilibrium: an economy's natural resting state. Solving a set of equations that describes a market, conceived of as populated by predictably self-interested individuals who face various constraints, yields that equilibrium, the prices that balance supply and demand. Physicists have over the centuries used mathematics to understand the nature of gravity, light, electricity, magnetism and nuclear forces. Analytic solutions were achieved when their equations were linear, the noise GAUSSIAN, and the variables separable. Our world was written by them in the passive voice: rivers flow, rocks fall, planets orbit. There are no doings. Only happenings.

As Edward Fullbrook warns in MARKET-VALUE: ITS MEASUREMENT AND METRIC [Fullbrook 2019][1], there are two ways of using mathematics relative to an empirical phenomenon. One is to choose a mathematical structure and then make assumptions about the empirical structure so as to make two structure homomorphic. This is the methodology of orthodox neoclassical economics that generates mathematical models from which concepts can be

defined and deductions made. But that is not the methodology of NEWTONIAN PHYSICS. The second way is what NEWTON called 'experimental philosophy'. Instead of beginning with a mathematical structure, it begins by observing and describing an empirical structure and then looks for or invents as Newton's calculus a homomorphic mathematical structure. It is then this empirical foundations, rather than the axioms of mathematics, that concepts are defined and deductions made. That is neoclassical economists' neglect.

Furthermore, we are in a world of living creatures that construct themselves. What neoclassical economic theory misses is the idea of a system that constructs itself. The rhythmic character of economic life, the waves of innovation and destruction, the rise and fall of systems of political economy do not abide well with the conditions neoclassical economic theory portray, because network equations turn out to be nonlinear, noise associated with them non-GAUSSIAN, and variables non-separable. They do not have explicit solutions.

Some post-2008 FINANCIAL CRISIS economists draw on strands of the discipline less enamored of equilibrium. Joan Robinson worried that equilibrium models understated the role of history in determining outcomes. Joseph Schumpeter saw the economy as undergoing constant change powered by innovation. Friedrich Hayek wrote on how the separate actions of individuals could generate 'spontaneous order' of incomprehensible complexity.

A famous economic theory of cycles is the KONDRATIEFF CYCLE, a long wave of 40 or 50 years, which starts with a cluster of new technologies and exhausts itself when they have been used up. Schumpeter drew on this idea in his depiction of capitalism's cycles of creation and destruction. In Schumpeterian view, capitalism is a dynamic disequilibrium system. The new only rarely supplements the old; it usually destroys it. As Carl Benedikt Frey explains in THE TECHNOLOGY TRAP: CAPITAL, LABOR, AND POWER ON THE AGE OF AUTOMATION [Princeton University Press 2019][1], the old, however, does not, as it were, simply give up but rather tries to forestall death or co-opt its usurper – a la KRONOS – with important implications.

There is neither a unique full employment equilibrium nor the variety of equilibria posited by Keynes. Nevertheless, there is a potential meeting between Keynes and Schumpeter, since Schumpeter, like the earlier generation of REAL BUSINESSS CYCLE THEORISTS, would not have denied that stabilization policy could make rocking less violent. Within the long cycles are shorter cycles of boom and bust, lasting 8 to 10 years. Lacking proper scientific explanation Paul Samuelson called cycle theories SCIENCE FICTION, nevertheless cycles have had great influence on macroeconomic policy. Typical macroeconomic constructions, such as the CYCLICALLY ADJUSTED BUDGET DEFICIT, refer to short cycles of definite duration, which oscillate round some 'normal' or 'long-run' situation.

David Hume, in the tradition of British Empiricism, thought of a passive observing mind/brain in a vat and wondered how that observing mind could have reliable knowledge of the world. He rightly noted that from what is observed to be the case, one cannot deduce what ought to be the case. One cannot deduce an ought from an is. Yet, ever since David Hume, economists have distinguished between short-run and the long-run effects of economic change, including the effects of policy interventions. The distinction has served to protect the theory of equilibrium, by enabling it to be stated in a form which took some account of reality.

In economics, the short-run now typically stands for the period during which a market or an economy of markets temporarily deviates from its long-term equilibrium position under the impact of some 'shock'; like a pendulum temporarily dislodged from a position of rest. This way of thinking suggests that governments should leave it to markets to discover their natural long-run equilibrium positions.

Reminding us of the harsh reality that in the long-run we will all be dead, JOHN MARNARD KEYNES pointed out that the long-run may be too long to be relevant. Historical cycles, on the other hand, refer to disturbances of a moral, socio-political, rather than technological equilibrium. That is; they embed technological innovation within the wider frame of political and social change. Societies are said to swing like pendulums between alternative phases of vigor and decay, progress and reaction, prodigality and puritanism. Each expansive movement produces a crisis of excess that leads to a reaction. The equilibrium position is hard to achieve and is always unstable.

By far the most important concatenation of these fundamental advances took place between 1867 and 1914, when electricity generation, steam and water turbines, internal combustion engines, inexpensive steel, aluminum, explosives, synthetic fertilizers, and electronic components created the technical foundations of the 20th century. A second remarkable saltation took place during the 1930s and 1940s with the introduction of gas turbines, nuclear fission, electronic computing, semiconductors, key plastics, insecticides, and herbicides. The history of jet flight is a good illustration of the inherently unpredictable nature of these rapid technical shifts.

Before the scientific revolution of the 17th century, there was no suggestion that there might be simple, orderly laws underpinning the confusion of the world, and the nearest anyone came offering a reason for the behavior of wind, and weather, the occurrence of famines, or the orbits of planets was that they resulted from the whim of God, or gods. NEWTON made the universe seem an orderly place, with no room for interference from capricious gods. He provided laws of motion, which describe the behavior of moving objects in the laboratory, or in the world at large, or in the SOLAR SYSTEM and beyond, and which, by extension, must also be thought of as universal laws, applying everywhere and at all times.

The kinetic theory of gasses was a significant example of how the universal laws of physics brought order out of chaos. The term "gas" was coined by JAN VAN HELMONT from the Greek word for chaos. It was ISAAC NEWTON's fellows' world-view that unleashed a theory of progress with human creativity and free will at its core.

ISAAC NEWTON worked out the mathematical basis of physics, RENE DESCARTES, its dualist philosophy, and FRANCIS BACON's the experimental method that subsequently led science to reach its heights. The experimental method that delivered CERTAIN results in physics came to be called REDUCTIONISM. REDUCTIONISM assumes that matter is the basis of all existence and that material world is composed of a multitude of separate objects assembled into a huge structure. Consequently, complex phenomena can be understood by reducing them to their basic building blocks, and by looking for the mechanisms through which these building blocks interact. Although physics led the way, the reductionist methodology eventually permeated all the sciences.

With the triumphs of DESCARTES, NEWTON, and LAPLACE, we have come to regard physics as the answer to our questions about what reality "is". In that search, we have come to think of the world as a vast "machine". This fundamental framework, extended by SPECIAL AND GENERAL RELATIVITY, QUANTUM MECHANICS, and QUANTUM FIELD THEORY alter some of the basic deterministic aspects of NEWTONIAN physics but not the view of reality as a giant "machine". Evolving life is not a "machine", neither is its biosphere. Unlike physics where laws hold sway, no laws at all entail the becoming of the biosphere.

We do not know what shall become as the biosphere evolves and shapes its own future in ways we cannot state in advance. This lawless emergence is contingent yet not random. Biosphere constructs itself and does so into a biosphere of increasing diversity. The living world can become more diverse and complex and in an ongoing way creates its own potential to do so. That requires harnessing of the release of energy to build order faster than that order can be dissipated by the second law of thermodynamics.

Much of the scientific method relied on taking a reductive stance toward nature, breaking the complex into simple basic units. In physics, this meant seeing objects as aggregates of individual atoms. In human affairs, it meant building a notion of society based on an understanding of the individual. THOMAS HOBBES, thus began his political treatise with the individual, a radical and strikingly modern step. According to the Christian doctrine dominating HOBBES's day, societies were organic wholes with individuals as part of the body of CHRIST. Individuals ultimately derived their identity from that larger collective vision. Each part had no shape except by relation to the social whole.

HOBBES reversed all that, putting the individual before society and seeing society as nothing more than aggregate of individuals. HOBBES's individuals were self-interested and social. Just as the atoms of the physics of his day were constantly in in motion, so too were HOBBES's individuals propelled by internal drives that kept them in constant motion. The inevitable result was conflict. Leading in his vision of "war of all against all".

SIGMUND FREUD in CIVILIZATION AND ITS DISCONTENTS [2017][1] argued that civilization stems from primordial guilt that first arose with patricide, perhaps as a band of sons rose up to kill their father. FREUD speculated that

in the aftermath of that bloody act, feelings of shame so overwhelmed them that they formed laws and social institutions to prohibit such acts. FREUD thus located our civilizing tendency in guilt, an emotional impulse. In contrast, HOBBES believed humans were rational calculators of self-interest, and for HOBBES rationality ultimately saves humans from themselves. Reason moves HOBBES's individuals, driven by the selfish desire for self-preservation, to relinquish liberty for security, ceding absolute control to a sovereign, a LEVIATHAN, in exchange for security.

The basis of life together is this social contract, in which the state exists only to safeguard the individual's self-preservation. JOHN LOCKE retained HOBBES's ideas of social contract as the glue of society, but attacked HOBBES's vision of absolute monarchy, arguing that it simply transferred the war of all against all to one between the monarch and his subjects. LOCKE thus argued for a limited, constitutional government, which in essence the modern limited, liberal state. Whereas HOBBES believed that only absolute rule could curb self-interest, ADAM SMITH saw self-interest as the basis or social order. The invisible hand of the marketplace thus replaced the sovereign LEVIATHAN, and common interest simply flowed out of collective pursuit of self-interest. So was SMITH's fantasy.

In TURNING POINT: SCIENCE, SOCIETY, AND THE RISING CULTURE [Capra 1982][1], Fridtjof Capra contends that the NEWTONIAN view of scientific method has crashed and that the first discipline to crash has been physics itself, where CARTESIAN philosophical foundation and the reductionist methodology had seemed most secure. First, quantum theory played havoc with DESCARTES's CERTAINTY PRINCIPLE, and the second discovery pertaining to the nonlocal connections of individual events abolished DESCARTES's separation of mind from matter.

In this 18th century system of the world, NEWTON brought together two themes. Embodied in his calculus and physics, one Newtonian revelation rendered the physical world predictable and measureable. Craving the authority of science, economists then mimicked Newton's laws of motion in their theories, describing the economy as if it were a stable, mechanical system. In the late 19th century, a handful of mathematically minded economists set out to make economics a science as reputable as physics, turned to differential calculus to describe the economy with a set of axioms and equations.

Just as Newton had uncovered the physical laws of motion that explained the world from the scale of a single atom to the movement of the planets, the mathematically minded economists sought to uncover the economic laws of motion that explained the market, starting with a single representative consumer and scaling up to national output. Thus, 150 years of economic theory biased our understanding with static mechanistic models and metaphors, when the economy is better understood as a complex adaptive system, made up of interdependent humans in a dynamic living world. The individual is not only embedded within a system but is directly involved in that system's self-organization. Long before DARWIN, IMMANUEL KANT understood this. "An organized being then, has the property that the parts exist for by means of the whole." KANTIAN WHOLE.

Another, less celebrated, was NEWTON's key role in establishing the trustworthy GOLD STANDARD, which made economic valuations as calculable and reliable as the physical dimensions of items in trade. For 200 years after 1717, except for its suspension in the Napoleonic wars, Newton, as master to the Royal Mint, having fixed the value of the pound to gold, the sterling pound, based on chemical irreversibility of gold, became the stable and reliable monetary Polaris. Newton's attempted and failed alchemical endeavors to reverse-engineer gold so that it could be made from base metals such as lead and mercury yielded crucial knowledge for his defense of the gold based pound. Newton's regime rendered money essentially as irreversible as gold, as irreversible as time itself as measurement of economic transactions.

These two concatenations substituted continuous processes for discrete production and gave us the classic image of wheels of industry, rolls of paper, spools of thread, ribbons of steel, classic assembly line of films like CHARLIE CHAPLIN's MODERN TIMES. Such industries represented only part of even industrial nations' output, but the ideal of the continuous process inspired capitalists and socialists alike. In the centuries of continuous process technology, it was manufacturers, refiners, and distributors who seemed to have excessive power over information, now a few disruptive platform companies do. Mass production economy based on cheap fossil fuel is evolving into information economy based on cheap micro-electronics in the 21st century. Industrial civilization flourished at the expense of nature and now threatens the ecology of the living Planet Earth.

In A WORLD BEYOND PHYSICS: THE EMERGENCE & EVOLUTION OF LIFE [Kauffman 2019][1], Stuart A. Kauffman sums the economy to be a network of complements and substitutes that he calls the ECONOMIC WEB. Like the biosphere, ECONOMIC WEB's evolution cannot substantially pre-tested, and is "context dependent". And creates its own growing "context" that subtends its "adjacent possible". The adjacent possible is what can arise next in this evolution. This evolution is sucked into the very adjacent possible opportunities it itself creates.

The 80-year history of Information technology is an example. In the 1930s, TURING invented the TURING MACHINE, an abstract formulation of a digital computer. By mid-World War II, TURING's idea was crafted at the University of Pennsylvania into ENIAC machine to calculate the trajectories of naval shells. After the war, VON NEUMANN was instrumental in the development of the mainframe computer. Shortly later, IBM made the first commercial machines, expecting to sell only a few. But the mainframe sold widely, and with the invention of the microchip, paved the way for the personal computer.

Chip-making was an in-house affair for Americans at the onset of the industry until 1961 when FAIRCHILD SEMICONDUCTOR began assembling and testing products in Hong Kong mostly to arbitrage labor costs. Internationalization of the production processes has accelerated as microchips have become more complicated and more manufacturing processes have been outsourced to specialized firms that emerged in Asia. The result was a multi-national complex constellation of thousands of companies that The ECONOMIST[1] roughly lumped into three categories. Designing [APPLE, INTEL, HUAWEI, QUALCOMM]; Manufacturing [INTEL, SAMSUNG, MICRON, TSMC] Packaging/Assembly [AMCOR, JCET, ASE, KING YUAN]. Designing is supplied by ARM, XILINX, SYNOPSYS, ZUKEN. Manufacturing, and Packaging/Assembly is supplied by AIR LIQUIDE, APPLIED MATERIALS, ASML, KMG CHEMICALS, LAM REASERCH, NAURA, SUMCO, TOKYO ELECTRON.

A typical itinerary of raw silicon to completed microchip is a fair illustration of the elaborate supply chains that emerged. Microchip's initial travel may start in the Appalachian Mountains in north America, where deposits of silicon dioxide are of the highest quality. The sand may arrive in Japan to be turned into pure ingots of silicon. The ingots of silicon are then sliced into standardized wafers, 300mm across, and sent to a "fab", a chip factory, in Taiwan or South Korea for high-tech and to China for low-tech. It is in this stage that the slices will be imprinted with a particular pattern using photolithography equipment made in Holland by AML. AML announced its compliance decision with COMMERCE DEPARTMENT and notified HUAWEI of its decision. The particular pattern will be determined by the overall design of the chip. This design might come from ARM, a British company owned by SOFTBANK, a Japanese ASSET MANAGER. The design can be tweaked for specific applications by one of the company's many licensees.

In its next phase, it must be assembled into a package, in which the etched silicon is placed inside the ceramic or plastic containers that are dotted across any circuit board. Then testing follows. Packaging might take place in China, Vietnam or the Philippines. The integration into a circuit board could happen somewhere else again. The final result will be one of the many components that arrive at factories from Mexico to Germany to China, for assembly into a final product: an industrial robot, a smart vacuum cleaner or a tablet. China's domestic microchip industry started at the lower-value end of this process, SEMICONDUCTOR MANUFACTURING INTERNATIONAL CORP, China's largest maker of semiconductors. Fueled by a fast growing domestic market, China established NATIONAL INTEGRATED CIRCUIT INDUSTRY INVESTMENT FUND help to turn promote design and higher-value manufacturing.

The 2011 earthquake and tsunami in Japan besides revealing how globally integrated the manufacturing had become, starkly revealed that Japanese firms have been producing the bulk of chemicals and other materials to make microchips. Japanese firms had substantial control over copper foils for printed circuit boards, silicon wafers to make chips, and resin to package them. For many components Japan was the home of biggest, sometimes the only, supplier.

Microprocessors are chips that do most of the grunt work in computers. They are built around INSTRUCTION-SET ARCHITECTURES, [ISAS], owned either by INTEL or ARM. INTEL's ISAS power desktop computers, servers and laptops. ARM's power phones, watches and other mobile devices. Though there are others, together ARM and Intel dominate the market. An ınstructıon

-set archıtecture is a standardized description of how a chip works at the most basic level, and instructions for writing software to
run on it. Computer scientists at the University of California, Berkeley, wrote RISC-V for use for publishable research because commercial producers of ISA were reluctant to make theirs available. The ISAS are proprietary, RISC-V is available to anyone, anywhere, and is free. RISC-V was introduced in 2014 at the HOT CHIPS MICROPROCESSOR CONFERENCE in California. It is now governed by a non-profit foundation. It recently moved to Switzerland out of American jurisdiction. The reason for shifting to RISC-V is the nature of open-source itself. Since the instruction set is already published online, American export controls do not apply to it. This has made it particularly popular with Chinese IT firms. ALIBABA announced its first RISC-V chip in July, 2019. HUAMI is mass producing smart watches containing processors based on RISC-V.

President Trump's WEAPONIZATION OF INTERDEPENDENCE, his threats to cut off foreign financial institutions from SWIFT banking network and the dollar clearing system for doing business with countries or entities he does not like highlighted China's vulnerabilities. One of the gravest is China's dominant role in electronics assembly. China is home to half of the world's capacity. In May 2019 COMMERCE DEPARTMENT blacklisted HUAWEI and its 70 affiliates, barring American firms from selling certain technologies without government approval to them. This shed light on another global network: microchip industry.

Around half of the modem chips to manage wireless connections of the world's baseband processors are made by QUALCOMM. Virtually all "server-class" chips used in world's data centers are made by INTEL. Chips based on designs licensed from ARM are ubiquitous in almost every advanced smart-phone. For their part, QUALCOMM, ARM and other chip designers depend on foundries to turn silicon into microprocessors. INTEL, SAMSUNG, and TSMC, in turn, rely on a bevy of specialized equipment suppliers to equip their factories. The emerged technically interdependent complexity of chip-making is multinational as its financial structure.

Taiwan had no comparative advantage in semiconductor manufacturing in the 1980s. Yet the Taiwanese government made a political decision to create state-sponsored TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY. The Taiwanese government nurtured TSMC with tariffs and subsidies in its early days when it was most vulnerable to foreign competition. TSMC, now, is a publicly traded company, a status the company could not have achieved without Taiwanese government's help. Those who shamelessly teach Ricardo's comparative advantage as science in their international economics classes should note that the Taiwanese created their comparative advantage, as SAMSUNG did in South Korea.

The mainframe did not cause the invention of the personal computer, but the wide market the mainframe created enabled the rather easy penetration of the personal computer into an expanding market. In addition, the spreadsheet is often described in histories of technologies as the killer app that caused an explosion of the personal computer market. The spreadsheet is the complement of the personal computer. Each helped the other gain market share. The personal computer did not cause but enabled the invention of word processing, and software companies like MICROSOFT emerged, which was originally founded to make the operating system for IBM personal computers.

The invention of word processing and abundant files invited the possibility of file sharing, and the modem was invented. The existence of file sharing did not cause, but invited, the invention of the WORLD WIDE WEB. The existence of the WEB did not cause, but enabled, selling on the WEB, and eBay and AMAZON emerged. And eBay and AMAZON put content on the WEB as did myriad other users, enabling the invention of WEB browsers; and also companies like GOOGLE emerged. Thence has followed social media and FACEBOOK.

Almost all of these successive innovations are the complements of the preceding ones. The existing goods and services at each state are the context in which the next good and/or service emerges. Word processing is a complement of the personal computer, the modem a complement of word processing, the WEB is a vast interconnected modem and is a complement and much more to file file-sharing. The opportunity to share files invited the invention of the modem. Accordingly, SCHUMPETER's depiction of capitalism's cycles of creation and destruction need to be modified to reflect goods and services as contexts that do not cause, but enable, the invention and introduction of the next good or service. Enablement is not a neoclassical

With a long decline in manufacturing profitability partly due to the income distribution system of MANAGERIAL CAPITALISM that the victors of WWII put in place in the rich economies, and partly due to the global overcapacity developed as the emerging economies of the world tried to catch up with the rich west, Anglo-American neoliberals have turned to globalize finance and data as one way to maintain economic growth as they measured economic growth with their biased GDP accounting rules that do not account for the destroyed natural and environmental resources in the process, and vitality in the face of sluggish manufacturing sector of the rich west enabled ASSET MANAGER CAPITALISM. All economic doctrines, but the anarchists, presuppose the existence of some kind of state, even minimal 'night-watchman-state'. The main flaw of the globalization efforts of ASSET MANAGER CAPITALISM in the last two decades of the 20th century was the attempts to integrate markets, particularly financial markets, on a global scale without a state. And, that has rendered life in the globalized markets more insecure, more criminal and less legitimate. It was the globally stateless, deregulated global financial structure that collapsed in 2008 ironically to be saved by all governments that the global financial system had down-sized and stripped their regulatory power.

As the 21st century developments in digital technologies enabled firms to generate and amass data, data have become increasingly central to firms to recast their relations with their employees, their customers, and competitors. A new business model has emerged, the platform, capable of extracting and controlling unimagined amounts of data, and with this development, there emerged gigantic monopolistic data owning centers. Primarily, platforms are digital infrastructures that enable two or more groups to interact. Instead of having to build a marketplace from the ground up, a platform provides the basic infrastructure to mediate between different groups. This is platforms' key advantage over traditional business models when it comes to data. A platform positions itself between users, as the medium upon which their activities take place, hence giving the platform the privileged access to record the users' activities and store and own them.

Moreover, digital platforms produce and depend on 'network effects', more users begetting more users which develop their innate inertia to monopolize. The ability to rapidly scale many platform businesses by relying on pre-existing infrastructure and low marginal costs with few limits to growth further enables monopolization. Platform owners set the rules of service and development, as they set marketplace interactions. In their intermediary positions, platforms gain not only access to more data but also control and governance over the rules of the game. Far from simply being the owners of data, these data giants are emerging to become the owners of the emerging infrastructures of societies in the future.

The monopolistic DNA of these platforms must be taken into account in any analysis of their effect on the broader economy. "Capitalism without competition is not capitalism." warn Jonathan Tepper with Denise Hearn in THE MYTH OF CAPTITALISM: MONOPOLIES AND THE DEATH OF COMPETITION [Tepper and Hearn 2019][1]. But not according to vocal defender of the monopoly form, Peter Thiel, a Silicon Valley entrepreneur and the author of ZERO TO ONE: NOTES ON STARTUPS, OR HOW TO BUILD THE FUTURE [Theil 2014][1]. Peter Theil's view is that commercial success is built in 4 strategies: building a proprietary technology; exploiting network effects; benefiting from economies of scale; and branding. The management literature calls these "strategic resources", and says they have three characteristics. They are valuable; rare; and hard to imitate. But, one strategy of successful business that Theil seems to omit is building a good organization. Labelling the competitive-economy a "relic of history" and a "trap", as ROBBER BARONS did at the turn of 20th century, he proclaims that "only one thing can allow a business to transcend that daily brute struggle for survival: monopoly profits." FACEBOOK to "bringing the world together" requires a global monopoly. Meanwhile, GOOGLE wants to organize the world's information and AMAZON wants nothing more than all the information to serve the world's consumers. Neoclassicals' economic model to explain and predict the platform world in the making is not helpful, but actually distorting.

Since platforms are grounded on the extraction of data and generation of network effects, the following broad strategies seem to have emerged from the competitive dynamics of these large platforms. Expansion of DATA EXTRACTION STRATEGIES by driving cross-subsidization of services to draw users into their network. GATEKEEPER STRATEGIES by positioning as a gatekeeper to occupy key positions within the ecosystem around a core business neither by horizontal nor vertical nor conglomerate mergers. They

are more like rhizoidal connections driven by permanent effort to place themselves in key platform positions. CONVERGENCE OF MARKETS STRATEGIES. The convergence thesis is the tendency for different platform companies to become increasingly similar as they encroach upon the same market and data areas. SILOED PLATFORM STRATEGIES by enclosing ecosystems and funneling of data extraction into siloed platforms. Their strategic choices are being installed in the 21st century ecosystems.

Ariel Ezrachi and Maurice E. Stucke in VITRUAL COMPETITION: THE PROMISE AND PERILS OF THE ALGORITHM-DRIVEN ECONOMY [The President and the Fellows of Harvard College 2016][1] warns: "Competition as we know it- the invisible hand that distributes the necessities of life- is being displaced in many industries with a digitalized hand. The latter, rather than being a natural force, is man-made, and as such is subject to manipulation. The digitalized hand gives rise to newly possible anticompetitive behaviors, for which the competition authorities are ill-equipped." [The President and the Fellows of Harvard College 2016, p.viii] "The upsurge of algorithms, BIG DATA and super-platforms will hasten the end of competition as we know it- a decline of the market system to which we have become accustomed. …. The innovations from machine learning and BIG DATA can be transformative ….. lowering entry barriers, creating new channels for expansion and entry, and ultimately stimulating competition …if companies' incentives are aligned with consumers' interests, and on their actions' collective impact on markets." [The President and the Fellows of Harvard College 2016, p.233] But, data-driven online markets do not have the built-in incentives to correct the market realities that emerged as declining upward mobility, diminishing rates of small-company creation, increasing market concentration and power, and widening wealth inequality. "Despite having one of the older antitrust laws, the United States is no longer viewed as the intellectual leader of antitrust." [The President and the Fellows of Harvard College 2016, p.248]
Continuous production may still be going strong, in fact stronger than ever thanks to industrial robots, but it has lost its excitement of the early and middle twentieth century particularly in the United States, with the emergence of ASSET MANAGER CAPITALISM. The platform company, which uses software to bring together buyers and sellers of goods and services, represents a new kind of efficiency, based less on the organization of machines and human labor than on gathering, analysis, and exchange of data. This is disruptive business process innovation. It reduces transaction costs by matching buyers and sellers with automated software.
The platform era that began in the late 1990s with AMAZON.com entered a new phase in the 21st century with the rise of search engines, smartphones, social media, networked web-based software, and a revival of artificial intelligence. In the 1990s Greenspan's monetary policies fueled Wall Street's romance with platform-based efficiency and diverted capital and talent from riskier but ultimately more broadly beneficial market creating innovation to dot.com IPOs. And transferred trillions of dollars from those that bought dot.com stocks to those that sold. Retirement funds of the rich countries that fell under Greenspan's spell were major buyers, therefore losers. The money managers of the retirement funds, however, kept their bonuses. RASPUTIN would have envied.
The continuous process innovations did not just reduce friction. In eliminating some jobs, they created many others, often more skilled and higher paid. Some believe that this phase of technology was a one-time event that will not be repeated by 21st century platform companies. Such a view is not tweeted by President Trump who has promised to bring the off-shored jobs back to his nostalgic supporters. Now, we are in the midst of the third saltation that McAfee and Brynjolfsson call it the second machine age in THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES [Brynjolfsson and McAfee 2014][1], and in MACHINE, PLATFORM, CROWD: HARNESSING OUR DIGITAL FUTURE [McAfee and Brynjolfsson 2017][1], they offer explanations of these technologies.

Nick Bostrom calls the third saltation superintelligence in SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES [Bostrom 2014][1], Max Tegmark's moniker is life:3.0 in LIFE 3.0: BEING HUMAN IN THE AGE OF ARTIFICIAL INTELLIGENCE [Tegmark 2017][1]. GOOGLE's in house technology guru Ray Kurzweil declares THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY [Kurzweil 2005][1], and also in HOW TO CREATE A MIND: THE SECRETS OF HUMAN THOUGHT REVEALED [Kurzweil 2013][1]. These writings either imply or explicitly posit the arrival of singularity when the contributions of artificial superintelligence will rise to such a level that they will be transformed into an unprecedented runaway process. This implies not only artificial intelligence surpassing any human capabilities imaginable but also coming ever closer to an instantaneous rate of physical change. Kurzweil predicted that as computer power and artificial intelligence expands to the point that it has the capacity to improve itself, computers effectively designing and creating more computers that is, the nature of humanity will irrevocably transcend our biological limitations. Kurzweil's prediction for artificial intelligence taking over is for 2045. In THE DEEP LEARNING REVOLUTION [Sejnowski 2018][1], Terrence J. Sejnowski gives us a concise history of learning algorithms that extract information from raw data; how information can be used to create knowledge; how knowledge underlies understanding; and how understanding leads to wisdom.

In 1999, Ray Kurzweil launched a hedge fund based on complex mathematical strategies called FatKat, short for FINANCIAL ACCELERATING TRANSACTIONS from Kurzweil's ADAPTIVE TECHNOLOGIES. FatKat deployed algorithms to ceaselessly comb through the market for new opportunities. The algorithms competed against one another in a Darwinian death match. The algorithms that made money survived. The weak died off. Many financial operations mandate making choices based on pre-defined rules. In performing these predefined rules as fast as possible machines were deployed. This is where the bulk of automation has taken place so far, transforming financial markets into ultra-fast hyper-connected networks for exchanging information. High-frequency trading is a prime example.

"The essential tool of econometrics is multivariate linear regression, an 18th century technology that was already mastered by GAUSS before 1794. Standard econometric models do not learn. It is hard to believe that something as complex as 21st century finance could be grasped by something as simple as inverting a covariance matrix. …. If the statistical toolbox used to model these observations is linear regression, the researcher will fail to recognize the complexity of the data, and the theories will be awfully simplistic, useless. I have no doubt in my mind, econometrics is a primary reason economics and finance have not experienced meaningful progress over the past decades ." writes Marcos Lopez De Prado in ADVANCES IN FINANCIAL MACHINE LEARNING[1] [Wiley 2018 p.15]. Discretionary portfolio managers, PMs, make investment decisions by consuming raw news and analyses, but mostly rely on their judgement or intuition rationalizing their decisions by some story. There is some story for every decision. Discretionary PMs are at a disadvantage when betting against a machine learning, ML, algorithm, but better results are possible by combining PMs with MLs in "quantamental" way.

The information theory of KURT GODEL, JOHN VON NEUMANN, ALAN TURING, and CLAUDE SHANNON tells us that human creations and communications are transmissions across a channel, whether that channel is a wire or the www measure the outcome as its "news" or surprise, defined as entropy and consummated as knowledge. Entropy is higher or lower depending on the freedom of choice of the sender. The larger the available alphabet of symbols – that is, the larger the set of possible messages – the greater the composer's choice and the higher the entropy and information of the message. Information is not order but disorder, not the predictable regularity that contains no news, but the unexpected modulation, the surprising bits.

"Information theory provides a measure of the amount of information conveyed by a message. …. This measure is based on the extent of surprise, or unexpectedness of the message to the receiver." [Lev and Gu 2016 p.42]write Baruch Lev and Feng Gu in THE END OF ACCOUNTING AND THE PATH FORWARD FOR INVESTORS AND MANAGERS [Lev and Gu 2016][1], and add "over the past 60 years, the role of corporate earnings, book values, and other key financial indicators in setting share prices diminished rapidly, and in terms of information timeliness or relevance to investors' decisions, financial report information(not just earnings and book values) is increasingly preempted by more prompt and relevant information sources." [Lev and Gu, 2016 p.50] "It is not only fraudulent information (ENRON's; WORLDCOM's) that impedes investment and growth; it's mainly the poor quality of "honest" financial reports, legitimately disclosed under the current, universally used accounting system, that seriously harms the capital allocation system and economic growth." [Lev and Gu, 2016 p.xvii] But, human creativity and surprise depend upon a matrix of regularities, from the laws of physics to the stability of money and ISAAC NEWTON was the godfather of both. Since these creations and communications can be business

plans or experiments, information theory provides the foundation for an economics driven not by equilibrium or order but by falsifiable entrepreneurial surprises. Information theory has impelled the global ascendancy of information technology. From worldwide webs of glass and light to a boom in biotech based on treating life itself as chiefly an information system, a new system of the world is transforming our lives. And, the static neoclassical economic theory is not at all helpful in understanding this transformation, actually a hindrance.

CLAUDE SHANNON's breakthrough was mapping electrical circuits to BOOLE's symbolic logic and then explaining how BOOLEAN logic could be used to create a working circuit for adding 1s and 0s. SHANNON had figured out that computers had two layers: physical [container] and logical [the code]. While SHANNON was working to fuse BOOLEAN logic onto physical circuits, TURING was testing LEIBNIZ's language translator that could represent all mathematical and scientific knowledge. Turing aimed to prove what was called the ENTSCHEIDUNGSPROBLEM, or "decision problem", that is: no algorithm can exist that determines whether an arbitrary mathematical statement is true or false. The answer would be negative.

TURING was able to prove that no algorithm exists, but as a byproduct, he formulated a mathematical model for an all-purpose computing machine. TURING figured out that a program and data it used could be stored inside a computer. TURING's universal machine intertwined the machine, the program and the data. From a mechanical standpoint, the logic that operated circuits and switches also encoded into the program and data. The container, the program, and data were part of a singular entity. Not unlike humans. We too are containers [our bodies], programs [autonomous cellular functions], and data [our DNA combined with indirect and direct sensory information]. The mind, accordingly, consists of a collection of content-specific information-processing modules adapted to past environments. This was the high point of what is called the COGNITIVE REVOLUTION.

Though it now owes much to the tragic genius of ALAN TOURING, with his extraordinary mathematical proof that reasoning could take mechanical form, that it was a form of computation, the COGNITIVE REVOLUTION actually began in 1950s with NOAM CHOMSKY. CHOMSKY argued that the universal features of human language, invariant throughout the world, plus the impossibility of a child deducing the rules of language as quickly as it does merely from the scanty examples available to it, must imply that there was something innate about language. Much later STEVEN PINKER in THE LANGUAGE INSTINCT: HOW THE MIND CREATES LANGUAGE [Pinker 1995][1] and in HOW THE MIND WORKS [Pinker 1997][1]dissected "language instinct", the notion that what the mind was equipped with was not innate data but innate ways of processing data.

The progress of digital technology is generally associated with Gordon Moore of MOORE'S LAW which state that computer processing speeds grow exponentially, doubling every 18 months or so. The one about the growth in data transmission, associated with George Gilder, is called GILDER'S LAW which state that the data transmission rates would grow 3 times faster than computer power. Data transmission speeds did grow much faster than processing speeds for few years, but then slowed to about the same pace as Moore's law. The one about the growth of usefulness of digital networks, associated with Robert Metcalf, is called METCALF'S LAW which states that the value of a network grows faster than the number of people connected to it. It grows twice as fast. The outcome is sometimes called TIPPING-POINT ECONOMICS. When the size of a thing gets past its tipping-point, it can snowball into something very big, very fast. Thus, it also explains the winner-take-all outcomes seen with on line competition among networks. The one that explains the mind bogging pace of innovation, associated with Hal Varian, is called VARIAN'S LAW which state that digital components are free while digital products are highly valuable. Innovation explodes as people try to get rich by working through the nearly infinite combinations of components in search of valuable digital products.

These LAWS help to explain why the economy in cyberspace seems to act differently than the economy in real space. METCALF'S LAW helps to explain the tendency of virtual economy to act as a winner-take-all contest. The power of networks and the eruptive pace of raw computing and transmission power are not the only thing driving the inhumanly fast pace of digitech. There is something very different about innovation in the digital world compared to the industrial world. The nature of digital innovation is quite different. It is radically faster because the nature of the underlying components is different. It is DIGITAL COMBINATORIC INNOVATION that is what Hal Varian calls it. The components are open-source software, protocols and APPLICATION PROGRAMMING INTERFACES [APIs], all free to copy.

DATAISM regards the universe to consist of data flows and the value of any phenomenon or entity to be determined by its contribution to data processing. DATAISM was born from the confluence of life sciences that came to see organisms, since the publication of CHARLES DARWIN's ON THE ORIGIN OF SPECIES, as biological algorithms and ALAN TURING's idea of TURING MACHINE. Computer scientists have learned to engineer increasingly sophisticated electronic algorithms. An algorithm is a methodical set of steps that can be used to make calculations, resolve problems and reach decisions. An algorithm is not a particular calculation, but the method followed when making the calculation.

DATAISM puts the two together pointing out that the same mathematical laws apply to both biochemical and electronic algorithms. DATAISM, eliminating the barrier between animals and machines, expects electronic algorithms to eventually decipher and outperform biochemical algorithms. According to DATAISM, MOZART's MAGIC FLUTE, stock market bubble, HIV virus are three patterns of data flow that can be analyzed using the same basic concepts and tools.

Humans are expected to distil data into information, information into knowledge, and knowledge into wisdom. But, DATAISTS believe that humans can no longer cope with the immense flows of data, hence they cannot distil data into information, let alone into knowledge or wisdom. The work of processing data should therefore be entrusted to electronic algorithms whose capacity far exceeds that of human brain. DATAISTS, skeptical of human knowledge and wisdom, prefer to put their trust in BIG DATA and computer algorithms. It was biology's embrace of DATAISM that turned the breakthrough in computer science into a possibility that may transform the very nature of life.

Not only individual organisms are seen today as data processing systems, but also entire societies such as beehives, ant hills, bacteria colonies, forests and human cities. Markets are data processing systems, as HAYEK reminded us half a century ago when he argued for its superiority over central planners. According DATAISTS, free market capitalism and state-controlled communism are not competing ideologies, ethical creeds or political institutions. They are in essence, competing data processing systems. Capitalism uses distributed processing, whereas communism relies on centralized processing. So are managerial dictatorships and market chaos.

Computers and other digital advances are doing for mental power, the ability to use our brains to understand and shape our environments, what the steam engine and its descendants did for muscle power. They are allowing us to blow past previous limitations and taking us into new territory. Daniel Dennett in FROM BACTERIA TO BACH AND BACK: THE EVOLUTION OF MINDS [Dennett 2017][1] tells the tale of human neurons, distant relatives of tiny yeast cells that are themselves distant relatives of even simpler microbes are organized in structures that are capable of astonishing feats of creativity by revisiting and extending half a century of work on the topic. Just as computers can perform complex calculations without understanding arithmetic behind it, so creatures can display finely tuned behavior without understanding why they do so. COMPETENCE WITHOUT COMREHENSION.

People do not have a special faculty of comprehension. Rather, the human mind has been enhanced by the process of cultural evolution operating on memes. Memes are behavior that can be copied. Words are a good example. Words and other memes gave humans powerful new competences in communicating, explicit representation, reflection, self-interrogation and self-monitoring. To use a computer analogy, memetic evolution provided "thinking tools"- a bit like smartphone apps – which transformed humans into comprehending intelligent designers, triggering an explosion of civilization and technologies.

Daniel Dennett expects that computers will continue to increase in competence but doubts that they will soon develop genuine comprehension, since they lack the autonomy and social practices that have nurtured comprehension in humans. The so-called super-intelligence does not succeed by deeper understanding of the games of GO, CHESS, or ATARI, to cite most fashionable examples. Super AI succeeds vastly accelerating the speed of game playing, capturing much of the possibility space of bounded and deterministic regime. Daniel Dennett worries that people may overestimate the intelligence of their artifacts and become over reliant on them and that the institutions and practices on which human comprehension depends may erode as a result. How exactly this transition will play out remains unknown. Rapid and accelerating digitalization is likely to bring economic disruptions. Orthodox neoclassical toolbox you acquired will not be much help unless,

block chain technology creates a virtual decentralized reality, platonic habitat for HOMO ECONOMICUS. Neoclassical market fundamentalists' utopia, but dystopia for others.

There have been two decisive events in the history of our planet according to James Lovelock. He wrote in NOVACENE: THE COMING AGE OF HYPERINTELLIGENCE [Lovelock 2019][1]. The first was about 3.4billion years ago when photosynthetic bacteria first appeared. Photosynthesis is the conversion of sunlight to usable energy. The second was in 1712 when Thomas Newcomen build a steam-powered pump. It burned coal and used heat produced to boil water into steam which was let into a cylinder with a movable piston. The piston rose and then cold water from a stream nearby was sprayed into the cylinder. The condensed, the pressure dropped and the piston moved back to its starting position, doing a substantial amount of work in process and clearing the mines of water. This little engine did nothing less than unleash the industrial revolution. This was the first time that any form of life on Earth had purposefully used the energy of sunlight to deliver accessible work and do so in a way that was profitable. This ensured growth and reproduction.

Though the term INDUSTRIAL REVOLUTION is accurate enough, a better name ANTHROPOCENE covers the domination of human power over the entirety of the planet for 300 years from Newcomen's installation of his steam pump until now, according to James Lovelock. ANTHROPOCENE is a new geological period when humans first began to convert stored solar energy in coal into useful work. This makes ANTHROPOCENE the second stage in the planet's processing of the power of the Sun. In the first stage the chemical process of photosynthesis enabled organisms to convert light into chemical energy. The third stage, James Lovelock calls NOVACENE, is when solar energy is converted in to information. In the NOVACENE new beings will emerge from existing artificial intelligent systems. They will think many times faster than we do and they will regard us as we now regard plants. But this will not be the cruel violent machine takeover of the planet imagined by science fiction. These hyper intelligent beings will be as dependent on the health of the planet as we are. Others refer to the third stage as the third industrial evolution.

After four billion years of organic life evolving by natural selection, science is ushering in the era of inorganic life shaped by intelligent design, and the designers are human scientists. The combination of biotechnology and AI might result in physical and mental traits that completely break free of the hominid mold. Yuval Noah Harari in HOMO DEUS: A BRIEF HISTORY OF TOMORROW [Harari 2017][1] warns. We still share most of our bodily structures, physical abilities, and mental faculties with Neanderthals and chimpanzees. Not only our hands, eyes, and brains distinctly hominid, but also are our lust, our love, our anger, and our social bonds.

3. Dialectic evolution of the internet: from global commons to monitized private enclosures and to the emergence of splinternet

In INFORMATION RULES: A STRATEGIC GUIDE TO NETWORK ECONOMY [Shapiro and Varian 1999][1], CARL SHAPIRO and HAL VARIAN popularized the term NETWORK EFFECT which came to mean that in digital world size easily begets size. Hal Varian has been described as the ADAM SMITH of the discipline of GOOGLENOMICS and the godfather of GOOGLE's advertising model.

Jack Goldsmith and Tim Wu in WHO CONTROLS THE INTERNET: ILLUSIONS OF A BORDERLESS WORLD [Oxford University Press 2008][1] tells the story of the death of the dream of self-governing cyber-communities that would escape geography forever, and also tells the story of the birth and early years of a new kind of INTERNET, a bordered network where territorial law, government power, and international relations matter as much as technological invention. As China and America wall off their respective digital markets from one another, each are looking for growth in the rest of the world. A divided world wide web or SPLINTERNET is already a reality, as China's internet grows behind a great firewall of censorship. AMAZON is promoting payment services in India. China's ALIPAY service is active in Brazil.

The INTERNET has become a new kind of battleground for the world's great powers. No longer a single entity, the INTERNET is becoming a SPLINTERNET as the Unites States and China fight to control the way in which it will be run and regulated, as part of a larger rivalry to control high-growth high-tech industries. Both rivals are increasingly nationalistic, supporting their own home grown companies in an effort to win the tech cold war by ring-fencing some of their supply chains to prepare themselves for a long-term tech and trade war.

ARPANET, funded by PENTAGON, was the brainchild of Paul Baran of the RAND CORPORATION who relied on the idea called packet switching. Baran's main goal was to develop something that would survive a Soviet first strike and still transmit messages to missile bases to retaliate. Hence the decentralized nature of the network. The INTERNET is more than packet switching. It requires computers, communications, all sorts of software and other protocols, many of which the government-funded research projects bought from the private sector. The ARPANET was effectively privatized in the 1990s.

Paul Baran for packet switching, Vint Cerf for writing TCP/IP protocols that proved crucial in allowing different programs to run on the INTERNET, and Sir Tim Berners Lee for developing the worldwide web were instrumental in the emergence of an open means of connecting computers to each other so that people could see what was on other nodes than their own hard drive.

To understand the internet's recent history, it helps to keep in mind that like most digital systems, it is designed in layers. At the bottom are all the protocols that allow different sorts of networks and devices to exchange information, or INTERNETWORK; hence INTERNET. At that level, it is still largely decentralized. No single company controls these protocols, although the number of firms providing internet access has dropped sharply. The INTERNET's base was designed to move data around and publish information, so its protocols did not record what had been transmitted previously by whom.

The INTERNET was built without memory. The INTERNET's arrival seemed to herald a new way of ordering human affairs that would free us from the tyranny of territorial rule. Self-governing cyber-communities would escape geography forever. It was to rely in open source, peer-to-peer networking. The INTERNET was created by, and continues to be shaped by, decentralized groups of scientists and programmers and hobbyists freely sharing the fruits of their intellectual labor with the world. OPEN-SOURCE collaborative network created a very large portion of the lines of code on which the INTERNET depends, and not just the INTERNET, but smartphones, stock markets, and airplanes. But the last decade has shown that national governments have an array of techniques for controlling offshore INTERNET communications, thus enforcing their laws, by exercising coercion within their borders. INTERNET is splitting apart and becoming bordered. Far from flattening the world, the INTERNET, its language, its content, its norms, is conforming to local conditions.

The result is an INTERNET that differs among nations and regions that are increasingly separated by walls of bandwidth, language, and filters. This bordered INTERNET reflects top-down pressures from governments that are imposing national laws on the INTERNET within their borders. It also reflects bottom-up pressures from individuals in different places who demand an INTERNET that corresponds to local preferences, and from the web page operators and other content providers who shape the INTERNET experience to satisfy these demands.

The INTERNET's design was not the result of some grand theory or vision that emerged fully formed. Rather, open design of the INTERNET was necessitated by the particularities of the specific engineering challenges. The INTERNET's creators, mainly academics operating within and outside the government, lacked the power or ambition to create an information empire. They faced a world in which the wires were owned by AT&T and computing power was a patchwork of fiefdoms centered on the mainframe computers, each with idiosyncratic protocols and systems.

INTERNET works over an infrastructure that does not belong to those using it. The owner is always someone else, and in the 1970s, it was generally AT&T in the United States. It was designed to link human brains, but it had no control over their activities than that. Egalitarianism born of necessity would persist as the network grew over decades to include everyone.

The concept of ENCAPSULATION was how a network interconnected with other networks. It means wrapping information from local networks in an envelope that INTERNETWORK could recognize and direct. In what would come to be known as TRANSMISSION CONTROL PROTOCOL [TCP] created a standard for the size and flow rate of data packets, thereby furnishing computer users with a LINGUA FRANCO [ESPERANTO] that could work among all networks. As a practical matter, this innovation would allow the INTERNET to run on any infrastructure, and carry any application, it packets traveling any type of wire or radio broadcast, even those owned by an entity as given to strict controls as AT&T.

It was an electronic information network independent of the physical infrastructure over which it ran. The invention of ENCAPSULATION permitted the layered structure of the INTERNET, whereby communications functions are segregated allowing the network to negotiate the differing technical standards of various devices, media, and applications. This was also born of necessity to link different types of networks by inventing a protocol that took account of the existence of many networks over which the creators had limited power.

TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL [TCP/IP] and other aspects of the INTERNET's architecture rested on the founders' beliefs about networks. In technical jargon, they created a network with OPEN ARCHITECTURE, or END-TO-END DESIGN. In non-technical terms, the founders embraced a design that distrusted centralized control. In effect, they built strains of American liberalism, and even 1960s idealism, into the universal language of INTERNET. The INTERNET's design was open, minimalist and neutral. It was open, because it was willing to accept almost any kind of computer network to join in one universal network-of-networks. It was minimalist, because it required very little of the computers that wanted to join in. Finally, it was neutral between applications.

The concept of network neutrality grew out of the END-TO-END DESIGN structure of the INTERNET, which favored the users rather than the network providers. While users pay for INTERNET connection, and the price they pay can depend on the speed or quality provided by their INTERNET service provider, once connected, their transmitted packets are treated the same way everyone else's by the network providers. Network providers are trying to secure control of information exchanged over the INTERNET for commercial gain. Proponents of network neutrality argue that the network should remain "stupid", thereby allowing end users to collaborate and innovate by developing their own applications. This DISTRIBUTED INTELLIGENCE that makes the INTERNET such a unique communications medium. The governments and the network providers feel differently. In 2011, Russia, Uzbekistan, Tajikistan and China submitted a proposal to the United Nations General Assembly calling for an international code of conduct for the information society. The preamble to the proposal states that "policy authority for INTERNET related public issues is the sovereign right of states." As of 2019, nations pushing for new forms of government control increased to include India, Brazil, South Africa and Saudi Arabia.

The INTERNET plays a central role in the American economy as it does in the Chinese. But there is a profound flaw in its architecture. Its software stack lacks a trust and transactions capability. Its OPEN SYSTEM INTERCONNECTIONS [OSI] model defines seven layers. While some of the layers have merged, none of the existing layers provide trust or validation or factuality or veracity of real monetary values. Perhaps, that abides well with the theoretical mainframe of the MBA programs: the money neutral neoclassical economic theory.

The original distributed INTERNET architecture sufficed when everything was "free", as the INTERNET was not a vehicle for transactions. When all it was doing was displaying WEB pages, transmitting emails, running discussions forums and news groups, and hyperlinking academic sites. The NET did not absolutely need a foundation of security. But when the INTERNET became a forum for monetary transactions, new security regimes became indispensable. The groups which developed the original protocols, the INTERNET ENGINEERING TASK FORCE and the WORLD WIDE WEB could have added security regimes to the rule book. But they did so, only belatedly. Perhaps, one reason was that many internet pioneers believed that the protocols would have been enough to prevent centralization. They were proven wrong.

To understand the contemporary INTERNET, one needs to start with STACKs which imitate hardware and transcend it in virtual threads and cores and chains. The seven-layer NETPLEX scheme of the OPEN SYSTEMS INTERCONNECTION model of the INTERNATIONAL STANDARDS ORGANIZATION consists of a hierarchical stack in which lower functions are controlled by higher functions. At the bottom is the physical layer, the fiber-optic lines, microwave oscillators, mixers, 1550 and 900-nanometer lasers, photodetectors, silicon routers, erbium-doped amplifiers, and twisted-pair telephone wires, antennas, coaxial cables – the list is endless – that carry the data packets across the network at the behest of the layers above it.

In OSI stack, above the physical layer is the DATALINK. This is the medium where hardware becomes "firmware" and software that define the electrical specifications, timing rules, and electron-photon conversions that enable the transmission of information across a link from one node or computational address to the next. SWITCHES operate at level two, passing packets only to the next node. Local area networks such as ETHERNET or WiFi function at this level. The third layer is the NETWORK layer, the domain of routers, which combines with the transport layer [layer four] to establish the end-to-end links that constitute the TPC/IP INTERNET PROTOCOLS. This is the entire system of IP addresses and TRANSPORT CONTROL PROTOCOL traffic shuffles that comprises the connections from end to end across the NET.

Layer three does the headers on the packets, the identities and addresses. Layer four does the actual transmission and reception of data packets and traffic management, load balancing and ACKS [I got it!] and NACKS [I'm still waiting] that assure connections. Layers three and four tend to be the bastion of central powers, where governments and their intelligence arms chase down domain names and addresses. Layer five governs a particular two-way communication from beginning to end, whether a video stream, a SKYPE call, a SESSION INITIATION PROTOCOL conference, a messaging exchange, an email post, or a transaction. Layers six and seven are the schemes for presentations and applications – user interfaces, windows, formats, operating systems. These are summed up in schemes of hyperlinks. The 70% of all links came to be handled through GOOGLE and FACEBOOK, major walled gardens.

The INTERNET needs a new payment method that conforms to the shape and reach of global networking and commerce. It is to obviate the constant exchange of floating currencies, more volatile than the global economy that they supposedly measure. The new system should be distributed as far as INTERNET devices are distributed: a dispersed heterarchy based on peer-to-peer links between users rather than a centralized hierarchy based on national financial institutions. It is invented and called BITCOIN BLOCKCHAIN.

On top of the existing seven layers of INTERNET infrastructure, the BITCOIN ledger builds a new layer of functionality – layer 8 – just as hypertext transfer protocol [http] builds network layer on the TRANSMISSION CONTROL PROTOCOL /INTERNET PROTOCOL [TCP/IP] network layer. This new transactions layer allows for the separation of the security and identification functions from the network. Based on new breakthroughs in information theory, security can be heterarchical rather than hierarchical – distributed on millions of provably safe devices beyond the network and unreachable from it. It is a security paradigm diametrically opposed to existing morass of passwords, usernames, PINS, personal tokens, and post-hack fixes on the network. In a BITCOIN transaction, there is no more need for the disclosure of personal information than in cash transactions.

With the ascendancy of AMAZON, APPLE and other on line emporia early in the 21st century, much of the INTERNET was occupied with transactions, and the industry retreated to the CLOUD. Abandoning the distributed INTERNET architecture, the leading Silicon Valley entrepreneurs replaced it with centralized and segmented subscription systems, such as PAYPAL, AMAZON, APPLE's iTUNES, FACEBOOK, and GOOGLE's CLOUD. UBER, Airbnb, and other UNICORNS followed. These centralized fortresses violate the COASE THEOREM OF CORPORATE REACH. "Business should internalize transactions only to the point that the costs of finding and contracting with outside parties exceed the inefficiencies incurred by the absence of real prices, internal markets, and economies of scale.", states the theorem. The industry sought safety in centralization, but centralization is not safe. It turned out to be.

Google developed the integrated model of reality combining a theory of knowledge, named BIG DATA, a technological vision, CENTRALIZED CLOUD COMPUTING, a cult of commons rooted in OPEN SOURCE software. The GOOGLE theory of knowledge, BIG DATA, is as radical as Newton's as intimidating as Newton's was liberating. Newton proposed a few relatively simple laws by which any new datum could be interpreted and the store of knowledge augmented and adjusted. Hundreds of thousands of engineers have added and are adding to the store of human knowledge by interpreting one datum at a time. John Gribbin, in DEEP SIMPLICITY: BRINGING ORDER TO CHAOS AND COMPLEXITY [Gribbin 2004][1], shows how chaos and complexity permeate the universe on every scale, governing the evolution of life and galaxies alike. Far from overturning all that has gone before, chaos and complexity are triumphant extensions of simple scientific laws.

BIG DATA's approach is different. The idea of BIG DATA is that the previous slow, clumsy, step-by-step search for knowledge by human brains can be replaced if two conditions are met. All the data in the world can be compiled in a single "place", and algorithms sufficiently comprehensive to analyze them can be written. Upholding this theory of knowledge is a theory of mind drived

from the pursuit of artificial intelligence. In this view, the brain is also fundamentally algorithmic, iteratively processing data to reach conclusions. Belying this notion of the brain are the studies of actual brains which show human brains to be much more like sensory processors than logic machines.

Iain McGilchrist argues in THE MASTER AND HIS EMISSARY: THE DIVIDED BRAIN AND THE MAKING OF THE WESTERN WORLD [McGilchrist 2010][1] that one's feelings are not reaction to, or a superposition on, one's cognitive assessment, but the reverse: the affect comes first, the thinking later. We make an intuitive assessment of the whole before any cognitive process come into play, though they will, no doubt, later be used to 'explain' and justify, our choice. We make an assessment of the whole at once, and pieces of information about specific aspects are judged in the light of the whole, rather than the other way around. The implication is that our affective judgement and our sense of the whole, depend on the right hemisphere, occur before cognitive assessment of the parts, the contribution of the left hemisphere of the brain. Marvin Minsky in THE EMOTION MACHINE: COMMONSENSE THINKING, ARTIFICIAL INTELLIGENCE, THE FUTURE OF THE HUMAN MIND [Minsky 2006][1] offers a nuanced version.

The CLOUD is the great new heavy industry of gargantuan data centers composed of immense systems of data storage and processors, linked together by millions of miles of fiber optic lines and consuming electric power and radiating heat to an extent that exceeds most industrial enterprises in history. In 2006, GOOGLE purchased ANDROID, an OPEN-SOURCE OPERATING SYSTEM that is endowing companies around the world with ability to compete with iPHONE. As ANDROID thrives, two things become apparent. The INTERNET may have ushered in a new age of sustainable open systems, but as APPLE have shown an integrated closed system monopoly remains as irresistible as ever.

The next layer up has become more concentrated, including many consumer services, from on line search to social networking. Centralization is rampant in what could be called the "third layer" of the INTERNET. All of its the extensions has spawned. APPLE's iOS or GOOGLE's ANDROID are what most people use as their smartphones' operating system. AMAZON, GOOGLE and MICROSOFT are the major competitors in cloud services outside of China. ALIBABA has a strong global lead in cloud services. In 2017 ALIBABA captured 45% of China's fledging cloud services market worth 69billion yuan [$10billion] compared to 10% for TENCENT according to BLOOMBERG. TENCET's WeChat, however, is on 4 in every 5 Chinese smartphones, and thus offers multiple products and a massive market for firms.

FACEBOOK may be the world's largest social network, but TENCENT's broad product based business model and technology is, by many measures, far superior. Less than 20% of TENCENT's revenue comes from online advertising, 98% of FACEBOOK's revenue, the other hand, is from online advertising. TENCENT has a digital assistant, XIAOWEI, a mobile payment system, TENPAY, and a cloud service, WEIYUN and also launched a movie studio, TENCENT PICTURES. In 2007, it introduced a cloud-based platform that allows companies to offer services to users in WeChat via 'mini programs' [i.e. tiny apps.]. More than 1million such 'mini programs' are used by over 200million people every day, and most of them are WeChat users. TENCENT's revenue from such mini programs, for now, is marginal, and furthermore, competitors like BYTEDANCE, are crowding what is on the offer with their 'mini programs'.

Quick success develops its own downside is a folk-wisdom. In February 2019 in America, BYTEDANCE, the parent of TikTok paid $5.7million fine for illegally collecting data on users under the age of 13, and in April an Indian court banned the app on the grounds that it abets sexual predators. BYTEDANCE's largest market outside China is in India where 2 of 5 TikTok users live. According to SOUTH CHINA MORNING POST's ABACUS, BAIDU, ALIBABA, TENCENT [BAT] hold stakes in 150 companies abroad. ALIBABA has 56 data centers overseas, according to ABACUS, and TENCENT's equity in SNAP is 17.5% and 7.5% in SPOTIFY. But in 2018, THE COMMITTEE ON FOREIGN INVESTMENT IN THE UNITED STATES, [CFIUS], blocked several Chinese firms' investments, largest being $1.2billion purchase of MoneyGram by ALIBABA's ANT FINANCIAL. In 2019, Chinese firms' investments in America fell below $5billion. It was $46billion in 2016. So far, President Trump's MAGA policies seem to be set to defer global spaghetti-like financial entanglements, not untangle them.

The data giants, AMAZON, FACEBOOK and GOOGLE, as they dominate their respective core markets, they also have accumulated more digital information than any other Western company. They use the information they store to sell targeted advertising and to fuel the development of their artificial intelligence [AI] services. At its core, GOOGLE is a list of websites and a database of people's search histories. FACEBOOK keeps track of their users' identity and interactions among them. AMAZON collects credit-card numbers and purchasing behavior.

These data giants' capacities to process, transmit and store data are growing by explosive increments. Scientists define an explosion as the injection of energy into a system at a pace that overwhelms the system's ability to adjust. This produces a local increase in pressure, and if the system is unconfined or the confinement can be broken, shock waves develop and spread outward. These explosive increments are injecting pressure into the prevailing socio-economic systems via job displacement faster than the prevailing socio-economic systems can absorb it via job replacement. The explosive potential emerges from the mismatch between the speed at which disruptive energy is injected into the system by job displacement and the socio-economic system' ability to absorb it with job creation. The displacement is driven by the eruptive pace of digital technology's application to information and communication technology. Artificial intelligence's and tele-migration's [remote intelligence's] elimination of jobs. The replacement is driven by human ingenuity which moves at the leisurely pace it always has. The radical mismatch between the speed of job displacement and the speed of job replacement has been a perennial downside of technological transformations. In the age of hyper-intelligence, the disruptions are faster. Technology produces and economic transformation, the economic transformation produces and economic and social upheaval, the upheaval produces a backlash and backlash produces a resolution according to Richard Baldwin in THE GLOBOTICS UPHEAVAL: GLOBALIZATION, ROBOTICS, AND THE FUTURE OF WORK [Baldwin 2019][1].

So far, the American data giants seem to have adopted the business model of ATTENTION MERCHANTS. They capture out attention by providing us with free information, services, and entertainment, and they then sell our attention to advertisers. The data giants seem to have far higher goals than any previous ATTENTION MERCHANTS. In 1920s, SIGMUND FREUD's nephew, EDWARD BERNAYS, realized that his uncle's psychotherapy opened up a new lucrative world of retail therapy by inventing the public relations industry. Despite being far richer than kings of old, we are too easily trapped on a treadmill of consumerism, continually searching for identity, connection and self-transformation through the things we buy. EDWARD BERNAYS's method of persuasion – tastefully named 'public relations' – transformed marketing worldwide and, over the course of the 20th century embedded consumer culture as a way of life. Drawing on his uncle's insights into the workings of the human mind convinced some women on behalf of the AMERICAN TOBACCO CORP. that cigarettes were their TORCHES OF FREEDOM.

These data giants' strategic goal is not to sell adverting, their tactical goal for now is. By capturing our attention, they manage to accumulate immense amounts of data about us, [how, when, where, why we behave] which is worth more than any advertising revenue. It is not accurate to think of GOOGLE's users as its customers. There is no economic exchange, no price, and no profit. Nor do users function in the role of workers. Users are not paid for their labor, nor do they operate the means of production. The user is not the product, but rather they are the sources of raw-material supply. GOOGLE's products are derived from data about users' behavior. Its products are about predicting users without caring what the users do or what is done to the users.

In the medium term, this data hoard opens path to a radically different business model whose victim will be the advertising industry itself. The strategic business model is based on transferring decision making from humans to algorithms, including the authority to choose and buy things. Once algorithms choose and buy things for us, the traditional advertising industry will be redundant. GOOGLE is aiming to reach a point where we can ask GOOGLE anything and get the "best answer" in the world.

In the great transformatıoın: the polıtıcal and economıc orıgıns of our lıves [Polanyi 1944, 1957][1], Karl Polanyi identified three transformations. First was branding human life as labor. Second was branding nature as real estate. Third was branding free exchanges of goods and services as money. The fourth, Shoshana Zuboff explains in the age of surveıllance capıtalısm: the fıght for a human future at the new frontıer of power [zuboff 2019][1] is "as the emerging economic order that expropriates human experience as free raw material for hidden commercial practices of extraction, prediction, and sales that subordinate production of goods and services to a new architecture of behavioral modification ." [Zuboff 2019 p.]

GOOGLE was the first in Silicon Valley to understand the concept of "behavioral surplus" in which human experience is subjugated to attention merchants' surveillance capitalism's market mechanisms and reborn as behavior. Everything one does and think on line has the potential to be monetized by platform tech firms. All human activity is potentially raw material to be commodified by the tech firms. "GOOGLE is to surveillance capitalism what the FORD MOTOR COMPANY and GENERAL MOTORS were to mass-production based MANAGERIAL CAPITALISM," Shoshana Zuboff wrote. [Zuboff 2019 p.63] Nearly everything we do can be mined by platform companies. But only if they can keep information free. That means keeping value of personal data opaque, ignoring copyrights on content by making it difficult to protect.

"Now, with the rise of the surveillance capitalism practiced by Big Tech, we ourselves are maximized for profit. .....our personal data is, for Big Tech companies and others that harvest it, the main business input. .... You are the raw material used to make the product that sells you to advertisers." writes Rana Foroohar in HOW BIG TECH BETRAYED ITS FOUNDING PRINCIPLES AND ALL OF US: DON'T BE EVIL[1]. [Foroohar, 2019 p.200]

In the longer term, by bringing together enough data and enough computing power, the data giants could hack the deepest secrets of life, and then use this knowledge not just to make choices for us or manipulate us but also to reengineer organic life and create inorganic life forms. Selling advertisements may be necessary to sustain the giants in the short term, but tech companies often evaluate apps, products, and other companies according to the data they harvest rather than according to the money they generate. The business model of a popular app may be a money loser, but as long as it sucks data, it could be worth billions. The rate of return analysis of corporate finance does not help much.

Tim Wu in THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES [Wu 2011][1] suggest that to understand the forces threatening the INTERNET as we know it, we must understand how information technologies give rise to industries and industries to monolithic structures. As with any economic theory, there are no laboratories but past experience. Illuminating the past to anticipate the future is the raison d'etre of economic history, which is conspicuously absent in MBA programs mass-marketed by American universities. Understandably so, because history, many times, negates their neoclassical mantra.

SCHUMPETER had no patience for what he deemed ADAM SMITH's fantasy of price warfare, growth through undercutting your competitor and improving the market's overall efficiency thereby. "In capitalist reality as distinguished from its textbook picture, it is not that kind of competition which counts," argued SCHUMPETER, but rather "the competition from the new commodity, the new technology, the new source of supply; the new type of organization." SCHUMPETER's THEORY did not account for the power of law to stave off industrial death and arrest the CREATIVE DISTRUCTION or help to speed up the destructive process by not regulating mergers and acquisitions.

ALPHABET, GOOGLE's holding company, in 2018 was the second largest company in the world. Measured by market capitalization, APPLE was first. Joined by AMAZON, MICROSOFT and FACEBOOK, the five form an increasingly feared global oligopoly.

In the 1970s, the microprocessor radically reduced the cost of computers. In the 1990s, OPEN SOURCE software started to dethrone WINDOWS, MICROSOFT's then dominant operating system. Richard M. Stallman of MIT's ARTIFICIAL INTELLIGENCE LABORATORY argued that software code was quickly becoming the language of communication between people, and people and things, and that it was immoral and unethical to enclose and privatize the new communications media, allowing few corporate players to determine the conditions of access while imposing rent. To keep software distributed, collaborative and free, Stallman assembled a consortium of programmers and erected an operating system called GNU made up of free software that could be accessed, used, and modified by anyone. In 1985 founded the FREE SOFTWARE FOUNDATION. GNU GENERAL PUBLIC LICENSE, unlike conventional copyrights that give the holder the right to prohibit others from reproducing, adopting, or distributing copies of an author's work, allow an author to give every person who receives a copy of a work permission to reproduce, adapt, or distribute it and require that any resulting copies or adaptations are also bound by the same licensing agreement. GPL became the vehicle for the establishment of free sharing of software. Six years after Stallman's GNU operating system and the GPL, Linus Torvalds designed a free software kernel for a Unix-like operating system for personal computers that was compatible with Stallman's GNU project and distributed it under the FREE SOFTWARE FOUNDATION's GPL. The LINUX kernel made it possible for thousands around the world to collaborate via INTERNET on improving free software code. In 1998, Eric S. Raymond and Bruce Perens created OPEN SOURCE INITIATIVE, OSI, to dampen FREE SOFTWARE MOVEMENT's fear of commercial interests.

MICROSOFT might never have come to rule PC software had IBM, accused of monopolizing mainframes, not decided in 1969 to market computers and their programs separately, a move that created the software industry. GOOGLE might not have taken off in the way it did had MICROSOFT not agreed, at the end of its antitrust trials in America and Europe in the 2000s, not to discriminate against rival browsers and to license technical information which allows other operating systems to work easily with WINDOWS.

MICROSOFT's first operating system [MS-DOS] that MICROSOFT acquired from another firm, SEATTLE COMPUTER PRODUCTS, was actually a clone of CP/M, another operating system. MICROSOFT WINDOWS was a rip-off of the APPLE MACINTOSH operating system; MICROSOFT WORD and EXCEL were copies of WORDPERFECT and LOTUS 1-2-3 respectively. By late 1990s, MICROSOFT unleashed its predatory strategy against NETSCAPE. EXPLORER was MICROSOFT's copy of NAVIGATOR, and soon NAVIGATOR was nowhere EXPLORER was everywhere. In few short years NETSCAPE was bankrupt. As Brian McCullough detailed in HOW INTERNET HAPPENED: FROM NETSCAPE TO THE IPHONE[McCullough 2018][1]. With minimal antitrust enforcement, MICROSOFT would have been in a perfect position to control the future of internet, had Department of Justice not decided to prosecute the last big antitrust case of the 20th century.

FIREFOX, a web browser made by the non-profit MOZILLA FOUNDATION, was born as 'phoenix'. It rose from the ashes of NETSCAPE NAVIGATOR, slain by MICROSOFT's INTERNET EXPLORER. In 2012, MOZILLA created FIREFOX OS, to rival APPLE's IOS and GOOGLE's ANDROID mobile operating systems. MOZILLA began life in 1998 after the "browser war" between MICROSOFT's INTERNET EXPLORER and NETSCAPE's NAVIGATOR. Even though the fight got MICROSOFT into deep trouble with completion regulators, which nearly broke it up, NETSCAPE had to capitulate. But released the NAVIGATOR's source code so that an alliance of volunteer developers could keep the browser alive. Even compared with other OPEN-SOURCE projects, MOZILLA is an unusual hybrid. It boasts a volunteer workforce of nearly 23,000 that contributes about half of the company's code in exchange for little more than recognition from their peers and the satisfaction of chipping in to a project they believe in. It is two organizations in one; the MOZILLA FOUNDATION and the MOZILLA CORPORATION that has 1,100 employees on payroll. The first is a charity which owns the second and makes sure that it does not stray away from its mission. The corporate arm is in charge of products and gets the cash that search engines pay for appearing on FIREFOX's start page. Together GOOGLE, BAIDU and YANDEX and a host of others paid $542million for the traffic they got from FIREFOX in 2017.

MOZILLA has shown that open-source approach can work in consumer software. FIREFOX was the first browser to block-up ads and allow users to surf anonymously, promoting commercial browsers to offer similar features. Unable to compete, MOZILLA killed the ill-fated mobile operating system project. Another 'phoenix' has arisen from it. KAIOS, an operating system conjured from the defunct software, powered 30million devices in 2017 and another 50millioin in 2018. Most were simple flip-phones sold in the West for about $80 a piece, or even simpler ones which Indians and Indonesians can have for as little as $20 or $7, respectively. KAIOS, based in Hong Kong, designed the software for smart-ish phones with old-fashioned number pad and long battery life, plus 4G connectivity, popular apps like FACEBOOK and features like contactless payments without snazzy touchscreens. GOOGLE invested $22million in KAIOS in 2018. Even if KAIOS powers another 70million devices in 2019, as the company expects in 2019, that would barely be one tenth of the 1.5billion APPLE and ANDROID phones sold annually.

A decade ago American firms took an early lead in 4G setting standards for new handsets and applications that spread word-wide. That dominance helped APPLE, GOOGLE, and other American businesses generating billions of dollars in revenues. China learned its lessons, investing $180billion to deploy 5G networks over the next 5 years and assigning swathes of wireless spectrum to three state providers. In America the same part of the spectrum is largely off-limits commercially because it is used by the federal government

American firms are experimenting with different parts of the spectrum that has some advantages under laboratory conditions but easily blocked by buildings and trees.

The potential consequences of the market power held by the new technology giants are greater and more pernicious than anything seen at the turn of the 20th century. Then the market power of companies like SWIFT, STANDARD OIL, AMERICAN TOBACCO, The AMERICAN SUGAR REFINING COMPANY, or US STEEL allowed them to raise the price they charged for food, steel, tobacco, sugar and oil. Now, it is about more than just the price.

The equivalent course of action now is to force today's giants to open up their data vaults, thus lowering the barriers to entry and giving newcomers a better chance to compete. Now it is the turn of data. Today online applications bundle user interface, code and data. FACEBOOK, for example, is known for its website and app, but both are just the tip of a virtual iceberg. Most of the software and all the information that keep social network going live in the firm's CLOUD. Controlling those data gives these companies power. Users are free to move to another service, but they would lose all that information, including the links to their friends.

EUROPEAN COMMISSION fined GOOGLE 4.3billion Euros on 7/18/2018 and ordered to GOOGLE to stop emulating the 1990s MICROSOFT's product strategy. To assure its market lead, instead of giving the buyers the option to choose, MICROSOFT bundled several software in tie- in contracts and offered the bundle to the buyers. GOOGLE's case involved its mobile operating system, ANDROID, and bundled related software and services, such as GOOGLE PLAY, its app store, INTERNET search and several other apps. GOOGLE, in practice, gives smart phone makers and telecoms operators an all or, nothing choice as MICROSOFT did in the 1990s. If, the makers want to install any of these programs on their devices, they have to install them all and show their icons in prominent positions. Since firms need at least the app store to make their products commercially viable, they have no choice but to comply. Furthermore, GOOGLE does not allow the phone manufacturers to install competing versions of ANDROID on any of their models.

By contrast, in WEB 3.0 interface, code and data are meant to be kept separate. This would allow power to flow back to users, who would decide which application can access their information. If they were not happy with one social network, they could easily switch to another. With such decentralized applications, [DAPPs], users could also interact directly with other users without an information-hoarding intermediary in the middle. Similar ideas have been tossed around. Decentralized services, then called "peer-to-peer" briefly flourished in the late 1990s and 2000s. They fizzed out mainly because a robust decentralized database did not exist.

Combining database and network technologies, BLOCKCHAIN is a digital peer-to-peer decentralized platform for tracking all kinds of value exchanged between people. Its name derives from the blocks of data, each one a snapshot of all transactions that have just been made in the network, which are linked together to create a chain of data blocks, adding up to a minute-by-minute record of the network's activity. Since, that record is stored on every computer in the network, it acts as a public ledger that cannot be altered, corrupted or deleted, making it a highly secure digital backbone for the future of e-commerce and transparent governance.

With the invention of BLOCKCHAIN, a ledger without a centralized administrator maintained collectively by some of its users, called "miners", who also protect the BLOCKCHAIN and keep others in check a robust decentralized system is feasible. The BLOCKCHAIN is a specialized database in the form of an immutable record of the transaction history, a digital BABYLONIAN TABLETS. Most WEB 3.0 projects comes with SMART CONTRACTS, snippets of code that encapsulate business rules which are automatically executed if certain events occur. The advanced projects focus on building the software infrastructure needed for DAPPs. BLOCKSTACK, arguably very ambitious, is seen as an operating system for such applications.

One digital currency that uses BLOCKCHAIN technology is ETHEREUM, which among its possible applications, is enabling electricity micro-grids to set up peer-to-peer trading in renewable energy. These micro-grids allow every nearby home, office or institution with a smart meter, INTERNET CONNECTION, and solar panel on its roof to hook in and sell or buy surplus electrons as they are generated, all automatically recorded in units of the digital currency. Such decentralized networks, ranging from a neighborhood block to a whole city, build community resilience against blackouts and cut long-distance energy transmission losses at the same time.

The landscape of Chinese FINTECH is dominated by two players: ANT FIANCIAL of ALIBABA, and TENCENT, best known for WeChat, its social media network. ANT was estimated to be worth $150billion in 2017, a little less than HSBS. Both firms got their start in payments. ANT FINANCIAL stems from ALIPAY created in 2004, TENPAY was launched in 2005 for QQ, TENCENT's online-messaging platform, and was later grafted into WeChat. Both have boomed by linking mobile apps with offline payments. Almost all merchants in China provide QR codes to be scanned by phone in order to pay. In 2017, ALIPAY had 54% of the mobile-payment market. It worked with more than 250 financial firms outside of China so that Chinese tourists can use it.

ANT and TENCENT are more interested in hooking users on other financial services than in payments alone. Once a user is on their platforms, mutual funds, insurance products, and virtual credit cards are accessible with a tap of a finger on smart phone. The duo's move into retail banking with TENCENT's WeBank and ANT's MyBank increased regulator's concerns for money-laundering, but also protecting the banks from FINTECH's competition.

The control structures built to ensure the ironclad hold of the founders of corporations are referred as "Key man risk", and is a big point of contention in China and abroad. China does not allow foreign entities to own sensitive assets, such as government licenses needed. These licenses are owned by Chinese individuals, often including the founders, are bundled into VARIABLE INTEREST ENTITIES. In addition, the Chinese companies listed in America have "dual class" stock structure which allows founders to own a special class of stocks with superior voting rights. JD.com, for example, ALIBABA's rival in e-commerce, has the ratio set at one share to 20 votes, enabling Richard Liu, the founder of JD.com, to control 80% of JD.com voting rights by owning less than 20% of the stock. JD.com has not convened an annual stockholders' meeting since its floatation in 2014 which is allowed under corporate governance laws of Cayman Islands where it is incorporated as most global Chinese tech champions are. Cayman Islands, one of Britain's Caribbean territories, seem to be the most favored location to incorporate for Chinese companies set to list in New York. BAIDU, for example, listed in America in 2005, and to list it incorporated in Cayman Islands, but has not held a stockholder's meeting since 2008. TENCENT of BAT is different. It has VARIABLE INTEREST ENTITIES, but one-stock-one-vote, and listed in Hong Kong in 2004.

Another first of GOOGLE in Silicon Valley was to introduce a dual-class share structure with its 2004 public offering. The two founders, PAGE and BRIN, would control the super-class B voting stock, shares that each carried 10 votes, as compared to the A class of shares, which each carried only 1 vote. The arrangement inoculated PAGE and BRIN from market and investor pressures. Subsequently, the founders imposed a tri-share structure adding a C class of zero voting rights stock. By 2017, BRIN and PAGE controlled 83% of the super-voting-class of B shares, which translated into 51% of the voting power.

When GOOGLE's leads, many Silicon Valley founders follow. By 2015, 15% of IPOs were introduced with dual-class structure, compared to 1% in 2005. In 2012 FACEBOOK's IPO with a two-tiered stock structure left MARK ZUCKERBERG in control of voting rights. The company then issued nonvoting class C shares in 2016, solidifying ZUCKERBERG's personal control over decisions. While the consequences of these share structures are being debated, absolute corporate control enabled the founders of GOOGLE and FACEBOOK to aggressively pursue acquisitions of start-ups in facial recognition, deep learning, augmented reality and more.

BRIN and PAGE at GOOGLE who do not enjoy the legitimacy of the vote, democratic oversight, or the demands of shareholder governance exercise control over their organization and presentation of the world's information, but neither do BAIDU's and ALIBABA's CEOs. ZUCKERBERG at FACEBOOK who does not enjoy the legitimacy of the vote, democratic oversight, or the demands of shareholder governance exercise control over an increasingly universal means of social connection along with the information concealed in its networks. So does JACK MA.

JACK MA, a founder of ALIBABA is a member of the Chinese Communist Party, and indirectly owns four of its five VARIABLE INTEREST ENTITIES with one of his co-founders. In 2019, when JACK MA steps down as chairman, as he said he would, all VARIABLE INTEREST ENTITIES will be transferred to two layers of holding companies, in turn owned by a broad set of ALIBABA's senior Chinese staff. JACK MA will remain a lifetime member of the ALIBABA

Partnership, which concentrates control of the company in a club of 36 senior staff. ALIBABA Partnership is empowered to appoint majority of board seats. Thus, Jack Ma will keep to have an influential role in the company's culture and ecosystem. This succession plan will unite ALIBABA's, CHAIRMAN and CEO, under DANIEL ZHANG. He has been an adroit CEO for ALIBABA since 2015. The succession plans of the founders of the Chinese tech firms who are now in their 40s and 50s, is expected to develop new challenges for global corporate governance in the next decade.

4. How to fit a fast changing world into a static theory

In 2017 the UK's ECONOMIC AND SOCIAL RESEARCH COUNCIL have let it be known that it was setting up a network of experts from different disciplines including psychology, anthropology, sociology, neuro-science, economic history, political science, biology and physics whose task it would be to revolutionize the field of economics. Eric D. Beinhocker in THE ORIGIN OF WEALTH: EVOLUTION, COMPLEXITY AND THE RADICAL REMAKING OF ECONOMICS [Beinhocker 2007][1] makes the reasons for this spirit of revolutionary zeal apparent enough. While both biological and economic systems share the core algorithm of evolution – differentiate, select, and amplify – and thus have similarities. Their realizations of evolution are in fact different and must be understood in their individual contexts. Director of the CENTER FOR COGNITIVE STUDIES, Daniel Dennett in DARWIN'S DANGEROUS IDEA: EVOLUTION AND THE MEANING OF LIFE [Dennett 1995][1] presents evolution as a general purpose algorithm for creating 'designs without a designer'.

The notion that the economy is an evolutionary system is a radical idea because it directly contradicts the mainstream paradigm of economics that portrayed the economy as a system that moves from equilibrium point to equilibrium point over time, propelled along by external shocks from technology, politics, changes in consumer tastes, and other external factors. But it is far from a new idea. Richard Nelson's and Sidney Winter's AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE [The President and Fellows of Harvard College 1982][1] was an early attempt to marry evolutionary theory to economics, and the recently developed tool of computer simulation. J. Stanley Metcalfe in EVOLUTIONARY ECONOMICS AND CREATIVE DESTRUCTION [The Graz Schumpeter Society 1988][1] integrates many of the relevant themes into a formal analytical treatment based around Fisher's Principle, a central theme in his evolutionary theory; namely that variety drives change. "What makes capitalism distinctive is the decentralized and distributed capacity for introducing new patterns of behavior; whether they be technological, organizational or social, they are the fuel which drives economic change." [The Graz Schumpeter Society 1998 p. 3] "Modern capitalism presents us with a paradox. The individual acts of creativity on which its mechanisms of change depend are remarkable for their lack of co-ordination. Yet the consequences of this immense micro creativity depend deeply upon the strong co-ordination of the fruits of that creativity by market processes. The joining together of the uncoordinated striving for innovation with the subsequent market co-ordination of the resulting activities is … the distinctive feature of the capitalist mode of change."[The Graz Schumpeter Society 1998 p.6]

Substrate-neutral algorithmic theory, with John H. Holland's landmarks ADAPTATION IN NATURAL AND ARTIFICAL SYSTEMS: AN INTRODUCTORY ANALYSIS WITH APPLICATIONS TO BIOLOGY, CONTROL AND ARTIFICIAL INTELLIGENCE [Holland 1992][1], and HIDDEN ORDER: HOW ADAPTATION BUILDS COMPLEXITY [Holland 1995][1]; John Maynard Smith's EVOLUTION AND THE THEORY OF GAMES [Smith 1982][1], and Stuart Kauffman's ORIGINS OF ORDER: SELF ORGANIZATION AND SELECTION IN EVOLUTION [Kauffman 1993][1] provided germ seeds that have flourished COMPLEXITY ECONOMICS that views the economic system as a complex adaptive system as W. Brian Arthur of SANTA FE INSTITUTE summarizes in COMPLEXITY AND THE ECONOMY [Arthur 2015][1]. Theoretical physicist Geoffrey West of SANTA FE INSTITUTE, a pioneer in the fields of complexity science, in SCALE: THE UNIVERSAL LAWS OF GROWTH, INNOVATION, SUSTAINABILITY, AND THE PACE OF LIFE IN ORGANISMS, CITIES, ECONOMIES, AND COMPANIES [West 2017][1] sums up decades of his inquiries into universal laws of scaling, not only of organisms but also cities, economies, and companies, to discern common patterns and to offer his vision of a grand unified theory of sustainability by explaining why some companies thrive while others fail, why the rate of innovation continues and why this dynamic threatens global sustainability.

Almost half a century ago, in THE ENTROPHY LAW AND THE ECONOMIC PROCESS [Georgescu-Roegen 1971][1] Nicholas Georgescu-Roegen's basic insight was that economic activity is fundamentally about order creation, and that evolution is the mechanism by which that order is created. He argued that while the biological form of the human species continues to evolve slowly, or 'endosomatically', through our genes, we are at the same time rapidly evolving 'exosomatically' through our culture. Georgescu-Roegen was not the first to make this observation. Darwin saw this as an implication of his theory, and 1960s Pierre Teilhard de Chardin in THE FUTURE OF MAN[1] developed a philosophy based on the idea of endosomatic and exosomatic evolution. Nor was Georgescu-Roegen was the only economist looking to cultural evolution for answers.

Georgescu-Roegen argued that the idea of continuous economic growth, implicit in neoclassical economics, had the same problem as a perpetual motion machine. It violates basic laws of physics. In fact, the entire mechanistic analogy was wrong. "Anyone who believes that he can draw a blueprint for the ecological salvation of the human species does not understand the law of evolution or even history – which is that of permanent struggle in continuously novel forms, not that of a predictable, controllable physico-chemical process, such as boiling an egg or launching a rocket to the moon." [Georgescu-Roegen 1971 p.] Neoclassical economic theory does not view production as physical transformation subject to biophysical limits and laws of thermodynamics. Also it shows that the force of resource scarcity is in the nature of a limiting factor, and not so easy to escape by substitution of capital for resources, as often claimed by neoclassical growth economists. He argued, but the most designers of very expensive MBA programs and their cheaper copycats ignored.

Friedrich Hayek wrote about cultural evolution in THE CONSTITUTION OF LIBERTY[1] and Kenneth E. Boulding presented his theory in ECODYNAMICS: A NEW THEORY OF SOCIETAL EVOLUTION[1]. It was Georgescu-Roegen, though who grounded his theory in science, in particular the connection between evolution and the SECOND LAW OF THERMODYNAMICS, the principle that the universe is inevitably moving from a state of low entropy to a state of high entropy. Economic systems exist in the real physical world, therefore, they must obey the same law of entropy as everything else in the universe does, was his argument. The economy is a subsystem of the Earth. The economy would have to conform to the behavior mode of the Earth. If, the economy is to take over the management of the entire ecosystem – every amoeba, every molecule, and every proton would then be allocated according to human purposes and priced accordingly. All 'externalities' would then be internalized, and nothing could any longer be external to the all-encompassing economy. All relationships in biosphere would be internalized into monetary accounts of the economy.

As the micro units of the economy – the firms, the households – operate as part of a larger system – the aggregate, the macro-economy – so does the aggregate economy operate as a part of a larger system, the natural ecosystem, The Earth. The macro-economy is an open subsystem of the ecosystem, GAIA, and is actually dependent upon GAIA, both as a source for inputs of low-entropy matter-energy and as a sink for outputs of high-entropy matter-energy. The physical exchanges crossing the boundary between system and subsystem constitute the subject matter of environmental economics. These flows need to be considered in terms of their scale or total volume relative to the ecosystem, not in terms of the price of one component of the total flow relative to another.

Economics is the problem of applying scares means to attain as many ordered values as possible within physical limits, but with care not to waste resources by satisfying lower values to the neglect of higher values. Scarcity is imposed by our environment, which is finite, non-growing., and materially closed, though open to a fixed rate of flow of solar energy. It is also subject to the laws of thermodynamics. The big ethical-economic problem is to apply our limited ultimate means to serve a hierarchy of ends ordered with reference to the ultimate end. Our ultimate means are low-entropy matter-energy – that which is required to satisfy our wants, but which we cannot produce in net terms but only use up. We have two fundamentally different sources of low entropy: the solar flow, and the terrestrial stock. They differ in their pattern of scarcity. The solar is flow-limited but stock-abundant, the terrestrial is stock-limited but temporarily flow-abundant. We can use up scarce terrestrial low entropy at a rate of our own choosing, in effect using tomorrow's fossil fuels today. But, we must wait for tomorrow to receive tomorrow's energy from the sun. We cannot 'mine' the sun. The ethical ques-

tions of balancing of interests between present and future generations in distributing terrestrial resources and massive transfers of inter-generational knowledge.

Economic definition of value had to take into account not just human labor or ownership, but also natural capital. According to Georgescu-Roegen's protégé Herman Daly, much of what is called economic growth had already become uneconomic, once loss of natural capital was taken into account. The solution was to aim for what John Stuart Mill had called a STEADY-STATE ECONOMY, one that would keep economic activity with ecological limits, conserve resources for future generations, and focus on qualitative improvements instead of aggregate growth in size, Herman Daly argued in FROM UNECONOMIC GROWTH TO STEADY-STATE ECONOMY [Daly 2014].[1] He defined STEADY-STATE "by constant stocks of people and physical wealth (artifacts) maintained at some chosen desirable level by a low rate of throughput. The throughput flow begins with depletion (followed by production and consumption) and ends with an equal amount of waste effluent or pollution. The throughput is the maintenance cost of the stock and should be minimized for any given stock size, subject to some limits stemming from the legitimate need for novelty." [Daly 2014 p.19] "The laws of thermodynamics provide a theoretical limit to the improvement of maintenance activity." [Daly 2014 p. 10] "Environmental economics, as it is taught in universities and practices in government agencies and development banks, is overwhelmingly micro-economics. The theoretical focus is on prices, and the big issue is how to internalize extended environmental crisis so as to arrive at prices that reflect full social marginal opportunity costs. Once prices are right the environmental problem is 'solved'- there is no macroeconomic dimension. … The reason is that environmental macroeconomics is an empty box lies in what Thomas Kuhn calls a 'paradigm'. And what Joseph Schumpeter more descriptively called 'pre-analysis vision'. … One might say that vision is what the 'right brain' supplies to the 'left brain' for analysis. Whatever is omitted from the pre-analytic vision cannot be recaptured by subsequent analysis'" {Daly 2014 p.39] To control use of non-renewable resources like oil, in 1973 Herman Daly proposed a cap-auction-trade system. The government would cap resource extraction, and sell the extraction rights to the highest bidder. It could thus control the rate at which sources are consumed. A STEADY-STATE ECONOMY had to be organized according to different principles than a growth economy. Free trade would only encourage a "race to the bottom" in environmental standards since capital is almost globally mobile and labor is not with visa enclosures.

Alexander Wendt in QUANTUM MIND AND SOCIAL SCIENCE: UNIFYING PHYSICAL AND SOCIAL ONTOLOGY[1][Wendt 2015] by proposing the thesis that human beings are walking wave functions, purports to describe social reality to be emergent in a quantum sense and portrays social life to be quantum mechanical and challenge the atomistic, deterministic, mechanist and objectivist classical world view. By proposing that consciousness is a macroscopic quantum mechanical phenomenon, unlike materialistic, atomistic, deterministic, mechanistic worldview of HOMO ECONOMICUS with its absolute space and time and the subject-object distinction, the Alexander Wendt's quantum consciousness hypothesis raises the issue of consciousness and its relationship to the physical world. All intentional phenomena, according to Alexander Wendt are quantum mechanical, including private thoughts and public or collective intentions like norms, culture and language.

Alexander Wendt's "QUANTUM MAN is physical but not wholly material, conscious, in superposed rather than well-defined states, subject to and also a source of non-local causation, free, purposeful, and very much alive. In short, she is a subject rather than an object, and less an agent than an agency, someone always in a state of BECOMING. Moreover, this agency is a process in and through which she is sovereign. She decides her present by how she collapses her wave function; she decides her future by projecting herself forward in time and enforcing correlations backwards, and to some extent she even decides her past, by adding to or replacing it in her particles." [Wendt 2015, p.207]

Jerome R. Busemeyer and Peter D. Bruza in QUANTUM MODELS OF COGNITION AND DECISION [Busemeyer and Bruza 2012[[1] claim that mathematical structures from quantum theory provide a better account of human thinking than traditional models, and introduce the foundations of modelling probabilistic-dynamic systems using two aspects of quantum theory. "Contextuality" to understand inference effects found with inferences and decisions made under uncertain conditions. "Quantum entanglement" to model cognitive phenomena in non-reductionist ways. They portray human decisions in a new light by employing these two quantum theory constructs by exploring the application of the probabilistic dynamic system created by quantum theory to the field of cognition and decision making. Traditional modelling in cognitive and decision sciences relied on classical probabilistic dynamic systems. Quantum theory allows them to model the cognitive system as if it was a wave moving across time over the state space until a decision is made. Once a decision is reached, and uncertainty resolved, the state becomes definitive as if the wave collapses to a point like a particle. They "argue that the wave nature of an indefinite state captures the psychological experience of conflict, ambiguity, confusion, and uncertainty; the particle nature of a definitive state captures the psychological experience of conflict resolution, decision, and certainty."[Busemeyer and Bruza 2014, p.3]

David Orrell's QUANTUM ECONOMICS: THE NEW SCIENCE OF MONEY [Orrell 2018][1]offers an alternative to the orthodox neoclassical economic theory. In mathematical finance, quantum physics-inspired methodology "offers some computational advantages over usual statistical approach, but also changes the way one thinks about financial system, from being a mechanistic system with additional randomness, to a world of overlapping alternative possibilities, in which uncertainty is intrinsic to the system rather than an extra added feature. The emerging fields of quantum cognition and quantum social science, meanwhile, take a broader inspiration from quantum mechanics to think about how human beings make decisions and interact with one another." [Orrell 2018, p.6]

Philip Mirowski in MORE HEAT THAN LIGHT: ECONOMIC AS SOCIAL PHYSICS AND PHYSICS AS NATURE'S ECONOMICS[1] [1989] portrays the progenitors of neoclassical economics trained as engineers with shallow and superficial grasp of physics who insisted that economics must become a mathematical science in order to instill some discipline and clarity of thought. "The overall thrust of the emulation of physics by economics was to discover the hidden fundamental natural determinants of value that lay behind the veil of everyday phenomena of money prices and incomes."[Mirowski 1989, p.250] Later in the 20th century, "many economists who did not know that neoclassicism was reprocessed physics felt that they could assume that money and/or income possessed a constant marginal utility [Marshal 1920, 842]. Little did they realize that they were simply completing the original physical metaphor by imposing the conservation of energy through the condition that money and utility were identical." [Mirowski 1989, p.251].

David Orrell adds "neoclassical economics is based on a NEWTONIAN picture of the economy as a mechanistic system, made up of self-interested atomistic individuals who interact only by exchanging goods and services and move the markets to a stable equilibrium thus viewing price changes as random perturbations. Money has no important role and acts primarily as an inert medium of exchange."[Orrell 2018, p.99] For the past 150 years, neoclassical economics has clung to a number of assumptions that were mostly at odds with reality. Such as the idea that the economy is a self-stabilizing machine that maximizes utility composed of atomistic units like independent NEWTONIAN particles that can be understood and predicted using deterministic laws, and the idea of rational economic man, HOMO ECONOMICUS, the atomistic unit which forms the core of neoclassical models. "Economic agents were viewed as particles, while marginal utility or disutility for a particular commodity defined as satisfaction gained from consuming one more unit or more unit of it was viewed as a force acting in a kind of commodity space." [Orrell 2018, p.177]

"A property of NEWTONIAN dynamics is that it can be expressed mathematically as a kind of optimization problem. Objects moving in a field take the path of least action, where 'action' represents a form of energy expenditure. .....Following the same script, neoclassical economists assumed that in the economy, individuals act to optimize their own utility by spending their limited resources. Economists could then make NEWTONIAN calculations about how prices would be set in a market economy, to arrive at what WILLIAM STANLEY JEVONS called a "mechanics of self-interest and utility". [Orrell 2018, p.176] David Orrell clarifies the epistemic constraints of the model in explaining economic phenomena.

In MACHINE DREAMS: ECONOMICS BECOMES A CYBORG SCIENCE [Mirowski 2002][1], Philip Mirowski discusses John Von Neumann's use of "Brouwer fixed-point theorem in economics explicitly in the context of a nonconstructive proof: basically , he showed the negation of his theorem would lead to a contradiction." [Mirowski, 2002, p.410]in his 1937 expanding economy model. In THEORY OF GAMES AND ECONOMIC BEHAVIOR [1944][1], he changed his mind about usefulness of mathematics. "By the 1950s, at least for von Neumann, the fixed-point theorem had been downgraded in significance in favor of constructive proofs for what he considered to be cent-

ral theorems of game theory. The contrast in THEORY OF GAMES AND ECONOMIC BEHAVIOR section 17.8 between the "indirect" and "direct" methods of proof of the minimax later became for von Neumann one of the main reasons to privilege the minimax over solutions such as Nash' equilibrium point: it was susceptible to constructive proof, whereas the Nash equilibrium was not." [Mirowski, 2002, p.410] "It may also contribute to an explanation of von Neumann's disdain for Nash's solution concept as "trivial": after all, he had deployed the Brouwer theorem in economics more than a decade before and had subsequently decided that it was dead end." [Mirowski 2002, p.450]

One area where HOMO ECONOMICUS played a conspicuous role "was the field of JOHN VON NEUMANN's game theory. … A key technique in game theory was BROUWER's FIXED-POINT THEOREM, which is a method for demonstrating that a system of equations, in this case representing the possible outcomes of a game, has a stable and optimal solution. GAME THEORY was initially developed for economics, but came into its own …… in developing the doctrine of MUTUALLY ASSURED DESTRUCTION [MAD]" [Orrell 2018, p.179-180]] during COLD WAR. According to MAD, rational actors can achieve a stable equilibrium if both know that starting a war will lead to instant annihilation of both sides. It is also used as an explanation of PEOPLE'S BANK OF CHINA's accumulation of high dollar reserves in 21st century. Though, the doctrine of MAD did not prevent President Trump from declaring trade wars to implement his selective protectionism.

"Whereas neoclassical economics had a lineage rooted in mechanics and therefore constructive models, the lesson derived by Arrow, Debreu, and Nash from Bourbaki was that questions of existence of equilibrium were really just demonstrations of the logical consistency of the model: there was no pressing commitment to models as a calculative device that mimicked reality. They all …. embraced fixed-point theorems … as defining their essence of equilibrium, to the neglect of whether and how it came about. In this sense they did finally cut themselves free from their origins in classical mechanics, which may go some distance in explaining how, in their own estimation, the history of their own economic tradition ceased to matter for their project.", claims Philip Mirowski. [Mirowski 2002, p.410]

HOMO ECONOMICUS also played a role in KENNETH ARROW and GERARD DEBREU's "proof that, again involved BROUWER's FIXED-POINT THEOREM, showed based on a highly idealized version of market economy, that free markets lead to an optimal 'fixed point', in which prices are set at their correct levels, and nothing can be changed without making at least one person worse off, a condition known as PARETO OPTIMALITY. But to accomplish this feat, the powers of HOMO ECONOMICUS had to be extended to include infinite computational power and the ability to devise plans for every future eventuality. The ARROW-DEBREU model seemed to provide mathematical proof of ADAM SMITH's invisible hand, SMITH's theory that free markets are inherently self-stabilizing and set prices to their optimal levels." [Orrell 2018, p.180]

The ARROW-DEBREU proof inspired the development of GENERAL EQUILIBRIUM MODELs and later DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODELs [DSGE] which are still relied on by policy makers today in spite of their failure in 2008 FINANCIAL CRISIS. "DSGE models deal in aggregates, ignore complexity, see the economy as an equilibrium system, and flatten the intricate structure of an economy down to a single uniform dimension. The name is misleading. 'Dynamic' refers only to changes to a model equilibrium over time as it adjusts to external shocks, not to any internal dynamism. 'Stochastic', meaning randomly determined, refers to random perturbations such as oil price shocks or technological developments which are treated as external effects. But these external effects come from a stable distribution and so can be estimated from past experience, and linear in the sense that small shocks have small effects and a shock twice as big as another has double the effect. "General" means that the model is supposed to include all markets, but omits derivatives and other forms of financial entanglements. The models assume that supply and demand drive prices to an equilibrium point where consumers are maximizing their utility, firms are maximizing their profits, and all markets clear." [Orrell 2018, p.222-223]

RATIONAL EXPECTATIONS HYPOTHESIS, [REH], and REAL BUSINESS CYCLE, [RBC], and a number of nominal rigidities and market imperfections are embedded into DSGE models. Most common were price and wage rigidities and various forms of consumer myopia. These allowed for temporary demand shortages, on which central bank policy could have a significant short-run impact. In accepting the REH and RBC theory as the framework for macroeconomic analysis, DSGE modelers surrendered Keynes's emphasis on uncertainty. In DSGE models, there was no uncertainty, only contingently imperfect information within known probability distributions. DSCE models have a very limited role for the existence of money, medium of exchange, and thus provides an ideal diversion from the important facts of reality.

Economic agents according to David Orrell "Instead of behaving like independent NEWTONIAN particles, as assumed in mainstream neoclassical economics, participants of economic activities are actually closely entangled and engaged in a sort of collective quantum dance. As Karen Barad puts it, "Existence is not an individual affair. Individuals do not preexist their interactions; rather, individuals emerge through and as part of their entangled intra-relating." [Orrell 2018, p.7]

We need to reorient our focus to understand human behaviors and preferences as they are, not as they find it easy to model. Most real world resource allocation decisions are made by humans whose brains include a prefrontal cortex capable of ratiocination and limbic system which is coded by evolution to act in deeply instinctive and emotional ways. Marvin Minsky, the co-founder of the ARTIFICIAL INTELLIGENCE LABORATORY of MIT, in THE EMOTION MACHINE: COMMONSENSE THINKING, ARTIFICIAL INTELLIGENCE, AND FUTURE OF THE HUMAN MIND [Minsky 2006][1] shows the way how the human cognitive system can be studied to develop artificial intelligence to aid in improving resource allocation decisions as more and more such decisions are being assigned to be made by artificial intelligence [AI] enabled machines. And in THE SOCIETY OF MIND [Minsky 1986][1], he claims that what we call 'intelligence' is not a singular thing; rather, it is an emergent phenomenon that arises from collective interactions of many individual parts. The magic of intelligence is that when those parts are organized in a particular way, they can do things that no individual part could do on its own. Marvin Minsky called this description of intelligence 'the society of mind'.

Iain McGilchrist in THE MASTER AND HIS EMISSARY: THE DIVIDED BRAIN AND THE MAKING OF THE WESTERN WORLD [McGilchrist 2010][1] suggest that attention is not just another function alongside other cognitive functions. Rather, the kind of attention we bring to bear on the world actually alters the nature of the world we attend to. Attention changes what kind of a thing comes into being for us. In that way it changes the world. This transformative or world-changing aspect of attention can be seen in every form of relationship we encounter and experience. Adjusting our mode of attention can have far-reaching and profound effects, and one might call this striking ability 'the attention effect'. As a remarkable a phenomenon in its way as recognition in quantum mechanics of how the act of observation alters what is being observed. This is because, 'I am my attention, everything else is given, is not mine.'

This unique role of attention has also been recognized in the new digital technologies of the modern 'attention economy', in which the human gaze is increasingly being monetarized and mined as a resource, again pointing to its central position in the landscape of the 21st century. The free service producers of Silicon Valley compete to capture our attention and emotional engagement and monetarize them to generate the cash flow necessary for their survival. The internet scene in China is different. The major source of their cash flow is not from advertising.

The objective of science is said to be not to pander to human preconceptions but to reduce our ignorance and folly. Cognitive science, in Nick Bostrom's SUPERINTELLIGENCE: PATHS, DANGERS, STRATEGIES [Bostrom 2016][1], and in Max Tegmark's LIFE 3.0: BEING HUMAN IN THE AGE OF ARTIFICIAL INTELLIGENCE [Tedgmark 2013][1] is at the threshold of a breakthrough in artificial intelligence that may change how allocative decisions are to be made. In THE DEEP LEARNING REVOLUTION[Terrence and Sejnowski, 2018][1], Terrence J. Sejnowski shows how learning algorithms extract information from raw data; how information can be used to create knowledge; how knowledge underlies understanding; and how understanding leads to wisdom. Ray Kurzweil in THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY [Kurzweil 2005][1] and in HOW TO CREATE A MIND: THE SECRET OF HUMAN THOUGHT REVEALED [Kurzweil 2012][1] explain why and how.

The singularity or artificial superintelligence involves computers whose ability to understand and manipulate the world dwarfs our own, comparable to the intelligence gap between human being and, say, earth worms; developing utopians and dystopians. The utopians, Ray Kurzweil, GOOGLE's guru in residence for example, envisions a radical future in which humans and machines fully merge to expand our consciousness and conquer mortality. Other utopians see artıfıcıal general ıntellıgence enabling us in decoding the

mysteries of the physical universe, understanding the universe at levels that humans cannot conceive of, and solving intractable problems. Dystopians disagree.

Algorithms increasingly make choices for us. More and more, these algorithms work by learning from the trails of data we leave in our newly digital world. Machine learning is the automation of discovery. It enables intelligent robots and computes to program themselves. The scientific method on steroids. In THE MASTER ALGORITHM: HOW THE QUEST FOR THE ULTIMATE LEARNING MACHINE WILL REMAKE OUR WORD [Domingos 2015][1], Pedro Domingos outlines each one of the machine learning' five major schools of thought -SYMBOLISTS, CONNECTIONISTS, EVOLUTIONISTS, BAYESIANS, and ANALOGIZERS- has its own master algorithm, a general purpose learner that you can in principle use to discover knowledge from data in any domain. The SYMBOLISTS' master algorithm is inverse deduction, the CONNECTIONISTS' is backpropagation, the EVOLUTIONISTS' is genetic programming, the BAYESIANS' is Bayesian inference, and the ANALOGIZERS' is the support vector machine. At its core machine learning is about prediction. Predicting what we want, the result of our actions, and how we achieve our goals from digital metadata. Neoclassical economics belong to the SYMBOLISTS' tribe.

Connectionism is about building computer networks that can learn. It is founded on "hebbian correlation" and "error back-propagation". Donald Hebb in THE ORGANIZATION OF BEHAVIOR: A NEUROPSYCHOLOGICAL THEORY [Wiley 1949][1] in 1949 stated that "when an axon of cell A is near enough to excite cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency as one of the cells firing B, is increased." In other words, learning consists of strengthening connections that are frequently in use. Unlike behaviorists that insist the black box must remain closed, Hebb was interested in finding what changed in the black box, the brain, and guessed correctly that it was the strength of the synapse.

A few years after Hebb's insight Frank Rosenblatt built a computer program called PERCEPTRON, which consisted of two layers of "nodes" switches, the connections between which could be varied. Its job was to vary the strengths of connections until its output had the "correct" pattern. When 30 years later a third layer of nodes was added between the output and the input layers, the connectionist network began to take on properties of primitive learning machine, especially after being taught "error back-propagation". "Error back-propagation" means adjusting the strengths of connections between the units in the hidden layer and the output layer where the output was in error, and the adjusting the strengths in the previous connections, propagating the error-correction back up the machine.

It is time to explain the financial markets as they actually operate, not as, SYMBOLISTS, neoclassical economists assume them to operate, observing the way in which information is processed, observing the serial correlations, bonanzas, and sudden stops, not assuming these away as noise around the edges of efficient and rational markets. We need to present the world as is, not the world as neoclassical economists have assumed to make their mathematics easy. Economic history matters. We need to study the history of financial crashes as well as the theories and mathematics that failed to forecast them, but were required to formalize them.

At various stages in history the lust for easy riches has spread out from the afflicted few to consume the whole classes of society. This happened in Amsterdam in the 17th century when the road to riches was apparently strewn with tulips. In London in the 18th century when it was not so much a road as a seaway to the South Seas. In London again in the 19th century when it was railroad. In New York in the early 20th century when it was indeed a road, a railroad, and an airway combined, and in the late 20th century when it was the information superhighway.

All of these were 'bubbles', a period of rapidly rising equity prices in a particular sector that were unfounded and thus liable to collapse equally rapidly. Carlota Perez's TECHNOLOGICAL REVOLUTIONS AND FINANCIAL CAPITAL: THE DYNAMICS OF BUBBLES AND GOLDEN AGES [Perez 2002][1] makes the provocative claim that major epochal changes in how the economy uses technology happen periodically and evolve first of all an interval of hype and speculation, both intellectual and financial, followed by a crisis and then a long period of deployment. Perez demonstrates that big changes in technology entailed not just the extraordinarily rapid growth of few industries, but a "techno-economic paradigm shift". Alan Greenspan in 1990s used the expression several times to explain his monetary policies that enabled the dot.com bubble to Congress.

There is an observable pattern to economic booms and busts. They start with an anticipated exciting change in the economy. Managers and investors with the help of spin doctors collectively create a story about it, which initially begins as a plausible explanation, then morphs into an extrapolation, and then into an exaggeration. Eventually the data contradict the narrative, as optimism turn into pessimism boom turns into bust, and a bout of austerity follows. A rout in platform companies' stock prices since August 2018 has led many to ask if the tech industry is experiencing the classic sequence of Greek drama: HUBRIS, ATE and NEMESIS for the second time in two decades. First, in the second half of the 1990s ending in March 2000, and the second, since September 2018. De ja vu. The level of hype was particularly high, a consequence of ubiquity of data on the internet and some of the numbers were decidedly soft. However, the reactions of the ECB and Fed were not. In 2019, they cut interest rates and engaged in QE.

Brenda Spotton Visano in FINANCIAL CRISES: SOCIO-ECONOMIC CAUSES AND INSTITUTIONAL CONTEXT [Visano 2006][1] explains financial crises by identifying the roles of credit, technology and institutions played in the historical evolution of capitalism. Innovation drives the evolution of the capitalist system and the culture that is engendered ensures change will be perpetual. Innovation induced social and economic changes are profound and profoundly uncertain. An innovation's potential to offer material advance is fundamentally uncertain and dependent, in part, on the collective assessment of that potential.

Few years before the 2007-2008 FINANCIAL CRISIS triggered by some Americans in some parts of the United States defaulting in paying their mortgages, Brenda Spotton Visano concluded that the more revolutionary the innovation, the greater is the potential for a speculative enthusiasm to become widespread among the population. The more accessible the means by which one may speculate, the greater will be the intensity of the speculation in a given revolutionary innovation. The manner in which credit may either be extended to support and promote the prior speculation or contracted so as to facilitate the transmission of the distress depends critically on the level of development of the financial structure and the nature of the particular financial instruments and enterprises that comprise that structure. The longer the process of diffusing the revolutionary innovation, the more fragile the environment becomes. It is the manner in which these periods of major transitions, financial institutions enable the most spectacular of speculations.

Rarely in stock market history have so many investors made so much money from so few stocks going up for so long. Some 37% of the rise in the value of all firms in the S&P500 index since 2013 is explained by 6 of its members: ALPHABET, AMAZON, APPLE, FACEBOOK, MICROSOFT and NETFLIX. About 28% of the rise in Chinese equities over the same period is owing to 2 firms: ALIBABA and TENCENT. The median drop in value of those eight firms has been 21% in September and October 2018, double the decline in global stock markets. Some $900billion have vaporized by the end of October 2018. WALMART paid $16billion to buy 77% of FLIPKART, an Indian e-commerce firm which in November 2018 is expected to lose $1billion in 2019 and more thereafter before the market rout which according to TV talk-heads are caused by a rise in global real interest rates, but also by decelerating growth, falling profit forecasts as a result, and rising capital intensity. Total investment for the 8 firms was $180billion a year between 2013 and 2018. Only one of the 8 firms needed capital markets to finance itself, NETFLIX.

We need to ask questions about objectives of economic activity. In defining the objectives of economic activity, the instrumental conventional wisdom, which have dominated the policy implementations of neoclassical economists for several decades, has simply assumed that maximizing growth in per capita GDP is an axiomatically desirable objective, and that inequality is justified because it helps maximize growth. Something is fundamentally wrong with the way economic performance and social progress is assessed. GDP estimates do not account for resource depletion and environmental degradation. GDP optimistically describes what is happening to total economic production and to the income generated from this production, whether this income accrues to a few people or many, to residents or to foreigners, to households or to firms. GDP could go up without a vast majority's income improvement. The single number GDP does not adequately summarize what people are experiencing argue Joseph E. Stiglitz, Jean-Paul Fitoussi, and Martin Durand in MEASURING WHAT COUNTS: THE GLOBAL MOVEMENT FOR WELL-BEING, THE MOVEMENT FOR NEW METRICS, BEYOND GDP[1] [OECD and Stiglitz 2019], and state: "We needed a dashboard if we wanted to reflect the many dimensions of success or deprivation -

including inequality, economic insecurity, and sustainability." [OECD and Stiglitz 2019 p.xvi]

Many circumstances conspire to extinguish scientific discoveries, especially those that cause discomfort about culture's sacred norms. As species, we cling to the familiar, comforting conformities of the mainstream. Deep inquiry into the objectives of economic activity and into the links between economic variables, such as income, and fundamental objectives, such as sustainability of human well-being in its universe, GAIA, the living Earth, is essential to good economics for our survival, no matter how difficult.

There is compelling evidence that the biological and physical components of our planet are part of a single network that operates in a self-regulating way to maintain conditions that are broadly suitable for the existence of life, but that undergoes fluctuations on all scales, including ice age-interglacial rhythms and mass extinctions, analogous to the fluctuations that occur in self-organizing systems on the edge of chaos. GAIA theory is a way of studying structuring matter at a molecular scale by slotting each atom into its needful place. It is a way of understanding flows of energy on every scale from that of the smallest living cell to that of the whole living planet. It an approach of understanding of growing order and surprise in a universe that its physical respects tend towards entropic stagnation. Life is Earth's entropy reduction process.

The concept GAIA postulates the idea that the Earth is alive. Aspects of the atmospheric gases and surface rocks and water are regulated by the growth, death, metabolism, and other activities of living organisms. The entire planetary air system is "metastable", stable in its reactive instability. The persistence of chemical reactivity arises from the combined actions of living beings. The entire planetary surface, not just the living bodies but the atmosphere that we think of as an inert background, is so far from chemical equilibrium that the entire planetary surface is best regarded as alive. The Earth is a single, mega-living system. Symbiosis is simply the living together in physical contact of organisms of different species. Partners in symbiosis, fellow symbionts abide in the same place at the same time, literally touching each other or even inside each other. A nuanced view of universe, not akin to neoclassical economists'.

Lynn Margulis explains that view in SYMBIOTIC PLANET: A NEW LOOK AT EVOLUTION [Margulis 1998][1]. She shows that symbiotic origins of novel life forms, symbio-genesis, has been far more common than ever dreamt by evolutionary biologists steeped in the DARWINIAN tradition. A tradition that emphasizes competition far more than cooperation in the evolutionary process. Orthodox economists' overemphasis of atomistic competition empowered by AI and algorithms of digital platforms can in fact lead to wasted efforts,
missed opportunities, and above all an inability to break out of established patterns argues Edward Tenner in THE EFFICIENCY PARADOX: WHAT BIG DATA CAN'T DO [Tenner 2018][1].

More and more of what we choose to spend our money on is itself some form of knowledge. More and more of things we wish to buy are not things, they are not "things" at all. They are intangible; that is to say, strictly speaking, they are neither a good nor a service. They are non-things, products of human mind, not manufactures but MENTEFACTURES. Examples include computer software, medical treatments, films, recorded music. We have reached a stage where knowledge produces knowledge. The knowledge components of consumption goods possess some striking characteristics. The same characteristics as knowledge applied to the production process. They occupy no physical space and have no weight. Consequently, they take up no real resources whatsoever. If I consume more I do not reduce the quantity available for you to consume. Infinite expansibility. Whether a film is seen by 200 or 2,000,000 or more people has no effect on its cost of production. Orthodox economists' quandary.

Jeremy Rivkin in THE ZERO MARGINAL COST SOCIETY: THE INTERNET OF THINGS, THE COLLABORATIVE COMMONS, AND THE ECLIPSE OF CAPITALISM [Rifkin 2015][1] heralds "zero marginal cost society" where the price of every incremental good and service, from search to software, from news to energy, will plunge towards "free" as every device and entity in the world is subsumed in an INTERNET OF THINGS where exponential network effects yield a new economy of leisure and abundance. These MENTEFACTURES have four economic properties. Scalability; sunkeness; spillovers; and synergies. These properties can exist with tangible assets also, but intangibles exhibit them to a greater degree. THE FINANCIAL CRASH OF 2008, in the long sweep of history, may prove as a radical turning point as the 1929 crisis of free market capitalism, FINANCIAL CAPITALISM, that in the 1930s gave birth to MANAGERIAL CAPITALISM, and the crisis of managerial capitalism in the 1960s and 1970s that evolved to ASSET MANAGER CAPITALISM from 1980s to 2008. The GREAT DEPRESSION of the 1930s led to a regime devoted to the maintenance of full employment. The GREAT INFLATION of the 1970s led to the maintenance of low inflation. The GREAT ILLUSION of the 1990s, some claim, will lead to a regime devoted to the maintenance of financial stability. So far in October 2018 according to elegant Christine Laggard of IMF, in President Trump's America evidence is supportive of increased risks of financial instability.

For more than 50 years, the dominant strain of academic economics has been concerned with exploring, through complex mathematics, how economically rational human beings interact in markets. The conclusions reached have appeared optimistic, indeed at times PANGLOSSIAN. KENNETH ARROW and GERARD DEBREU illustrated that a competitive market economy with a fully complete set of markets was Pareto-efficient. Neoclassical economist, ROBERT LUCAS, argued that if human beings are not only rational in their preferences and choices but also in their expectations, the macro economy will have a strong tendency toward equilibrium, with sustained involuntary unemployment, a non-problem. RATIONAL EXPECTATIONS THEORY.

Neoclassical economics have developed models of firms behaving as monopolies, duopolies, and perfect competitors, but in the realm of few firms their modeling and predictions run into difficulty. Mainly, because in modeling, they assume economic agents to be hyper-rational and well informed, time to be instantaneous, and place nonexistent, economic agents to be represented by a single prototype, and are left isolated seeking equilibrium in a system fraught with change. The message of neoclassical economics is that is humans can just behave rationally enough, and if we possess enough information, then the economy will be revealed as a universe of clockwork predictability. Even the uncertainty of neoclassical economics is of the well-behaved kind. The dream of clockwork universe ended for science in the 20th century, and is to end for economics in the 21st. The economy is too complex, too nonlinear, too dynamic, and too sensitive to the twists and turns of chance to be amenable to prediction over anything but very shortest of terms.

The EFFICIENT MARKET HYPOTHESIS appeared to illustrate that liquid financial markets are driven not by the patterns of chartist phantasy but by efficient processing of all available information, making the actual price of a security a good estimate of its intrinsic value. Economists therefore provided arguments for the proposition that totally free markets achieved the objective of allocative efficiency. And they also argued that allocative efficiency and income growth over time were desirable objectives, and that increased income delivered increased utility, which they equated with life satisfaction. This was in part because any deeper inquiry into the relationship between income and welfare or happiness would have interfered with mathematical precision, which required a precisely defined maximand. Regrettably, as a description of neoclassical academic economics, this may be construed as simplification.

Overhauling the way economics is taught is to produce students better equipped to understand the modern world if that is the goal. Even better, it should improve the discipline's ability to describe and predict the economic reality.

The economic crisis is also a crisis for economic theory. Most analyses of the evolution of the 2008 crisis invoke three themes – contagion, networks, and trust – yet none of these play a major role in orthodox economic theory, argues Alan Kirman in COMPLEX ECONOMICS: INDIVIDUAL AND COLLECTIVE RATIONALITY [Kirman 2011][1]. The economy and the financial sector had organized itself into a highly interdependent system. Paradoxically, the excessive interlocking of the components and the heavy trading of the derivatives actually concealed information rather than revealed it. Thus, the system organized its own self destruction, leading to a radical change in the aggregate situation. This is interaction and interdependence and breakdown of relations of trust which had emerged and not one of an external shock to a stable market. The direct interaction between individuals, firms, and banks does not simply produce imperfections in the functioning of the economy but is the very basis of the functioning of a modern economy.

The economy needs to be considered as a complex adaptive system in which the agents constantly react to each other. We are familiar from statistical physics and biology for example, the behavior of the aggregate cannot be deduced from the behavior of the average or "representative" agent. Just as the organized activity of an ants' nest cannot be understood from the behavior

of a "representative ant". All ants are endowed with COMPETENCE WITHOUT COMPREHENSION. The macroeconomic phenomena should not be deduced from the representative individual and the representative firm. Furthermore, the representative firms are managed by people endowed with "comprehension".

The neoclassical economic theory considers each "representative agent" in isolation, but "representative agent's" fitness is a complex function of all "representative agents". If "representative agents" are independent, the relative frequencies of their variants rapidly converge to the maximum fitness point and remain in equilibrium thereafter. But if "representative agents" interact, evolution – the search for maximum fitness – is vastly more complex. Echoing Fred Hoyle's observations in THE INTELLIGENT UNIVERSE: A NEW VIEW OF CREATION AND EVOLUTION [Hoyle 1988][1], the universe is "an inextricable loop where everything exists at the courtesy of everything else". For instance, if electrons were much lighter, there would be no stable stars, and if they were much heavier, there could be no ordered structures such as crystals and DNA molecules. If protons were 0.2% heavier, they would decay into neutrons unable to hold electrons, so there would be no atoms. If they were instead much lighter, then neutrons inside of atoms would decay into protons, so there would be no stable atoms except hydrogen.

Econometrics is the application of classical statistical methods to economic and financial series. The essential tool of econometrics is multivariate linear regression, an 18th century technology that was mastered by GAUSS before 1794. Standard econometric models do not learn. It is hard to believe that something as complex as 21st century finance could be grasped by something as simple as inverting covariance matrix. Every empirical science must build theories on observation. If the statistical toolbox used to model these observations is linear regression, the researcher will fail to recognize the complexity of data, and the theories will be simplistic, not very useful. It seems econometrics was an important reason economics and finance have not experienced meaningful progress over the past decades. Marcos Lopez De Prado in ADVANCES IN FINANCIAL MACHINE LEARNING [Wiley 2018][1] shows the epistemological difference and strengths of machine learning over discretionary portfolio managers.

Discretionary portfolio managers make investment decisions that do not follow a particular theory or rational, if there were one, they would be systematic discretionary portfolio managers. They consume raw news and analyses, but mostly rely on their judgement or intuition. They may rationalize those decisions based on some story, but there is always a story for every decision. Because nobody fully understands the logic behind their bets, investment firms ask them to work independently from one another, in silos, to ensure diversification.

JOSEPH SCHUMPETER believed that speculative manias often occur with the inception of a new industry or technology, when people overestimate the gains and underestimate the effects that the attraction of new capital will have in depressing returns. CHARLES KINDLEBERGER, in MANIAS, PANICS AND CRASHES: A HISTORY OF FINANCIAL CRISES [Kindleberger 2005][1], suggested something similar. The first stage is displacement, which excites speculative interest. This is followed by positive feedback, as rising stock prices attract new investors who then drive prices up further. The final stage is euphoria, when investors take leave of their senses.

In JOSEPH SCHUMPETER's writings, the economy evolves by cracks and leaps. Booms and busts are endemic, and are to be welcome as the result of the economy's life force. Similarly, he excoriated the orthodox economist's emphasis on the benefits of perfect competition and even thought that monopoly could be beneficial as a spur to innovation. Physicists call a sudden change in the character of a system a phase transition. In random networks, the phase transition from small clusters to giant clusters happens at a specific point, when the ratio of segments of edges to nodes exceeds the value of 1. One can think of the ratio of one edge to one node as the 'tipping point' where a random network suddenly goes from being sparsely connected to densely connected. THE S-CURVE is the shape of phase transitions of all kinds, the shape of creative destruction, ice melting, the spread of new technologies, paradigm shifts in science, the fall of empires. THE TIPPING POINT could well be entitled the S-CURVE. Many phenomena we think of as linear are in fact S-CURVES, because nothing can grow without limit. Because of relativity, and contra NEWTON, acceleration does not increase linearly with force, but follows an S-CURVE centered at zero.

S-shaped functions describe many natural growth processes as well as the adoption and diffusion of innovations, be they new industrial techniques or new consumer items. Initially slow growth accelerates at the J-BEND and if it is followed by a rapid ascent whose rate of increase eventually slows down, forming the second bend that is followed by a slowing ascent as the growth becomes minimal and the total approaches the highest achievable limit of a specific parameter or a complete saturation of use or ownership. By far the best known, and the most often used function of the S-SHAPEDss trajectory is the one expressing logistic growth. Unlike with exponential unbounded growth, whose rate of increase is proportional to the growing quantity, relative increments of logistic, limited, growth decrease as the growing quantity approaches its maximum possible level that in ecological studies is commonly called carrying capacity.

5. Not so representatıve agents ın theır ever changıng dıverse envıronments

The contemporary American business corporation, though legally a creature of the state from which it derives its charter, has a substantial but somewhat indefinite sphere of autonomy and privacy. In the United States it is known as "corporate personhood". The American legal system considers a corporation to be an individual in many ways, bizarrely one that is psychopathic in the sense of having no conscience and being solely interested in profits. Its defining features are limited liability and profit maximization. The corporation is therefore a tool for generating wealth while limiting responsibility.

The first SUPREME COURT case on the rights of corporations was decided in 1809, a half a century before the first comparable cases on the rights of African Americans or women. The SUPREME COURT heard its first case explicitly addressing the constitutional rights of African Americans, DRED SCOTT v. STANFORD, in 1857. The court held that African Americans had "no rights which white man was bound to respect". The first women's rights case, BRADWELL v. ILLINOIS, on whether women had a right to practice law, was heard in 1893, and the court ruled against the woman. The first corporate rights case was brought to the SUPREME COURT by the first BANK OF THE UNITED STATES, the brainchild of Alexander Hamilton chartered by the first CONGRESS in 1791. It pitted the legacies of two founding fathers, Alexander Hamilton and Thomas Jefferson. Their conflict spilled over into the struggle over constitutional protections for corporations. HAMILTONIANS were CORPORATIONALISTS, proponents of corporate enterprise who advocated for expansive constitutional rights for business. JEFFERSONIANS were POPULISTS, opponents of corporate power who sought to limit corporate rights in the name of the people.

Adam Winkler in WE THE CORPORATONS: HOW AMERICAN BUSINESSES WON THEIR CIVIL RIGHTS [Winkler 2018][1] summarizes how corporations used test cases, and novel legal claims made in a purposeful effort to reshape the law reveals the enormous influence corporations had on the birth of American democracy and on the shape of the CONSTITUTION itself. He shows how America's most powerful corporations won fundamental rights and turned the CONSTITUTION into a weapon to impede the regulation of big business.

The notion that corporations should devote themselves to maximizing profits is often to be the bed rock principles of corporate law and governance. In the early history of corporations, however, business corporations were much different. Corporations could only be formed if they served public purposes. Today, in part because of the DARTHMOUTH COLLEGE v. WOODWARD, that rule no longer applies, and contemporary American business corporations are considered private entities that need not serve any explicit objective. Indeed, corporate officers who fail to focus on the profitability of their corporation, at least in the long run, would be in breach of their fiduciary duties.

Corporations have fought to win a greater share of the individual rights guaranteed by the CONSTITUTION. First, they won constitutional protection for the core rights of corporations identified by BLACKSTONE in his COMMENTARIES: rights of property, contract, and access to court. Then they won the rights of due process and equal protection under the FOURTEENTH AMENDMENT and the protection of the criminal procedure provisions of the CONSTITUTION. In the 20th century, the SUPREME COURT said that there were nonetheless limits to the constitutional rights of corporations. They had property rights but not liberty rights. Eventually, however, the SUPREME COURT broke down that distinction and began to recognize corporations to have liberty rights such as freedom of the press and freedom of association.

"In 1886 the MICHIGAN SUPREME COURT ruled that a corporation was entitled to the same legal status as a person, with rights including freedom of speech. In 1916, when HENRY FORD tried to prioritize business investments over dividends, his stockholders [the DODGE brothers] successfully sued." [Orrell 2018, 212] In 1914, Henry Ford announced that he would begin paying workers $5 a day doubling their wages when labor shortages were not prevalent. Furthermore, he lowered the price of his cars even as significant improvements were introduced and inventory sold out. He decided that the stockholders were earning enough and in 1916 announced that FORD company would not distribute a special dividend to stockholders despite having on hand a cash surplus of $60million. During the trial, Henry Ford insisted that FORD company had the right to make decisions in the interest of the public even if stockholders had to sacrifice. He could have claimed, as executives often do these days when pressed to defend socially responsible policies, but Henry Ford refused on principle.

The court ruled against FORD and Henry Ford's public-spirited view of the corporation. "The main purpose of a corporation is to maximize the shareholders' profits" [Orrell 2018, 212] was the court's decision in DODGE BROTHERS v. FORD MOTOR COMPANY. Indeed, ever since the Dodge Brothers sued to stop Henry Ford from pursuing policies to benefit employees and the broader public without regard to stockholders, the law required that all corporate activity be designed in the long run to enhance profits. Officers had to obey that legal mandate or risk being held in violation of their fiduciary duties to the corporation. As a result, corporations are not "free" in the way that individuals can be. A person can choose her own values. A corporation, however, is legally obligated to prioritize profit, at least in the long term.

"As MILTON FRIEDMAN wrote in 1962, few trends could so thoroughly undermine the very foundations of our free society as acceptance by corporate officials of a social responsibility other than to make as much money for their stockholders as possible." [Orrell 2018, 212] Corporations are rational economic man, HOMO ECONOMICUS, writ large, according to orthodox neoclassical economic theory. Like the individual citizen, the corporation is taxed and regulated and may be rewarded with public employment, punished for mischief by judicial action, and possibly called on for sacrifice in the national interest, and may be saved from bankruptcy with generous handouts, as the western banks' bailouts were in the GREAT FINANCIAL CRISIS. The people running a corporation are occasionally criminally responsible when the corporation has done something illegal. However, they are not when the corporation does something legal yet immoral.

Financial regulators and the Wall Street megabanks they oversee like to say the GREAT FINANCIAL CRISIS was concentrated in the so-called shadow banking system, the gray area occupied by nonbank financial institutions that were outside the more heavily regulated commercial banking sector. Much of the attention and debate regarding troubled institutions has focused on the failures or near-failures of the nonbank troika of BEAR STEARNS, LEHMAN BROTHERS, and AIG. The 2010 DODD-FRANK ACT was sold as a way to give regulators important powers they did not previously have, to oversee such large, risky firms outside commercial banking. Meanwhile, it was CITIGROUP that received the most generous government assistance of any bank during the GREAT FINANCIAL CRISIS.

CITIGROUP was a federally regulated bank holding company containing a federally insured bank. It was subject to the full range of supervisory authorities. It had not one but multiple federal banking agencies already overseeing its activities. It was specifically overseen by the FEDERAL RESERVE BANK OF NEW YORK and its chief Timothy Geithner, a principal architect of the GREAT FINANCIAL CRISIS policies during both the Bush and Obama administrations. He was Robert Rubin's protégé when Robert Rubin was Clinton's Treasury Secretary. Timothy Geithner became Obama's Treasury Secretary, and Obama replaced him by a former CITIGROUP employee Jack Lew.

CITI was created in 1812, two days before the start of the WAR OF 1812 and a year after the closing of the first BANK OF THE UNITED STATES. CITI BANK OF NEW YORK was conceived to serve the financial needs of New York merchants and the young national government. The stockholders of the BANK OF THE UNITED STATES provided more than 50% of the startup capital in the CITI BANK OF NEW YORK. The new bank can be seen as a direct descendent of the United States' first central bank. It was the first corporation created by the first CONGRESS. CITI's first president, Samuel Osgood, had been a member of the CONTINENTAL CONGRESS and America's first postmaster general. As today, CITI, at its inception was deeply intertwined with the national government with benefits for both parties. When CITI was created, the bank's capital was something of a mirage, and the customers were often the directors themselves. The founding directors exempted themselves from putting up any cash at all. Instead, they could take out indefinite loans from the bank by using their shares as collateral. When the owners not only fail to put up much capital but also lend bank funds to themselves, they crate risks on both sides of the balance sheet. As of February 1814, a quarter of the bank's lending commitments were tied up with 12 of the bank's 750 customers.

Unlike the age of the GREAT FINANCIAL CRSIS's TOO-BIG-TO-FAIL banks, when the PANIC OF 1837 proved too much to bear for CITI, there was no taxpayer bailout. The 1837 FINANCIAL CRISIS and the economic downturn that followed was America's FIRST GREAT DEPRESSION. John Jacop Astor bought a piece of the bank and provided the needed capital. Astor was New York City's preeminent trader and real estate magnate. Unlike the present day magnates, the frugal Astor carried little debt and had the ready cash to buy controlling interest in the bank and install Moses Taylor on CITY's board. Taylor would eventually lead the bank beginning in the 1850s through a decade of stability and success. In striking contrast to the government-backed modern CITI, which has careened through long periods of serial crisis, the 19th century version of the bank seems to have been heedful of the lessons of its 1837 near-collapse and did not repeat the mistakes that required a private rescue.

While the bank had been founded by government action and would come to rely on federal help throughout its history, CITY in the 19th century became a pillar of financial strength that not only consumers and businesses but even the government itself would look for assistance in times of crisis. In contrast to the periods of instability in the bank's early years and also in the 20th and 21st centuries, Taylor's arrival at the bank marked the beginning of roughly three-quarter of a century of stability without government backstop. At its lowest point in the Taylor era, CITY BANK's ratio of equity capital to assets stood at about 16%. The ratio of the modern CITIGROUP rarely rises near 10%.

Taylor's CITY was highly capitalized, though it became less so overtime. The equity capital ratio was more than 50% in1841; 35% in 1849; below 20% in 1862; and it remained around 16% from 1878 to 1891. The capital ratio became smaller over time, because the bank's deposits grew. During 1870s, when the bank's deposits stood at $10million, his personal deposits were more than 40% of this total. Under Taylor, the bank's capital ratio was roughly in line with industry peers, but CITY was safer because it had more liquidity. During the PANIC OF 1857, CITY BANK's deposits increased 42% when several of its competitors failed. A year after the PANIC OF 1893, CITI became the largest bank in the United States, two years after James Stillman became its president. Under Stillman the bank grew organically, not relying on mergers. The exception was CITY's purchase of THIRD NATIONAL BANK in 1897, a bank that provided a variety of services for smaller banks outside of New York city.

The United States, with the COINAGE ACT OF 1873 attached the US dollar exclusively to gold, replacing COINAGE ACT OF 1834 that attached the US dollar to the ratio of silver to gold at 16 to 1. With SHERMAN SILVER PURCHASE ACT OF 1890, the US had moved from a gold standard for its currency to a situation in which US TREASURY paper could be exchanged for either gold or silver. This scared foreign investors to trade their US notes for gold, causing gold to flow out at an alarming rate. As always throughout recorded history, doubts about the value of a nation's currency triggered economic disruption and destruction. Robert J. Shiller in NARRATIVE ECONOMICS: HOW STORIES GO VIRAL & DRIVE MAJOR ECONOMIC EVENTS [Shiller 2019][1] explains the gold standard versus bimetallism narratives triggered 1893-1899 depression. In 1893, nearly a third of US railroads would go bankrupt. President Grove Cleveland persuaded CONGRESS to repeal the silver law, but CONGRESS instead, raised high tariffs on foreign goods even higher, adding another brake on economic growth. Washington-created monetary chaos put extreme pressure on banks nationwide. More than 500 banks failed. Yet CITY, overseen by Stillman, remained and island of stability. Instead of looking to Washington for Bailouts as it would do later in its corporate life, the bank was where Washington looked for help when politicians had gotten taxpayers into a jam. Stillman, recruited Frank Vanderlip, assistant Treasury secretary, to be his vice president. As Assistant Secretary of Treasury, he was in charge of the relationships between Treasury and the National Banks. He urged the banks to open accounts with the CITY.

By restricting branch banking, regulators all but forced smaller banks to develop with other banks, especially in New York, correspondent relationships. The combination of Washington-created advantages and Frank Vanderlip's marketing CITY's deposits doubled by 1905. Vanderlip also pushed the old-fashioned commercial bank into a significant role in TREASURY BOND trading and investment activities.

The PANIC OF 1907 is commonly remembered as a crisis managed and resolved by a private citizen, J. Pierpont Morgan. While Morgan certainly led the management of the crisis and put Morgan money into the solution, Treasury Secretary Cortelyou pledged $25million on behalf of the US government, with the funds deposited in CITY, $8million, FIRST NATIONAL, $4million, and NATIONAL BANK OF COMMERCE, $2.5million among other New York banks. These strong commercial banks would then have more to lend to the firms that were struggling. In CITY's Stillman era, even the federal government could count on CITY for help in times of crisis. But under Vanderlip, those roles would be reversed.

Vanderlip's strategy transformed CITY from a specialized wholesale bank into an all-purpose intermediary providing a wide array of financial services to a variety of customers at home and abroad. In a move that would be echoed almost 90 years later with the creation of CITIGROUP, Vanderlip actually pushed CITY into capital markets before it was formally permitted. By 1920, CITY had 55 foreign branches and did not have enough trained men to run them. Rapid growth, distracted CEO and hard-to-quantify risks seemed to be combined at CITY. The OFFICE OF THE COMPTROLLER OF THE CURRENCY was required by the FEDERAL RESERVE ACT OF 1913 to conduct on-site examinations of CITY and all other national banks twice a year. In June of 1919, a federal examination report disclosed problems with CITY's management and its loan portfolio of their foreign branches. Many loans were intertwined with the fates of shaky governments overseas. They grew to 97 in 1930.

After few years of conservative banking to put the books in order Charles E. Mitchel did not just want to be America's banker, but its broker too. His vision was to sell financial services that had previously been available only to the wealthy individuals and institutions to America's burgeoning middle class by persuading them to become shareholders. Under Mitchell, CITY aimed to become a sort of financial supermarket for America's growing middle class. By mid-1929, CITY had attracted more than 230,000 such customers with $62million in deposits. CITY was lending heavily in the call loan market in which investors would buy securities from brokers with a small amount down, borrow the balance, and put up the purchased stock as collateral.

Mitchell had dreamed of turning America into a nation of stockholders, and serving millions of them with a new type of financial supermarket. He went a long way toward achieving both goals, but thanks to his mistakes overseas and the FED's at home, his bank was hobbled and his brokerage, NATIONAL CITY COMPANY, was hardly worth a decent sum. NATIONAL CITY COMPANY was not directly owned by CITY BANK, but was separately owned by the bank's shareholders, so when its value imploded, CITY did not have to record a loss. Yet CITY endured another crisis, with a big help from taxpayers.

Mitchell became the target for politicians determined to regulate and separate trading from commercial banking. Given his market boosterism prior to the 1929 CRASH, he became the symbol of 1920s excess. As the GREAT DEPRESSION deepened the press increasingly pictured banks as villains rather than victims. Bankers, Charles E. Mitchell foremost among them, were reviled as "banksters". As Ferdinand Pecora, chief counsel to the SENATE COMMITTEE ON BANKING AND CURRENCY showed the CITY, under Mitchell, borrowed directly from the FED, made a habit of refusing to recognize problems in the overseas loan portfolio. CITY and its WALL STREET affiliate disclosed very little to regulators or even to its own investors. And yet, in 1933, the government's purchase of preferred stock in CITY was one of the largest of its bank investments. CITY sold $49million, CHASE $46million, CONTINENTAL sold $50million of preferred stock paying 5% annually to RECONSTRUCTION FINANCE CORPORATION. Just as in 2008, federal officials in the 1930s wanted 'healthy banks' to accept government investment so that the weak banks that really needed it would not be stigmatized by accepting federal assistance.

The election of President Franklin Roosevelt in 1932 not only separated banks from WALL STREET but essentially turned them into public utilities. The result was a banking system largely protected and controlled by the federal government. Then, in the 1940s, Washington would repeat what it had done in the 1860s, regulate US banks with the primary goal of funding a war. From 1941 to 1945, US government debt more than quintupled. This would not be last time that government regulation encouraged private banks to loan money to government, nor the last time that bankers seized the opportunity to get regulatory relief for doing so. The combination would become a recurring theme in the era of government backed banking.

In 1955, CITY BANK bought FIRST NATIONAL BANK OF THE CITY OF NEW YORK and the combined firm was called FIRST NATIONAL CITY BANK OF NEW YORK. By the early 1950s, loans were bigger part of the balance sheet than investments. Once again the CITY expanded its overseas operations. CITY's overseas operations had been erratic from the initial success during Vandelip years to Russian and Cuban debacles, to the partial revival under Charles Mitchell before the disasters of the GREAT DEPRESSION. Banking is different from other industries, because the taxpayer is often forced to stand ready to offer assistance when a big bank stumbles.

Outstanding loans to less developed countries at the New York's 8 largest banks increased from $33billion in 1977 to nearly $60billion in 1984 with such loans representing more than 10% of total assets and more than 250% of capital reserves for the 8 banks at their peak. By 1973, foreign deposits at CITY exceeded domestic deposits. CITY's CEO, Walter Wriston's most remarkable achievements were rebranding it CITIBANK in 1976 and persuading Washington regulators that lending money to governments in developing countries were nearly risk-free. The big American banks were taking 'petrodollar' deposits from Middle Eastern depositors and recycling them into loans for countries rising out of poverty.

The largest 9 American banks had $39.6billion on loan to developing countries, excluding oil-exporting states in 1979 according to FED. Moreover, these banks' capital totaled only $21.9billion. In theory, they could all be forced into insolvency if only half of their loans were to default. Wriston had proclaimed that counties do not go bankrupt. This turned out to be true only in the sense that Washington would not let them fail, especially when they owed so much to banks like CITIBANK.

The megabanks were faced with an overhang of exposure from their loans to less-developed countries. Then as now, Washington regulators enjoyed broad discretion in applying capital rules to the banks they oversaw. The FED, the COMPTROLLER, and the FDIC had basically two alternatives. The first was to take a hard look at the capacity of Mexico, Brazil, Argentina, and the others to pay their loans and reduce reported capital levels for the megabanks accordingly. This meant requiring the banks and their stockholders and creditors to accept the consequences of their bad decisions, but also accepting any collateral damage that might occur in the financial system. The alternative option is to look the other way and decide not to enforce the capital standards, allowing the megabanks years to work through their problems. Federal officials went for option two and exercised "forbearance". They decided that to do otherwise was to allow a cascade of failures of giant financial institutions. TOO-BIG-TO-FAIL.

A primary argument in favor of forbearance relates to the fear of systemic collapse. As in 2008, in the 1980s virtually all major banks were suffering to some degree from the same problem. In the first case they had over lent to Latin America. Years later they would shovel to many loans to US homebuyers. The history of forbearance shows that it is appealing to government officials when it allows them to avoid having to manage the closure of a big firm. Regulators did not cut any slack to hundreds of smaller banks that failed during 1980s and were summarily shuttered. Forbearance allowed a number of big New York banks to survive by allowing them to fudge the value of their assets during Latin American debt crisis of the early 1980s.

When debt crisis exploded in the early 1980s, the US government first tried sending aid to foreign governments that had borrowed too much while also exercising regulatory forbearance at home, allowing banks like CITIBANK to pretend they were healthier than they were. In the mid-1980s Washington pursued a plan named after James Baker, Reagan's second SECRETARY TREASURY. The idea of the BAKER PLAN was to exchange new lending to the indebted countries in return for market-oriented reforms such as tax reduction, privatization of state-owned enterprises, reductions in trade barriers, and investment liberalization. Otherwise known as WASHINGTON CONSENSUS. For years, Washington seemed to think that the problem involved a temporary shortage of liquidity. As James Freeman and Vern McKinley explain in BORROWED TIME: TWO CENTURIES OF BOOMS, BUSTS, AND BAILOUTS AT CITI [Freeman and McKinley 2018][1] that is, probably, why many in Washington figured that extending and pretending with Latin American loans might allow enough time for both the borrowers and lenders to recover their financial health. The idea of the BRADY PLAN was to have the

lenders accept lower repayments in exchange for more liquid, tradable assets. The lenders would trade many of their old, dodgy loans for new bonds issued by foreign governments that had lower interest or principle payments but were backed by US TREASURY BOND as collateral.

Walter Wriston, the leading architect of the Latin American debt crisis, retired from CITIBANK in 1984 to be replaced by John Reed. In 1987, CITIBANK put aside $3billion loss provision against Latin American debt wiping out the last 4 years of earning under Wriston. Notwithstanding the BLACK MONDAY CRASH of 1987, CITIBANK made it through relatively unscathed. However, Reed had to deal with CITIBANK's ailing domestic loan portfolio to real estate developers. Reed and his senior team were mainly marketers and operations executives who succeeded in building a large consumer bank, but lacked a thorough understanding of lending and underwriting. Even after experiencing the Latin American debt debacle Reed had allowed CITI's commercial bank to make big bets on the US real estate market. Having witnessed the crisis years in sovereign borrowing that exposed the flaws in the Wriston model, Reed continued to run the bank with minimum capital.

By the summer of 1990, Donald Trump was negotiating with CITIBANK and other creditors who had extended him a total of $2billion in bank debt and more than $1billion in bond debt. CITIBANK and other banks gave him another $65million in emergency financing requesting Trump to sell his personal assets. He refused. CITIBANK having lent a total of $1,1billion was most conciliatory negotiator largely in the event Trump cedes control of his assets, CITIBANK had the most to lose. Some of CITIBANK's original loans to Trump were unsecured.

The leaked report of the COMPTROLLER's examination to NEW YORK TIMES in 1992 singled CITIBANK as the nation's largest mortgage lender in 1989. Donald Trump's, it seems, were not the only failed loans on the banks portfolio, but one that was covered by the press. Washington regulators worked hard to make sure taxpayers never found out about them. After the FEDERAL RECORDS ACT OF 1950, it is not possible to access OFFICE OF THE COMPTROLLER OF THE CURRENCY's examination reports of individual banks. For decades now, the government's standard practice has been to warehouse individual examination reports for banks for 30 years while refusing to release them, citing exemptions under the FREEDOM OF INFORMATION ACT. After 30 years, feds then destroy the reports.

The level of troubled loans at CITIBANK that were no longer even accruing interest was nearly equal to its equity capital and its efforts to build loan loss reserves fell far short of its major bank competitors. In February of 1991, CITIBANK sold $590million of its preferred stock to Prince Alwaleed bin Talal bin Abdulaziz al Saud. Before the sale Alwaleed was the bank's largest stockholder with 4.1% stake in common stock, 11% after. A few weeks later, the bank raised an additional $600million from 3 dozen institutional investors.

More than 60 years after Senator Carter Glass blamed Charles Mitchell for the GREAT CRASH and persuaded CONGRESS that CITY BNK had to be separated from Wall Street, CITI BANK and Wall Street were united. On April 6, 1998 CITICORP and TRAVELERS GROUP announced their merger, the stocks of both companies rallied. America's global bank for consumers and businesses was joining with TRAVELERS conglomerate that included insurance, mutual funds, and SOLOMON SMITH BARNEY, the investment bank. The merger's business model was not exactly legal. In spite of the regulators poked holes in GLASS-STEAGALL barriers between commercial and investment banking, enough of the old restrictions remained that a full melding of the new company's various financial businesses would require a change in the law. A new law that allowed financial supermarkets had to be written, ironically CITIGROUP was asking Washington to rewrite the law that CONGRESS had specifically written in 1933 in response to the CITY BANK's earlier troubles. In 1999, Clinton signed the rewrite.

98 years after Frank Vandelip, Assistant Secretary, left TREASURY and few months later joined CITY BANK, Robert Rubin, TREASURY SECRETARY, left TREASURY and few months later joined CITIGROUP. Roughly 80 years after Senator Carter Glass claimed CITY BANK's Charles Mitchell for the GREAT CRASH of 1929, another federal official was suggesting the same bank may have been responsible for the historic taxpayer-backed rescue of 2008. A Robert Rubin protégé from Clinton era joined CITIGROUP to serve as chief operating officer of CITI ALTERNATIVE INVESTMENTS UNIT that imploded during financial crisis. In 2013 Jack Lew became Obama's secretary of US TREASURY. Jack Lew succeeded Secretary of Treasury, Timothy Geithner who, during the financial crisis years, was the chief regulator responsible for overseeing CITIGROUP when he was at FEDERAL RESERVE BANK OF NEW YORK. Plus ca change, plus c'est la meme chose.

There is much more to any system of managerial process than meets the eye by studying the charts of organizations which are intended to represent the structure of organizations. The impressive thing about the organize national environment of corporations, although not unique to them, is the extent to which rationality is expected, encouraged, and even enforced. Substantial resources are devoted to developing information and to the discussion of its implications for action. Where rationality becomes institutionalized, that is, becomes a socially sanctioned rule of conduct, the legally prescribed institutional structure and performance that specify how actions and interactions ought to be are important elements that cannot be overlooked. But actual alternatives of managerial styles are affected by all sorts of other factors. These are the necessities of economics with linkages to the political and social system.

The motivations and the habits of the decision makers of the corporations are also influenced by their personal, unique situations - the precise points in their bureaucracies at which they find themselves. Yet there have been demonstrable periodic regularities in the ways they were managed, as there have been differences in the ways they were run when their habitat changed from FINANCIAL CAPITALISM [- The Great Depression], to MANAGERIAL CAPITALISM, [New Deal – Thatcher-Reagan Liberalism], and then to ASSET MANAGER CAPITALISM I[1980s – 2008 The Great Financial Crisis]. ASSET MANAGER CAPITALISM II and/or STATE CAPITALISM [2008-]

6. Managerıal dıctatorshıp or market chaos

Paul Seabright in THE COMPANY OF STRANGERS: A NATURAL HISTORY OF ECONOMIC LIFE [Seabright 2010][1] explains how the shirt he bought in New York had its cotton grown in India from seeds developed in the United State; the artificial fiber in the thread came from Portugal and the material in the dyes from at least 6 other countries; its collar linings came from Brazil and the machinery for weaving, cutting, and sewing from Germany; the shirt itself was made up in Malaysia. The project of making a shirt and delivering to Paul Seabright in New York has been a long time in planning, since well before two winters ago when an Indian farmer outside of Coimbatore planted the seeds he bought from the MONSANTO's distributor. Engineers in Cologne and chemists in Birmingham were involved in the preparation many years ago. A marvel of global production with no authority in charge. The firms that make up the many links in different countries with different legal infrastructures in the chain that supplied the shirt at point of purchase had merely obeyed market prices.

The metaphor of the pin made famous by ADAM SMITH does not have a single maker, but 25 persons involved, all collaborating without a central planner, a collaboration the mainstay of 18th and 19th century classical and classical economic theory. But, the economists of the day failed to shed light on the question of why some activities were directed by market forces and others by firms, and what the determinants of an economy's infrastructural organization were.

According to Ronald H. Coase, "Firms are a response to the high cost of using markets, transaction costs".[Coase 1990][1] So he wrote in 1937. Instead of negotiating and enforcing separate contracts for every transaction, it, generally, costs less to manage tasks by fiat. In markets for standardized goods and services such "transaction costs" are low, argued Ronald Coase. A well-defined task can easily be put out to the market, out-sourced, where a contractor is contracted and paid an agreed sum for doing it. The firm comes into its own when simple contracts of this kind will not suffice. Alternatively, an employee is contracted to follow varied and changing instructions, up to agreed limits, for a contractually agreed salary. Thus, the hierarchical authority structure of the firm trumps the invisible hand of the market. With the advance of platform corporation, the boundary between the firm and the market might appear to be dissolving altogether. The share of self-employed contractors in the global labor force has risen. In the "gig economy" exemplified by UBER [DIDI in China] drivers are mushrooming.

Open APPLICATION PROGRAMING INTERFACES, API, enable organizations to offer access to their platforms without taking enormous risks or offering much in the way of support. Multiple players participate in a broadly open ecosystem of developing, using, and refining computer applications as well as data that flow between them. From the perspective of those who develop on

these platforms, API can provide important shortcuts that can help to avoid reinventing the wheel on the way towards offering customers breakthrough product, but running the risk that the organization offering the platform service [FACEBOOK, APPLE, MIROSOFT, et.al] might unexpectedly pull the rug out from under them. The promises of this emerging ecosystem by AI empowered machines, platforms and crowds are tremendous, but the full implications of this inter-reliance remain to be seen. The global business systems turbo charged by CHIMERICA and lesser degree by the other members of BRICS [Brazil, Russia, India, South Africa] are changing the global ecosystem fast as the rich, the emerging and the poor societies move deeper into the information economy. But in this 21st century chaos lies opportunities that will shape how employees-employers, customers-suppliers are going to relate to each other, and the epistemology of neoclassical economics does not help.

The idea behind open innovation is as simple as powerful. The creators of new ideas do not have to be within your organization in order to be helpful. Recent advances in IT have made the frictionless sharing of experiences and lawyer-free integration of platforms possible. Yet firms have not withered away in globalized 21st century, and in President Trump's version. Managerial dictatorship of the firm with differing institutional arrangements between the firm's "stakeholders" [its customers, suppliers, creditors, CEO and staff, employees, investors, sovereign governments, international institutions [IMF, WORLD BANK, BIS, WTO, NAFTA, EU] and the very visible as well as the textbook-invisible hand of the market chaotically co-exist, for now.

Nick Srnicel in PLATFORM CAPITALISM [Srnicel 2017][1] offers an overview of the emerging landscape by presenting five different types of platforms: ADVERTISING PLATFORMS [e.g. GOOGLE, FACEBOOK] which extract information on users, undertake analysis, and the use the products of that process to sell ad space; CLOUD PLATFORMS [e.g. AWS, SalesForce] which owns hardware and software of digital dependent businesses and are renting them out as needed; INDUSTRIAL PLATFORMS [e.g. GE, SIEMENS] which build the hardware and software necessary to transform traditional manufacturing into internet-connected processes that lower the costs of production and transform goods into services; PRODUCT PLATFORMS [e.g. ROLLS ROYCE, SPOTIFY] which generate revenue by using other platforms to transform a traditional good into a service and by collecting rent or subscription fees on them; and LEAN PLATFORMS; [e.g. UBER, Airbnb] which attempt to reduce their ownership of assets to a minimum and to profit by reducing costs as much as possible. These analytical divisions can and often do run together within any one firm.

Artificial intelligence is barging its way into business. Firms of all types are harnessing AI to forecast demand, hire workers and deal with customers. In 2017, companies spent $22billion on AI related mergers and acquisitions. Even after 2008 financial catastrophe, it is still fashionable to do it in the financial markets rather than in R&D shops. Regardless of how it is acquired, AI is not only changing how the work place is managed, but the managerial process itself.

AMAZON has a patented a wrist-band designed to tract the hand movements of warehouse workers that uses AI guided vibrations to nudge employees into making the "right" moves and eliminate the "wrong", and resultantly make warehouse workers more efficient. FREDERICK TAYLOR would have approved. Another software company, WORKDAY, crunches around 60 factors to predict which employees will leave the company by collecting and analyzing 60 factors, such as pay, time between holidays taken and turnover in managers to whom the employee reports, and flags those at risk of quitting and for-warning Human Resource departments. Still another startup, HUMANYZE, sells smart ID badges that can tract employees around the office and reveal how well they interact with their colleagues. ID badges the size of a credit card and depth of a book of matches are strapped on employees' wrists to collect data to be analyzed. The ID badges contain a microphone that picks up employees' conversations with each other; BLUETOOTH and infrared sensors are to monitor employees' locations; and an accelerometer records when they move. AI makes ubiquitous surveillance worthwhile, because every bit of data is potentially valuable for DATA ANALYTICS. The idea behind the project is not panoptic or scrutiny according to the founders' description. So, they claim. The revenue of HUMANYZE come not only from sales of hardware and software but from the use of data their badges generate for HUMANYZE.

ALEX PENTLAND, the director of HUMAN DYNAMICS LAB within MIT's MEDIA LAB, the godfather of wearables, especially GOOGLE GLASS, the author of SOCIAL PHYSICS: HOW SOCIAL NETWORKS CAN MAKE US SMARTER[1], and HONEST SIGNALS: HOW THEY SHAPE OUR WORLD[1] and his students have spent last two decades inventing instruments and methods that can transform all of human behavior, especially social behavior, into highly predictive math. One result was to introduce the SOCIOMETER, a wearable sensor that combines a microphone, accelerometer, BLUETOOTH connection, analytic software, and machine learning techniques designed to infer the structure and dynamic relationships in human groups.

PENTLAND and his teams have worked to crack the code on the instrumentation and instrumentation of social processes in the name of a totalistic social vision founded on a comprehensive means of behavior modification. In 2010, PENTLAND founded SOCIOMETRIC SOLUTIONS to apply the rigors of his SOCIAL PHYSICS to captive populations of office workers. By 2015, the company rebranded itself: HUMANYZE. Its technology is described as a platform that uses a "smart employee badge to collect employee behavioral data, which it links to specific metrics with the goal of improving business performance.

BEN WABER, its CEO, portrays the company's work as "money ball" for business enabling any organization to manage its employees like sports team based on measures that reveal how people move through the day, with whom they interact, their tone of voice, if they lean into listen, their position in the social network across a variety of office situations, and much more, all of it to produce 40 separate measures that are then integrated with a "business metric dashboard" in PEOPLE ANALYTICS: HOW SOCIAL SENSING TECHNOLOGY WILL TRANSFORM BUSINESS AND WHAT IT TELLS US ABOUT THE FUTURE OF WORK[1].

An artificial intelligence enhanced video-interview service, HireView, video-interviews candidates as HireView's AI program analyzes the facial expressions, body postures and the verbal skills, intonation and gestures of the candidates. Such machine-sorting can be helpful for companies that recruit globally when candidates are from different cultures or speak another first language, but with the worrisome possibility of rejecting the wrong candidate. Video-interview is the first step of the recruitment process in HireView, only when applicants pass the video-interview they meet some humans of the Human Resources Departments. Another recruitment service company, PYMETRICS, helps to develop data about candidates without conventional qualifications by providing games that ignore factors such as gender, race and level of education for candidates to play. The candidates are also tested for some 80 traits such as memory and attitude to risk. PYMETRICS then uses machine learning to measure applicants against top performers and predict their suitability for a role. PYMETRICS aims to helps the recruiter to identify employable among candidates without conventional qualifications.

In another start-up, COGNITO's AI-enhanced software listens to customer-service calls and assigns an "empathy score" based on call centers' agent's compassion and capability in settling complaints. Among employee surveillance startups, VERIATO, goes so far as to track and log every keystroke an employee makes on his computer in order to gauge employee's commitment to the company. VERIATO's software searches for signals that may indicate poor productivity and malicious activity, like stealing company records, and scans e-mails to gauge how employee's sentiment changes over time. Companies can use services offered by SLACK to sift through not just employees' professional communications but their social-media profiles too. SLACK stands for searchable log of all conversation and knowledge. AI and DATA ANALYTICS empowered employee surveillance systems are changing the work environment, redefining the rights and obligations of employees and employers. Few laws exist to govern how data are to be collected at work, and many employees unguardedly consent to surveillance when they sign their employment contract. The emerging work environment of the 21st century is beginning to look very different from the 20th. So far, managerial authority seems to be the expanding its sphere of control at the expense of reduced sphere of decision options of the employees.

At MICROSOFT employees can track their own movements with MyAnalytics, a program which puts together data from e-mails, calendars and show employees how they spend their time, how often they are in touch with key contacts and whether they multitask too much. MyAnalytics is a feedback tool provided to the employee mainly for self-help, it is not designed as a surveillance tool to enhance managerial control mechanism. MyAnalytics also aggregates the data and offers the summaries to the employees to help them manage their departments and see how their teams are doing.

AMAZON has an in-house OPTIMIZATION SQUAD, a unit that writes algorithms AMAZON uses to constantly streamline its own operations. In AMAZON's fulfilment centers, vast warehouses more than 100 in North America and 60-odd around the world, the packages move on conveyor belts at the speed of an escalator in a shopping mall. The deafening noise of the facility is matched by conspicuous lack of humans. There are, instead, thousands of yellow 6 feet tall cuboid shelving units inside a fenced-off area, the size of a football field. In AMAZON's vernacular, they are "pods". These pod are shuffled by hundreds of robots in and out of neat rows by sliding beneath the pods and dragging them around. Associates, human workers in AMAZON's terminology, are assigned to stations at gaps in the fence that surrounds this 'robot field'. Some of the associates pick items out of pods brought to the by a robot, others pack items into empty pods, to be whirred away and stored. For the system to keep track, the associates pick or place an item, scan the product and the relevant shelf with a bar-code reader. To minimize the down-time of human workers and have faster flow of goods through the warehouse, the amount of down-time human workers has to wait before a robot drags a pod to their station need to be shorter and fewer. Optimization squad for fulfilment centers are developing these algorithms for robots.

AMAZON has an AI body-tracking system pilot project that AMAZON refers as NIKE INTENT DETECTION which is to track what the associates pick and place on shelves to get rid of the hand-held bar-code reader. Such manual scanning by the associates takes time that can be saved if the cameras can keep track. What AMAZON GO is to do for shoppers, NIKE INTENT DETECTION is to do it for fulfilment

associates. It is to track what they pick and place on shelves. AMAZON's algorithmic venture, a cashier-free grocery, AMAZON GO, that watches shoppers with a bank of hundreds of cameras converting visual data into a 3D profile that track hands and arms as they handle a product. AMAZON GO records which items shoppers pick up and bills them to their AMAZON account when they leave the store.

Platform companies' reality can best be understood by deciphering the hidden DNA of AMAZON, APPLE, FACEBOOK, and GOOGLE [ALPHABET], the American disruptors, and their Chinese counterparts, ALIBABA, BAIDU, TENCENT, XIAOMI, HUAWEI, ZTE, OPPO, LENOVO, HAIER to understand how they are changing the rules of business. FACEBOOK and GOOGLE suck up two-thirds of America's on line ad revenues. AMAZON controls more than 40% of the country's booming online shopping market. In some countries GOOGLE processes 90% of web searches. Not only is the message but the platform is also the market.

Just as electricity enabled the assembly line in the 19th century, since machines no longer had to be grouped around a central steam engine, data analytics companies promise to usher in the assembly lines of digital economy, distributing data-crunching capacity where it is needed. They may also help all kinds of firms create the same network effects behind the rise of the tech giants. The better they serve their customers, the more data they collect, which in turn improves their capacity. Globally, according to PitchBook, a research company, there are 35 startups in data analytics in 2019. Most of these firms claim of having conjured up AI platforms. Only a few of them meet the generally accepted definition of "platform", typically reserved for APPLE's and GOOGLE's smartphone operating systems which allow developers to build compatible apps easily. An AI platform is expected to automatically translate raw data into an algorithm-friendly format and offer a set of software design tools that enable people with limited coding skills to use.

Many of the 35 data analytics companies including the biggest, PALANTIR, sell high-end customized services by building an operating system from scratch for every client. Whereas, AMAZON WEB SERVICES, MICROSOFT AZURE and GOOGLE CLOUD offer standardized products for their corporate customers. Among the 35 startups, 3C.ai and DataBricks stand out. DataBricks was founded by the group that developed APACHE SPARK, an open-source program which can handle reams of data from sensors and other connected devices in real time. DataBricks expanded APACHE SPARK to handle more data types. In 2019, it sells its services to Hotels.com and VIACOM. Born of abstruse computer science, DataBricks helps clients deploy open-source tools effectively. 3C.ai on the other hand, like most enterprise-software firms sell proprietary applications. 3M employs 3C.ai software to pick out potentially contentious invoices to pre-empt complaints. The United States Air Force uses it to work out which parts of an aircraft are likely to fail soon. It is unclear which one will prevail.

The gig economy is assembling a reserve force of atomized laborers who wait to be summoned, via electronic foremen, to deliver people's food, clean their houses or act as their chauffeurs. The 21st century lumpen proletariat, some say. Figures from the BUREAU OF LABOR STATISTICS, released on June 7, 2018 show that group of American workers to be only 10.1% of the employed. Not an alarming figure supporting the much heralded decline of the conventional jobs in recent years caused by disruptive platform companies.

As with its Great Firewall, China was able to prevent American firms from taking on Chinese rivals in China, and Chinese companies were kept out of America, Europe fell under the spell of Silicon Valley before Chinese tech had matured. APPLE was an exception to flourish in China. But now, ALIBABA is taking on AMAZON, BAIDU is matched against GOOGLE, and TENCENT is to prove its technological superiority against FACEBOOK. They have very different strategies, however. American firms typically set up outposts firm from scratch. They fund subsidiaries that offer much of the same service to Indians or Mexicans as their domestic users might expect. One-size-fits-all.

ALIBABA's strategy in emerging markets, on the other hand, has been not to set up shop itself, but instead to invest in local companies. ALIBABA's partners include PAYTM and BIGBASKET in India, TOKOPEDIA in Indonesia, LAZADA in Singapore, DARAZ in Pakistan, TRENDYOL in Turkey. Since GOOGLE and FACEBOOK earn bulk of their revenue from advertising, and therefore, there is less incentive to localize, and furthermore, their optimization algorithms reflecting factor scarcities of America make little efficiency sense in emerging markets' price priorities. Chinese firms' competitive advantage, by contrast, has come from being able to process payments and organize distribution of goods in a country where doing such things had previously been tricky. "One size fits all" solutions are hard to implement. Partnership with local entrepreneurs is the Chinese customized strategy.

The annual conferences of AMAZON, FACEBOOK and GOOGLE held to announce new tools, features, and acquisitions, send shock waves of fear through venture capitalists and entrepreneurs of Silicon Valley. Venture capitalists attend to see which of their companies are going to fall in "kill-zone" around the giants. Tech giants try to squash startups by copying them, or they pay to scoop them up early to eliminate a threat. The idea of a kill-zone may bring to mind MICROSOFT's long reign in the 1990s, as it embraced a strategy of "embrace, extend, and extinguish" and tried to intimidate startups from entering its domain. But entrepreneurs' and venture capitalists' concerns are striking because for a long while afterwards, startups had free rein.

Venture capitalists are wary of backing startups in online search, social media, and e-commerce. The wariness comes from seeing what happens to startups when they enter the kill-zone, either deliberately or accidentally. Amazon's cloud service, AMAZON WEB SERVICES, [AWS], have labelled many startups as "partners", only to copy their functionality and offer them as a cheap or free service. A giant pushing into startup's territory, while controlling the platform that startup depends on for distribution, makes life tricky. The KRONOS EFFECT is the efforts undertaken by a dominant company to consume its potential successors in their infancy. Understanding this effect is critical to understanding the cycle of from open to closed system, from a freely accessible channel to one strictly controlled by a single corporation or cartel.

By 2017, FACEBOOK managed, unchallenged by ANTITRUST authorities, 67 acquisitions, AMAZON undertook 91 and GOOGLE got away with 214. In this way, the tech industry became essentially composed of just a few giant trusts as their competitors became marginalized with every passing day says Tim Wu in THE CURSE OF BIGNESS: ANTITRUST IN THE NEW AGE [Wu 2018][1].

The monopolistic structure that typified the 20th century information industry found its footing on the internet when Apple while it had always wavered on openness, committed itself to work exclusively on the network of AT&T, to a set of ideals well aligned with the interests of the faltering old media, the entertainment conglomerates, and newspaper magnates like Rupert Murdoch. While a difficult partner in many respects, Apple provided the old monopolistic firms a rejuvenation at last via the internet through the great promise of the iPAD. Combination of Apple, AT&T and entertainment conglomerates was welcome after the spectacular failure of AOL and Tıme Warner merger. As Apple befriended the old monopolistic media, google remained the defacto leader of a different coalition that depended on the

WWW and an open INTERNET when the early 21st century dream of vertically integrated MICROSOFT-GE, AOL TIME WARNER, and COMCAST-DISNEY fell apart.

In China, fewer and fewer tech startup companies are able to escape the radar screens of BAIDU's, ALIBABA's and TENCENT's investment groups on the look-out for potential winners. In 2019, BAT as the tech triumvirate is known, has already invested, directly or indirectly, in more than half of the 124 startups counted as "unicorns" [those worth $1billion or more] according to IT JUZI, a database of startups in Beijing reports The ECONOMIST[1]. By the time firms hit the $5billion mark, over 80% have taken a form of BAT investment. The KRONOS EFFECT with Chinese letters. Of the three, two are bigger. Even after declines in tech stock prices in the third quarter of 2018, ALIBABA and TENCENT are still worth close to half a trillion dollars. Lately, both have moved out of their core business into areas as varied as financial services, bike-sharing, ride-haling and food delivery, clashing along the way. Gracefully maturing and increasingly powerful, they are ruthlessly blocking and tackling not only each other, but any firm that sides with the enemy, and not only in China anymore.

To the Chinese, the scene of American venture capital firms may seem familiar, a scaled down version of the Chinese scenario. "Kill-zone" is the metaphor that describes acquisitive investment strategies of technology giants, AMAZON, FACEBOOK and GOOGLE, in acquiring startups particularly in consumer-internet products. According to McKINSEY, a consultant, America's giants make just 5% of all domestic venture capital investments, whereas BAT account for close to half of those in China. TENCENT has a portfolio of 600 stake-holdings acquired during 2012-2017. ALIBABA and TENCENT are offering more than just large checks. They offer their platforms. TENCENT's WeChat counts over 1billion users. ALIBABA's emporia are home to 1million merchants. Through WeChat PAY and ALIPAY, their competing payment systems, ALIBABA and TENCENT account for 94% of mobile transactions.

Venture capitalists, in the United States, shy away from backing startups whose business centers on the consumer-internet, when the preferences of GOOGLE and FACEBOOK are conspicuously evident. In China, however, that is not yet the case, because of sufficient availability of early-round financing. Many Chinese venture capitalists' strategy is try to identify the sparkiest startups, anticipating generous sell-out later when the giant steps in to buy. When TENCENT invested $600million in MOBIKE, a shared-bike startup in 2017, ALIBABA countered with a $700million stake in a rival OFO, forcing dozens of smaller competitors out of the race, but richly rewarding those venture capitalists that provided early-round financing for MOBIKE and OFO. The government is unlikely to break up the "walled gardens" that giants have built around their offerings, in which startups must also operate so long as the giants follow the government's directives in directing its knowhow according to the state's industrial plans.

The narrow profit maximizing efficiency focus of corporations has inspired the launch of an OPEN SOURCE CIRCULAR ECONOMY movement. Its worldwide network of innovators, designers and activists aims to follow in the footsteps of open-source software by creating the knowledge commons needed to unleash the full potential of circular manufacturing. The full regenerative potential of circular production cannot be reached by individual companies seeking to make it all within their own factory walls. If every tractor, refrigerator and laptop manufacturer attempts to recover, refurbish and resell all and only its own brand of products within proprietary cycle of material flow. The system wide regenerative potential cannot be achieved.

The movement has been driven by four principles: the open-source sharing of new inventions, the promotion of a collaborative learning culture, a belief in community self-sufficiency, and a commitment to sustainable production facilities. The software used to program and print physical products remains open source, allowing participants to share new ideas with one another in do-it-yourself, DIY, hobbyist networks. The open design concept conceives of the production of goods as a dynamic process in which participants learn from one another by making things together. The elimination of intellectual-property protection significantly reduces the cost of printing products, giving the 3D printing enterprise an edge over conventional manufacturing enterprises, which must factor in the cost of myriad patents.

The production process is organized completely differently than the manufacturing processes of the first and second industrialization. Conventional factory manufacturing of the first and the second were a subtractive process. Raw materials are cut down and winnowed and then assembled to manufacture the final product. In the process, a significant amount of the material is wasted and never finds its way into the end product. 3D printing is additive infofacturing. The software is directing the molten material to add layer upon layer, creating the product as a whole piece.

OPEN SOURCE CIRCULAR ECONOMY movement believes that circular manufacturing must be open source because the principles behind open source design are strongest fit for the circular economy's needs. Those principles include modularity, that is making products with parts that are easy to assemble, disassemble and rearrange; open standards, that is designing components to a common shape and size; open source, that is full information on the composition of materials and how to use them; and open data, that is documenting the location and availability of materials. In the collaborative commons, millions of innovators are defying the mainstream economic theory that without intellectual property protection innovators, not being able to recoup their costs, will not bring new products to market.

They are co-creating and using free open-source software known as FOSS as well as free-open source hardware, FOSH. GLOBAL VILLAGE CONSTRUCTION SET demonstrates step-by-step how to build from scratch 50 universally useful machines, from tractors to wind turbines. OPEN BUILDING INSTITUTE aims to make open-source designs for ecological, off-grid, affordable housing available to all.

Many WEB 3.0 projects have developed their crypto-economic models after SATOSHI MAKAMATO pointed the way. The idea is to replace a centralized firm with a decentralized network, held together by incentives created by a token – a kind of "crypto-co-operative". All those involved, including the users, are meant to have a personal stake in the enterprise and get their fair share of the value created by a protocol. The invisible hand of the market replacing "the firm". SATOSHI MAKAMATO provided the tools for the defenders of JEFFERSONIAN CAPITALISM to challenge the enshrined HAMILTONIAN centralized corporate hierarchy of managerial authoritarianism as AI enabled HAMILTONIAN corporation incorporated the invisible hand of the market to manage its internal affairs, CROWD SOURCING, is flattening the layers of corporate hierarchy of managerial authoritarianism.

7. 20th Century lessons are not "plus ca change, plus c'est la meme chose"

By the 1910s, the Unites States had surpassed the United Kingdom as the world's largest economy. The reason was largely the strength of US manufacturing companies, which accounted for approximately 50% of the country's GDP at the time. American factories were powered first by flowing water that turned waterwheels, then by steam. Around the start of the 20th century, electricity appeared as another viable option. It first gained traction as a more efficient replacement for the single big steam engine that sat in the basement of factories and supplied power to all of their machines. Electrification was one of the most disruptive technologies ever. In the first decades of the 20th century, it caused something close to mass extinction in US manufacturing industries.

At the start of 20th century, manufacturing industries in the United States were dominated by "industrial trusts". They were large companies born of mergers. Their owners aimed at to take advantage of scale economies in production, purchasing, distribution, and marketing. Certain trust builders also hoped to create companies so large that they would become monopolies able to set prices. A survey published in 1904 tallied more than 300 such trusts, managerial dictatorship a l'Americaine. The THIRD REICH coopted the state and the industrial cartels as the Japanese state coopted ZAIBATSUs to form uber managerial dictatorships not only to compete with Moscow's monolithic command-control system, but also quickly solve the mass misery of the GREAT DEPRESSION.

Consider a listing of the top American companies from about 1910 or so. It would include U.S. STEEL and BETHLEHEM STEEL, STANDARD OIL, and GULF, SWIFT ARMOUR, and GENERAL FOODS, AT&T, GENERAL ELECTRIC, and WESTINGHOUSE, ANACONDA COPPER, and ALCOA, DUPONT, and AMERICAN TOBACCO. At the time, US industrial trusts seemed positioned to reign for a long time. They were well capitalized, staffed by the first generation of professional managers, and far from hostile new technologies. They learned to communicate by telegraph and ship goods via railroad, and switched from steam to electric power in their factories. A survey in 1935 found that over 40% of the industrial trusts formed between 1888 and 1905 had failed by the early 1930s.

The great shake-up in the early 20th century American manufacturing had

multiple causes, including the upheavals of WWI and President TEDDY ROOSEVELT's trust-busting crusade, but the many shocks of electrification were one of the fundamental reasons why so many top companies failed or floundered. The big gains came not from simple substitution of electric motors, but from the redesign of the production process itself that involved techno-economic paradigm shift.

Except for companies from new industries, like GENERAL MOTORS and RCA, the listing of companies in 1970s is much the same as they were at the start of 20th century. Despite all the vicissitudes of mergers, name changes, and antitrust, the top companies in 1910 mostly held their positions for the next seventy years.

The successful companies of the early 1900's had emerged from the most savagely Darwinian Industrial maelstrom in history. ROCKEFELLER, CARNEGIE, and their ilk, clawed to the top through ruthless efficiency and lethal execution. The best German or British chemical and steel companies could beat the Americans in this or that niche, but across the board the United States possessed the most formidable array of industrial power ever seen.

And then Americans slacked off. Almost as soon as US STEEL was born from a string of mergers in 1901, its chief, Elbert Gary, started working out market-sharing and the price maintenance agreements with his competition. US STEEL was born controlling more than half the market. Gary argued that if his fellow steel moguls just adopted U.S. Steel's high price structure, they would each maintain their market shares, and all could flourish together. After the standard break up in 1911, the oil industry fell into a similar pattern, and eventually so did newer industries, like automobiles and televisions. A steel company chief once explained the logic of price maintenance to a Senate antitrust committee: "If we were to lower our prices, then it would be met by our competitors, and that would drop their profit, so we would still be right back to the same price, relatively."

War preserved and extended Americans' hegemonies. Companies could wax fat on wartime weapons orders and post war reconstruction, and at the same time, help destroy their overseas competitors. A 1950s steel sales executive bragged, "Our salesmen don't sell steel; they allocate it." But by defanging competition, Gary's system of "administered pricing" froze technology. The locus of innovation in steel-making shifted to Europe and Japan.

In the United States, MANAGERIAL CAPITALISM emerged out of the Great Depression and its set up was characterized by stable high economic growth and shared prosperity. Indeed, the 25 years following World War II were called the "Golden Age" of capitalism. Prior to the Great Depression, FINANCE CAPITALISM prevailed in the United States. It was characterized by a small government, gold standard constrained with little regulation of banking and finance or anything else, and a growing income and wealth inequalities, essentially laissez faire capitalism. As a consequence, the economy was much more financially unstable and recorded numerous, frequent, and prolonged economic contractions.

From 1931, the size of government spending progressively grew and with the NEW DEAL, a new stage of capitalism progressively emerged that increasingly involved the federal government in macroeconomic and regulatory affairs, MANAGERIAL CAPITALISM. Partly due to federal government's involvement in macroeconomic management, the distribution of income and wealth narrowed and real income grew across all income categories. A broad range of households benefitted from the prosperity and were able to increase and maintain their standard of living without recourse to debt.

Prior to 1933, The FEDERAL RESERVE operated under a gold standard domestically and externally, and it was constrained in its discounting operations by the REAL BILLS DOCTRINE. GOLD RESERVE ACT of 1934 removed any obligation to convert U.S. currency into gold on demand, and forbade any contractual clause requiring final payment in gold. In addition, the GLASS-STEAGAL ACT of 1933 ended the REAL BILLS DOCTRINE by allowing any economic unit access to the DISCOUNT WINDOW, and by allowing the latter to accept any type of collateral. By making the U.S. dollar an inconvertible currency domestically, and by broadening the powers of the Federal Reserve, the United States acquired more, but not full, monetary sovereignty and so acquired more financial flexibility to promote economic and financial stability. In addition to a big bank, a big government was also created through a large increase in federal expenditures and purchases.

KEYNES proposed that in normal circumstances there is not enough effective demand from private firms and households to ensure the use of all potential resources, resources which could be brought into use by existing technology and business organization. Therefore, government policies should add to private demand, not just in a downturn, but in normal times. The governments' budgets' proper job was not to balance the governments' accounts, but to balance the nations' accounts - aggregate supply and demand - at full employment. Whether this required a budget surplus, zero balance, or deficit depended on the state of aggregate demand. In principle, therefore, the budget could be used to restrain demand as well as to increase it, with the fiscal multiplier giving a precise arithmetic estimate of both.

Governments could calculate the difference between potential and actual output and adjust taxes and spending accordingly. Monetary policy was to support fiscal policy. Interest rates were to be kept permanently low, their main purpose being to minimize the cost of capital and enable the government to borrow as cheaply as possible. The political implications of KEYNESIAN policy were contentious. Conservative politicians, committed to reducing taxes, gravitated towards monetary policy as part of their long-term goal of minimizing the state's role in allocating capital, and assign the management of the business cycle to the weaker of the two possible options: the monetary policy.

FIRE [Finance, Insurance, Real Estate] was a much smaller portion of the GDP and so was consumer finance in banks' loans. Bankers did not entice households and companies to use a lot of leverage to improve their economic well-being. Bankers' profitability rested on a careful examination of creditworthiness of borrowers and the establishment of long-term recurring relationships, rather than the aggressive expansion of their market by increasing debt loads. An originate-and-hold banking model, and labor conditions promoted sustained shared prosperity. Union membership was at its peak in the United States in 1950s with about a third of the employed and a quarter of the labor force. Given its institutional characteristics, and the politico-economic environment, MANAGERIAL CAPITALISM was less prone to financial instability with the decline of economic volatility. Not only were the financial crises less numerous during the post war era but they were also milder.

The WWII had subordinated capitalism to society. KEYNESIANISM was part of the democratic attempt to keep control over capitalist economy in peacetime. All Western governments were committed to ACTIVIST REAL OUTPUT MANAGEMENT with big differences between the kind of activism they thought was needed. Sweden practiced a form of SUPPLY-SIDE KEYNESIANISM derived from the STOCKHOLM SCHOOL. A high level of welfare spending was coupled to activate labor market measures to force up labor productivity: a policy tailor-made for a small export-economy. The French state, which emerged from the war as the nation's chief investor, had experimented with STATISM since COLBERT in the 18th century. The German post-war economic policy, on the other hand, was influenced by the FREIBURG SCHOOL that rejected both NAZISM and STATE SOCIALISM. It accepted the original liberal belief in a competitive market system, but thought that the gaps in classical thought needed to be filled not by the state budget, but by a constitutional framework. This was necessary to protect competition from distortion, see benefits equally distributed and protect markets from the encroachment of government. These ideas coalesced in ORDO-LIBERALISM and the SOCIAL MARKET ECONOMY. The independent BUNDESBANK became the monetary pillar of the new German constitution. ORDO-LIBERALISM blended with industrial co-partnership in a German version of incomes policy.

Taking the advanced countries as a whole, a Keynesian commitment to full employment was the common element in a wider mix of national compromises between right and left, capital and labor. Countercyclical policy, improved protection for labor, partial state ownership of some industries, active supply-side policy, enlarged welfare spending, indicative planning, the social market economy, short-term lending facilities through IMF were promoted in different countries as middle ways between LAISSEZ-FAIRE and central planning. In the COLD WAR era they did important political work in protecting Western societies from communism, and the success of post-war capitalism was in marked contrast to FINANCE CAPITALISM's dismal global record between WWI and WWII.

During the war, John Kenneth Galbraith had been instrumental in running the United States as centrally directed economy through controlling prices when he worked at the OFFICE OF PRICE ADMINISTRATION. In AMERICAN CAPITALISM[1] and in THE NEW INDUSTRIAL STATE[1], he offered visions of Managerial Capitalism that were sharply different from the visions offered

offered by Milton Friedman and George J. Stigler of Chicago University. But, the building blocks of Galbraith's arguments were in many ways not radically different. For example, Galbraith's argument that firms did not maximize profits but pursued goals like sales maximization, that reflected the needs of what he called the TECHNOSTRUCTURE was in line with the managerial theories of the firm of the day. But, unlike the mathematized neoclassical economists of the day, Galbraith spurned technical details and mathematical modelling, and instead chose to address general public with his works.

After the devastation of WWII, American manufacturing was in a globally dominant position. It was marked by large manufacturing plants built along FORDIST lines, with the automobile industry functioning as the paradigm. These factories were oriented towards mass production, top-down managerial control, and 'just in case' approach that demanded extra workers and inventories in case of surges in demand. The labor process was organized along TAYLORIST principles, which sought to break tasks down into smaller deskilled pieces and reorganized them in the most efficient way. The workers were gathered together in large numbers in large factories collectively represented by labor unions. Collective bargaining ensured that wages grew at a healthy pace with relatively permanent jobs, high wages, and guaranteed pensions. Meanwhile the welfare state redistributed money to those left outside the labor market.

Pre-World War II writings about management presumed managers to be completely in charge of the enterprise and knew it holistically from top to bottom, but needed to take their social duties more seriously, see how they were beholden to their fellow human beings, to society, and even more narrowly, to their customers. Most managers had worked their way through the firm, from the bottom up, as did Andrew Carnegie. This holistic style of thinking has re-emerged in the STAKEHOLDER THEORY of MANAGERIAL CAPITALISM, which sought to restore a balance between shareholders and those of the rest of the people and social institutions that interact through the firm's activities.

BIG LABOR was inducted into the system in the 1950's, with the GENERAL MOTORS formula for labor settlements. The industry price setter usually took the lead in union negotiations. Contracts would normally cover three years, and would include wage awards in line with forecasted productivity increases. Later, as inflation picked up, contracts included both the expected productivity increase plus biannual adjustments for inflation. But when productivity flattened out in the 1970's, and inflation accelerated at the same time, the companies were left with a cost problem they could not wish away.

Even contemporaries understood that the 1950's and early 1960's were something of a golden age. Most big companies became providers of pension and health benefits. For a large slice of the population, the American dream of a house with a lawn and a decent school for the kids came true. John Kenneth Galbraith's THE AFFLUENT SOCIETY [Galbraith 1960][1] in 1960 announced that the problem of production had been solved, and that it was time to focus on "expelling pain, tension, sorrow and the ubiquitous curse of ignorance".

Labor schools for Union activists flourished in the 1950s and 1960s. Most of them were run by Catholics, many at Jesuit colleges. The big industrial unions were often two-thirds Catholic. The schools taught bargaining and organization techniques, labor law, and labor economics, while extolling the "solidarist" power-sharing arrangements characteristic of Catholic Europe. Businessmen often attended the courses. Union leaders and executives began to regard themselves as industrial statesmen.

The stakeholder theory of MANAGERIAL CAPITALISM was more than a theory of how to run a company better. It had a far-reaching social and economic implications. In sharp contrasts to Milton Friedman and Michael Jensen who advocated strongly that a company succeeds simply through profit maximization, a stakeholder view emphasized the social relationships between management and employees, between the company and the community, the quality of the products produced and so on. These relationships gave the company social goals as well as financial ones. Together they can create more sustainable 'competitive advantage'. And because value is created collectively, through investments of resources by a multitude of actors, it should be also distributed more collectively, not just to the stockholders.

In contrast to stockholder value maximization and its goal of short-term profit maximization and its marginalization of human capital and research and development of ASSET MANAGER CAPITALISM, stakeholder values of MANAGERIAL CAPITALISM saw people not just as inputs but as essential contributors who need to be nurtured. Trust was then built between workers and managers, in a process that acknowledged the vital role of workers and managers in value creation. Investing in people was an admission that employees add value.

At the business schools, the reign of the big companies was taken as part of the natural order. The hot topics of the 1950s and 1960s were organization and finance, essentially rearranging furniture within the stable multi-unit enterprises of modern MANAGERIAL CAPITALISM. There was a 1960s merger movement, but it had academic, chalk-dust smell. The idea was that if companies assembled diverse portfolios of businesses, they could smooth out their earnings cycles. Absurdly, EXXON went into office equipment, bought a circus and a department store chain.

As business administration migrated to the graduate schools, executive ranks drifted farther from the shop floor. The consistent message of management textbooks from as late as the 1970s was that FORD, GENERAL MOTORS, and DuPont had written the sacred texts of production practices in the 1920s. The most important post war developments were mathematical techniques for optimizing machine maintenance and inventories. You could work on the formulas without going near a factory. Philip Mirowski in MACHINE DREAMS: ECONOMICS BECOMES A CYBORG SCIENCE [Mirowski 2002][1] traces the present-day predicaments of neoclassical economic theory to its intellectual reformulation and institutional restructuring at the COWLES COMMISSION and RAND CORPORATION with military funding and in the crucibles of WWII and the COLD WAR.

Philip Mirowski demonstrates that the mathematical economics of the postwar era was a complex response to the challenges of cyborg science, the attempt to unify the study of human beings and intelligent machines through JOHN VON NEUMAN's GENERAL THEORY OF AUTOMATA, and Sigmund Freud's PROSTHETHIC GOD. The dream of creating machines that can think has affected social sciences. He shows that what is conventionally thought to be 'history of technology' can be integrated with the history of economic ideas, focusing on the history of the computer. His analysis combines COLD WAR history with the history of the postwar economics in America, revealing that the PAX AMERICANA had much to do with the content of such abstruse and formal doctrines as linear programming and game theory.

In 1974, Congress passed the EMPLOYMENT RETIREMENT INCOME SECURITY ACT [ERISA] to tighten the ways the retirement funds are to be invested with PRUDENT MAN RULE intended to protect pension funds from unscrupulous financiers. Instead, it ensured that the funds would be used to advance the financial communities interests for it was the financial community that determined what constituted a prudent investment. "In other words, it was the deferred wages of millions of northern unionized workers that banks and the financial community used to invest in America's major corporations that, in turn, were abandoning their unionized workforces and relocating in southern right-to-work states. Millions of unionized workers' savings were being invested in companies whose explicit policies were to eliminate their very jobs, and nobody seemed to be aware of it. .... The financial community and the global companies were using .... the workers' pension capital to relocate not only to the Sunbelt but also beyond, setting up operations around the world." [Rifkin 2019 p. 151]

When a company is ahead or is chasing another without being chased by any, there is typically no need to take evasive action. With the road ahead looking promising and no one visible in the rear-view mirror, businesses take a forward-looking approach and emphasize finding good employees and keeping them for the long term. Consequently, seniority-based wages and lifetime employment are typical features of "the golden era", especially at successful companies, since such measures help maintain a stable and reliable work force. In the United States, IBM and other top companies did in fact have lifetime employment systems during "the golden era".

Like flightless birds on a predator-free island, Western companies had no defenses when hungry and hard-eyed Japanese competitors finally came hunting from Asia in the 1970s. It was a slaughter! Many in the West were shocked to find that Japanese cars required so little maintenance and so few repairs. The Germans may have invented the automobile, and Americans may have established the process by which it could be manufactured cheaply, but it was the Japanese who developed cars that did not break down. The arrival of Nikon F camera also came as an uber shock to the German camera industry in the late 1960s because it was so much more rugged, adaptable, easy to use and serviceable than German LEICAS and EXAKTAS, and professional photographers switched to the Japanese brands. For the first time since Industrial Revolution, the western business system found itself challenged by

a formidable competitor from Asia. By 1980, for all practical purposes America no longer manufactured televisions or radios, the Germans and Japanese controlled the machine tool industry, the American steel and textile industries were a catastrophe. Even IBM's mainframe computers were being challenged powerfully by AMDAHL and FUJITSU. ZENITH, MAGNAVOX and many other well-known US companies folded under the onslaught of Japanese competition.

By the end of the 1970s, the West began losing its ability to compete with Japanese firms as the latter overtook their US and European rivals in many sectors, including home appliances, shipbuilding, steel, and automobiles. This led to stagnant income growth and disappearing job opportunities for Western workers. When Japan joined the GATT in 1963, it had many tariff and non-tariff trade barriers. In other words, while Western nations had been steadily reducing their own trade barriers, they were suddenly confronted with an upstart from Asia that still had many barriers in place. But as long as Japan's maximum tariff rates were falling as negotiated and the remaining barriers applied to all GATT members equally, GATT members who had opened their markets earlier could do little under the agreement's framework to force Japan to open its market. The same problem resurfaced when China joined the WTO in 2001.

When US-Japan trade frictions began to flare up in the 1970s, however, the exchange rate response was correct. When Japanese exports to the United States outstripped US exports to Japan, there were more Japanese exporters selling dollars and buying yen and strengthening yen. Since exchange market participants in those days were mostly exporters and importers, the dollar fell from 360yen in mid-1971 to less than 200yen in 1978 in response to widening Japanese trade surpluses with the United States.

Many US and European companies added Japanese products to their product lines or sold them through their dealership starting in the 1970s. These products carried American or European brand names but were actually made in Japan. GENERAL MOTORS bought cars from TOYOTA, FORD from MAZDA, CHRYSLER from MITSUBISHI. FORD acquired a large ownership stake in MAZDA, and CHRYSLER did the same with MITSUBISHI. In Germany, LEICAS were increasingly made with MINOLTA components, and EXAKTA and CONTAX were made entirely in Japan. Japan's emergence in the 1970s shook the US and European industrial establishments. As manufacturing workers lost their jobs, ugly trade frictions ensued between Japan and the West. While Western companies at the forefront of technology continued to do well, the disappearance of many well-paying manufacturing jobs led to worsening income inequality in Western countries.

Spasmodic attempts to react to the foreign onslaught only revealed how incompetent American companies had become. During the years that Detroit was mesmerized by chrome-laden tailfins and theories of "planned obsolescence," companies like TOYOTA and VOLKSWAGEN introduced Americans to the advantages of small, well-made, fuel-efficient cars. Subcompact imports began to gain enough market share that FORD and CHEVROLET responded with small cars of their own, the PINTO and the VEGA, both introduced in 1970. When the oil price shocks hit in 1973 and small-car sales took off, the American entries were exposed as embarrassing duds. FORBES magazine later ranked them among the worst cars of all time. After SPUTNIK, all in all, Western nations' confidence that they were the world's most technically advanced economies was shattered.

After trying options from protectionism with VOLUNTARY EXPORT RESTRICTIONs and learning JAPANESE MANAGEMENT, the Western powers agreed to pressure Japan to sign the PLAZA ACCORD.

At the end of the second decade of 21st century, the average life span of a FORTUNE 500 COMPANY is around 30 years. Only 71 companies that appeared in the original FORTUNE 500 list of the biggest in 1955 were on the list in 2012. In 2019 it was reduced to 60. In 2019, in the GLOBAL 500, there were 121 companies from the United States and 129 from the People's Republic of China.

8. The money illusion

In the 1960s, the FED encouraged US banks to step up credit creation, and more euro-dollars were created, and they spilled over as foreign investment. US companies undertook large purchases of European corporations - LE DEFI AMERICAIN. In 1971, when the French realized that American Corporations bought up Europe with money created by American banks, they called the United States' bluff - $35:1 Troy ounce of 24K Gold. The French sent all those dollars that had been flooding into France, and demanded that they be converted into gold.

On August 15, 1971 the United States had to suspend the convertibility of dollars into gold. The fixed exchange rate system of BRETTON WOODS collapsed and the US dollar fell sharply on world markets, and the price of gold sky-rocketed. Edmund Safra of REPUBLIC NATIONAL BANK OF NEW YORK who amassed gold at $35 an ounce became very rich. The reserve currency of the world officially became fiat money, no longer pegged to gold. The reserve currency of the world came to be created by private bank credit, debt, and eventually, derivatives securitized by debt, more derivatives securitized by securitized-debt. And banks were allowed to trade and swap a lot of debt among themselves behind closed doors assigning values to their trades as they see fit. In 2018, the nominal value of DERIVATIVES that TOO-BIG-TO-FAIL BANKS carry as assets on their balance sheets were staggering. The nominal value of all derivatives, according to BIS, stood at $639trillion.

In the 1980s, Japanese automobile manufacturing was the envy of the world. Having mastered a suite of production processes like just-in-time inventory systems, simultaneous engineering in which the design specifications of interdependent components are worked out concurrently rather than consecutively, and mutual monitoring, Japanese firms like TOYOTA and HONDA had come to epitomize the concept of a modern lean corporation. TOYOTA, in particular, was held up to the world by management experts as a shining example of brutal efficiency cohabitating with creative flexibility. The industrial behemoth that produces TOYOTA cars and trucks is a group of roughly two hundred companies integrated by their common interest in supplying the TOYOTA itself with everything from electronic components to seat covers known as the TOYOTA PRODUCTION SYSTEM.

Companies in the group routinely exchanged personnel, shared intellectual property and assisted each other at the cost of their own time and resources, all without the requirement of formal contracts or detailed record keeping. Firms like TOYOTA that rely on networks of suppliers and subcontractors have to think of their partners' profitability rather than optimize their own short-term profitability. A network [the Japanese KEIRETSU] is a team effort, the art of building and maintaining relationships, ability to attract talent are important for network's sustainability as is its bottom line. Networks also experience a kind of inertia. Their evolution is path-dependent and often irreversible, so what happens in the early stages can be critical.

Network economics is very different from the orthodox economic theory's singular, overreaching, one-size-fits-all orthodox dogma. Unification, the search for a simple and all-encompassing theory, is the Holy Grail of science. But, the network theory suggests that in economics we need a plurality of theories for different contexts. The neoclassical theory's emphasis on competition only represents half of the story, because cooperation is not only essential for survival, but necessary for path determined existence.

According to Richard A. Werner's narrative in PRINCES OF THE YEN: JAPAN'S CENTRAL BANKERS AND THE TRANSFORMATION OF THE ECONOM [Werner,2003,2016,2018][1], and in NEW PARADIGM IN MACROECONOMICS: SOLVING THE RIDDLE OF JAPANESE MACROECONOMIC PERFORMANCE [Werner,2005][1] from the time of the MONGOLS' attempt to invade Japan in the 13th century through PERRY'S BLACK SHIPS to the PLAZA AGREEMENT, changes in Japan's economic, social, and political system have happened only three times in modern Japanese history during MEIJI PERIOD, in the late 19th century, and during WWII and Japan's defeat 74 years ago, and the 1989 crash and its longest and deepest recession that followed. In all three cases, crises triggered the change. And BoJ's reaction to PLAZA ACCORD triggered the last crisis. PLAZA ACCORD was a list drawn by the West signed by the Japanese.

The threat of colonization by foreign countries propelled the MEIJI REFORMS. THE GREAT DEPRESSION, the PACIFIC WAR, and the consequent defeat were the triggers for the second major mutation. The post war miracle of high growth was despite all its achievements, largely a quantitative change, one that took place within the unchanged economic and political institutions that had been put in place largely during WWII as an output-maximizing mobilized war economy. The third crisis was engineered by BoJ to implement PLAZA ACCORD's structural change agenda.

Once, when East was East and West was West, the chasm between them was not only geographical, but moral and historical too. ASIA was a term invented by Europeans to emphasize their own distinctiveness. To KIPLING-era imperialists, Asian societies were backward, despotic and unchanging. By contrast, Europe had made the decisive break to pursue a scientific approach to human affairs which justified Europe's domain over other continents.

Condescension was met with emulation. Since Japan's MEIJI RESTORATION in 1868, Asia modernization was long a matter of copying the West, either out of admiration for Europeans or to repel them or both. Asia's economic transformations since the second world war were partly shaped by the needs of Western markets.

The US occupation, officially in charge until 1952, implemented the US program of reeducation and democratization of the Japanese people. It provided Japan with a new constitution, political parties, free elections also for women, a market-oriented capitalist economic system. MAC ARTHUR's reforms allowed labor unions, broke up the ZAIBATSU, and introduced sweeping land reforms. It was during the war that virtually all of the characteristics of the Japanese social, economic, and political system of postwar era that later came to be called the Japanese Miracle were formed.

US occupation purged the capitalist class, the owning families of ZAIBATSUs that mainly controlled their ZAIBATSU firms through holding companies which owned the majority of ZAIBATSU firms' stock. While the capitalist families disappeared from the economic landscape their large conglomerates remained and regrouped as KEIRETSU business groups. US occupation's other major change of the economic landscape was full-scale land reform that expropriated large-scale land and redistributed among peasants purging the land owning class. Having capitalist and land owning classes purged, the US occupation put KEIRETSU managers and government bureaucrats in charge of Japan.

Freed of profit maximizing capitalists and maximum rent demanding landlords, Japan's bureaucracy, thanks to US occupation, managed to realize its wartime fantasy of managing entirely free from the profit oriented interests of individual ownership. The wartime vision of managers not aiming at profits, but their own goals, had become entrenched reality. And managers' aims are advanced best when the firm grows – growth for the glory of the nation. Labor's share of profits rose along with wages, and Japan came to be known as a middle-class country, with more than 90% of the population identifying themselves as such. Some Japanese proudly quipped in 1960s and 70s that Japan was how Communism was supposed to work. As Japan had to work out PLAZA ACCORD imposed structural changes, Taiwan, South Korea and later China emerged as serious competitors.

A mobilized MANAGERIAL CAPITALISM was established. Japan became a nation run by public and private bureaucrat-soldiers in the fight for economic supremacy. The stellar economic performance of Japan and the East Asian economies were not achieved through free markets, liberalization or deregulation policies advanced by neoclassical economics. As the WORLD BANK in 1993 recognized in its EAST ASIAN MIRACLE study, the EAST ASIAN success was due to government intervention in the form of clever institutional design and direct intervention in resource allocation especially in the credit markets. Ha-Joon Chang in GLOBALIZATION, ECONOMIC GROWTH AND THE ROLE OF THE STATE [Chang,2003][1] and in greater detail in THE EAST ASIAN DEVELOPMENT: THE MIRACLE, THE CRISIS AND THE FUTURE [Chang,2007][1] presents the historical data in the economic development model he advocates.

Until the end of the 1980s, the post war Japanese economic structure was characterized by restricted and incomplete capital markets, reliance of corporate finance on bank funding, weak stockholder influence, a large number of government regulations, direct government interference in the form of guidance, a large number of formal and informal cartels, inflexible labor markets offering full-time staff at large enterprises job security, promotion based on the seniority in terms of years spent with the firm and in-house company unions. Firms could afford to maintain cross stockholdings even if stock prices fell, because Japan was using German style book value accounting. Without pressure from stockholders, firms could plan for the long term and grow fast. Book value accounting had the additional benefit that it shielded companies from unnecessary volatility due to stock market movements and contributed to overall economic stability.

Japan, under American pressure, agreed to resolve growing trade surplus with the United States by pushing the yen higher with the PLAZA ACCORD of 1985. Dependent on America for security, Japan was constrained in its pushback. The PLAZA ACCORD also involved Britain, France, and West Germany. The countries announced that they wanted the dollar depreciate and intervened in currency markets to make it happen. Within a year the yen soared by nearly 50% against the dollar.

The PLAZA ACCORD is best understood not as a one-off event but as a critical stage in a multi-year dispute, which ranged from agriculture to electronics. America accused Japan of stealing intellectual property and plotting to control future industries. Robert Lighthizer, America's lead negotiator against China in 2019, gained his experience in Japanese-American negotiations. Back then Japan and Germany placated President Reagan's negotiators by agreeing to strengthen yen and D-mark against the dollar, making American goods a bit more competitive. Japan, in particular, was bullied into voluntarily restricting exports of from textiles to cars. More constructively, Japanese firms opened car factories in America, bringing Japanese quality management with them. But in 2019, the Chinese are not welcome to invest in America, where they stand accused of stealing technology and threatening national security. In 1990, Japan agreed to a STRUCTURAL IMPEDIMENTS INITIATIVE. America wanted Japan to improve its competition laws, open more widely to foreign investors and weaken its conglomerates, the KEIRETSU groups. Not very different from what President Trump wants from China.

ENDAKA, the strong yen, accompanied by the tight money policy of BoJ of the 1990s accelerated the shift of manufacturing units into Asia and promoted the opening up Japanese domestic economy to imports. The unprecedented shift of factories out of the Japan has virtually created a second Japan outside its borders. In financial year 1995, Japan produced more abroad than it exported from mainland Japan. ENDAKA, at the same time, boosted imports. A large part of imports was re-imports from Japanese factories that were offshored.

The PLAZA ACCORD set Japan on a path to doom. To counter the effect of strong yen, an obvious drag on exports, Japan slashed interest rates and unleashed fiscal stimulus. These moves brought about a short lived economic rebound. But they also generated asset bubbles. Stock and land prices tripled within five years after the PLAZA ACCORD. These bubbles burst and the economy slumped, never to recover its former mojo. In nominal terms Japanese stocks are, in 2019, 40% below their peak on the final trading day of 1989. The PLAZA ACCORD did succeed in defusing tensions between the second largest economy, Japan, and America by neutering Japan as a challenger. In 2018, the Japanese were worried about income inequality as high paying manufacturing jobs have migrated to lower-wage countries. The Japanese are more concerned about the emergence of the so-called "working poor" who were once employed in manufacturing but have now been forced to take low-paying service jobs. Estimates are 20million out of a total population of 130million are living in poverty in 2019. Japan in 1990s has entered an import-led globalization phase and is reliving the West's experiences of 1970s when Japan's MANAGERIAL CAPITALISM's spectacular success was the enabler of America's ASSET MANAGER CAPITALISM. How America dealt with LE DEFI JAPONAIS has percolated into official thinking in China in the last half of the second decade of the 21st century.

The sequence of Japan's woes does seem to make for damning indictment. But a close look at each step shows that they were not preordained. One point, clear in retrospect, is that under American pressure without European support Japan overcompensated for the slowdown in exports. Within 18 months of the PLAZA ACCORD, BoJ had cut benchmark interest rates from 5% to 2.5%. It also announced a big stimulus package, increasing government spending and cutting taxes in May 1987, though by then its recovery was already under way. It did not shift gears and raise rates again until 1989, when its asset bubbles were already a few years old.

There were at least two other factors that could have led to a different outcome. Excessive stimulus, by itself, did not guarantee that Japan would suffer an asset bubble. But, BoJ's credit expansion became much more effective when it was combined with financial deregulation, which led banks to lend more to property developers and home buyers. Guided cheap credit expansion is the recipe to inflate bubbles. Greenspan must have taken notice.

The bursting of the double bubbles did not guarantee that Japan would suffer a lost decade, let alone three. A confusingly sluggish response by regulators compounded the trouble. Rather than pushing banks to raise capital as post 2008 Western regulators did, they encouraged them to go on lending to zombie firms, perhaps to share to costs of the double real and financial assets' crashes.

The domestic economy changed after the offshoring of factories and the influx of manufactured goods. In order to compete with rising imports, firms had to lower prices, reduce inefficiencies, and increase productivity.

Employment practices had to change and consumer preferences had to be taken more seriously. In April 1995, double crisis of economic slump and the shock of yen at 80 yen to a dollar convinced even the conservatives that Japan had to deregulate. All the barriers against foreign firms came down. As Japan shifted its economic system to ASSET MANAGER CAPIITALISM, the center of the economy moved from main-banks to stock markets. Since mid-1994, the Japanese service sector employed more people than the manufacturing sector.

Japanese MANAGERIAL CAPITALISM without capitalists had become increasingly embattled during the 1990s. The collapse of stock market bubble ensuing the credit crunch engineered by BoJ forced many companies to sell off cross stockholdings that had been created during the war, ZIBATSUs and in the postwar era, KEIRETSUs. NIKKEI 225 index closing at a twenty-year low on the last day of 2002 provided foreign investors with the opportunity to buy the ownership of Japanese companies. In March 1999, the share of stocks listed on the TOKYO STOCK EXCHANGE that were owned by foreigners reached a postwar record high of 14.1%. By March 2001, it had risen to 18.3%, a long way above the 2.8% recorded in 1978.

Mark-to-market accounting was adopted by the Ministry of Finance in 2001 speeding the transformation away from the corporate governance of MANAGERIAL CAPITAISM to corporate governance of ASSET MANAGER CAPITALISM. By 2005, the corporate governance landscape was reshaped, making main-bank system history. KEIRETSU's cross stockholdings have become exception, not the rule, it was before the crash. As a result, accountability to shareholders became a reality for the first time since the 1920s. Corporate management became increasingly profit oriented and companies are run for stockholders' wealth maximization not managers' and employees' income maximization.

In other EAST ASIAN countries there were close similarities, some were put in place already under Japanese colonial rule. The phenomenal growth of the Chinese economy since 1980 has also occurred without the benefits of the free market model of neoclassical economics.

The main reason why the extraordinary nature of Japan's MANAGERIAL CAPITALISM is unknown in the MBA programs these days is the a-historic and usually counterfactual approach of neoclassical economic theory. History provides data set for the scientific economists to study. Ignoring history means neglecting the facts. The peacetime war economy of Japan's MANAGERIAL CAPITALISM was highly successful, actually by many measurements the most in the world. In the 1950s and 1960s, Japan expanded continuously at double-digit growth rates. From 1960 to 1970, Japan's real GDP rose from 71.6trillion yen to 188.3trillion – up 2.6 times. Japan overtook Germany to become the second economic power in the world reducing the world's and especially American tolerance of Japan's highly successful economic system.

After 20 years of almost continuous double-digit growth, the real GDP growth suddenly contracted in 1974. The recession lasted longer and was more severe than had been anticipated. The necessary and sufficient condition for economic recovery was an increase in credit growth. Many studies concluded that Japan would not be able to maintain the historical growth rates mainly based on exports. It would have to revamp its economy. Thus, the events of the 1970s were more than a wake-up call and a test run for BANK OF JAPAN.

It cannot be denied that BoJ had gained valuable experience in the mechanics of the creation and propagation of a real estate based credit boom and the collapse that must follow. To cope with the aftermath of 8/15/1971 NIXON's unilateral decision that ended the BRETTON WOODS fixed exchange regime, BoJ bought a lot of yen and domestic financial assets with the newly created money. Already flush in liquidity for productive projects, the firms used the increased bank loans to embark on speculative land purchases. Urban land prices jumped by more than 50% from 1972 to 1974. BoJ induced credit boom was large enough to spill over from asset markets to real economy. All this happened before the oil shock of November 1973.

From mid-1980s until the end of the decade, Japanese foreign investments dominated international capital flows. Japanese long-term capital flows multiplied from a net inflow of more than $2billion in 1980 to an outflow of nearly $10billion in 1981 to reach $65billion in 1985, $132billion in 1986, and $137billion in 1987. Japan was purchasing far more assets abroad than it could afford due to its exports. To fund its international shopping spree in the 1980s, Japan actually had to borrow foreign currency. Japan created new hot money and then bought up the world. Despite the enormous capital outflow, the yen did not weaken. To the contrary, it rose 106% from 1985 to 1987. And in the West, management gurus urged business leaders to adopt Japanese techniques as the last resort to withstand LE DEFI JAPONAIS.

Japan pulled off the same strategy corporate America used in the 1950s and 1960s, when US banks excessively created dollars, Eurodollars. Corporate America used Eurodollars, hot money of the day, to buy up European companies. While the United States had the cover of the dollar standard, [$35:1 Troy ounce of 24karat gold] Japan's cover was its significant trade surpluses, which was enough to convince observers that the yen had to be strong. As the yen did not weaken, the world suffered from the biggest bout of illusion on record. The great yen illusion.

Approximately 40% of the cumulative value of Japanese overseas investments were wiped out in yen terms between January of 1985 and January of 1987. Despite the losses, Japanese investors continued to invest in sizable amounts in US and other foreign assets. This anomaly persisted over several years despite the fact that the intention of the PLAZA ACCORD – namely to strengthen the yen – was not in doubt. In 1991, as Japanese current account was heading for new record surpluses, topping $90billion, net long-term capital outflows had suddenly vanished. Japan remained a net seller of foreign assets throughout 1991. With increasing losses on their foreign investments, it had become apparent that Japanese corporations, and particular the country's financial institutions, had not invested to make profits.

"Japan's economic rise during the 1980s provides one of the best examples of exponential growth. … After growing 2,6 times during the 1970s, when the US economy endured its lost decade, NIKKEI 225 increased by 184% between January 1981 and 1986, , almost 43% in 1986, nearly 13% in 1987, almost 43% in 1988, and a further 29% in 1989. Between January 1981 and December 1989, NIKKEI 225 had more than quintupled, the performance corresponding to average annual exponential growth of 17% for the decade and 24% for its second half. Concurrently, Japan's GDP kept on growing at an annual rate surpassing 4%, as the yen's exchange rate strengthened from 238Yen/US$ in January 1980 to 143Yen/US$ by December 1989." summarized Vaclav Smil in GROWTH: FROM MICROORGANISMS TO MEGACITIES [Massachusetts Institute of Technology 2019 p.23][1]

The crisis of 1990 has spelled the end of Japanese miracle model. Japan in the 21st century is again in the process of switching to a fundamentally different form of economic organization, namely, an ASSET MANAGER CAPITALISM. Few were and are aware of the fact that in 1920s Japan's economy in many ways looked a lot more like pre-GREAT DEPRESSION US economy, FINANCIAL CAPITALISM.

Transformation of Japan's economic system was no small undertaking. The war economy system internally consistent and permeated all sectors and levels of the economy and even society. It had shaped the labor market, the capital market, the corporate governance structure, the legal system and the behavior of firms, government bureaucrats, and politicians as ordinary people. To change Japan, it seemed, one need to change everything. Only if one abandoned all features of the old system would it be possible to create a different economic structure. The Japanese needed to be made conscious of the need for such a historically unprecedented transformation. They needed an unprecedented peace time crisis. Two asset bubbles and their bust. BoJ delivered them all

9. Financialization in the age of baby boom

The complacent incompetence of American business was bad enough, but with the demographic tides they were a double whammy. Ask an economist about the 1970's plunge in American productivity, and he will point to the fall off in investment. Possibly, some executives were slothful and incompetent, but rising inflation and interest rates made capital very expensive. On the other hand, a demographer would point to an upsurge in young workers. People in the BABY BOOM GENERATION entered their twenties in the 1970s, creating downward pressure on wages. "When workers are cheap and capital expensive, it is sensible to reduce investment." claimed orthodox economists, but the Chinese mandarins disagreed and achieved highest growth rates per annum for their economy by investing more than half of their GDP in most years in the last two decades of the 20th century. So great was the overhang of Chinese mandarins' investment strategy in manufacturing sector that by the second decade of the 21st century Chinese companies' prices have become global prices.

The baby boom illustrates the impact of marginal changes in a population

cohort. Eighteen-to twenty-four-year-olds were 4.3% of the population in 1960, and 5.6% of the population in 1970, which looks like only modest change. But the total numbers of eighteen-to twenty-four-year-olds jumped by about 50%, from 7.6 million to 11.4 million, and that was utterly disruptive.

Richard A. Easterlin [2004][1], who wrote one of the earliest and thorough analyses of the boomer phenomena, emphasized the size of a birth cohort compared to the one just before. Birth rates dropped sharply during the Depression years, so the generation of men entering the labor market in the 1950s was an unusually small one and was much in demand. The pay gap between young workers and older workers, therefore became unusually narrow, facilitating early marriage and greater economic security also made couples more willing to have children. In Easterlin's formulation, the cohort changes became self-amplifying.

Sometime in the mid-1950s, however, the amplifying mechanisms began tilting toward disruption. When the boomers reached school age, elementary schools everywhere were forced onto double and triple sessions. It was even worse in the suburbs, where schools had to be built from scratch. As they hit their teens, juvenile delinquency moved to the top of the social agenda. Struggling to cope, police forces became more selective about the behaviors that elicited an intervention, a process that Daniel Patrick Moynihan later called "defining deviance down."

When Reagan took office in 1981 and Paul Volcker launched his assault on inflation, the great American industrial firms built during the halcyon years from the 1940 to 1960s were already intrinsically vulnerable. MONETARISM would in effect, blow them apart, for the double digit interest rates Volcker and Reagan brought on in 1981 had three catastrophic effects on these sectors. First, it destroyed their export markets, sending economies in Latin America, Africa, and parts of Asia into a tailspin from which they could not recover, in some cases, for twenty years. Second, the recession destroyed, though more briefly, their home markets. Thirdly, the interest rates drove up the value of the dollar, by around 60% in relation to the U.S. trading partners.

Those who could still purchase equipment could get it at lower price from Japan or Germany, from KOMATSU or SIEMENS rather than CATERPILLAR or INTERNATIONAL HARVESTER or ALLIS-CHALMERS. The great American Industrial belt and the labor unions it housed were kicked to pieces. And the process of dismantling of the institutions of the NEW DEAL began in the United States.

By the midpoint of the Reagan era, many large corporations had been bankrupted by high interest rates, the ensuing recession in 1981 and 1982, and the competitive boost that the high dollar gave to competing industries in Japan and Europe. A major reorganization of the most technologically advanced sectors took place. Technology wizards left the large integrated companies to form their own start-ups in Silicon Valley and Seattle. In the 1990s and after, what remained of some of America's once great industrial and technical firms would fall victim to new waves of financial fraud. Plainly, the great American corporation was neither permanent nor invincible. Many that taught at business schools in early 1980s in America basically decided to pretend that the demise of large corporations had its roots in bad macro management and government's regulatory interferences with the market.

"Government was the cause", President REAGAN assured "not the corporations' market power". The business school mantra asserted that the presence of the Japanese and Germans on the world stage meant that there was competition after all without specifying the two systems' different structures and macro policies. Power dispersed in several directions. Some of it went to technologists, as they set off to California and Washington to establish their own independent companies, transforming the large integrated enterprises from producers to consumers of scientific and technical research. Some of it went to asset managers of hedge funds and private equity groups concentrated in Manhattan and London, who came to reassert their own standards of financial performance on large companies, at the risk of a disciplinary raid and hostile acquisition. Some of it was lost overseas, to the encroaching enterprises of Europe and Japan. Some of it devolved unto members of the chief executive class, previously subordinate in practice to the techno-structure.

These four phenomena, the rise of international trade , the reassertion of financial power, the outsourcing of technological development, and the ascendance of an oligarchy in the executive class that coupled with Reagan's and Thatcher's deregulations over the last two decades of the twentieth century had dramatic effects on American corporations, on the way they are run and on their broadly declining position in the world.

The decline of national industrial corporations in the United States can be seen in part as a process of dispersion of the techno-structure's power. This occurred partly in response to growing global competition, partly following a countercoup of asset managers from the world of international finance, partly in response to a change in the organization of technology, and partly as the result of the rise of a class of oligarchs, the new CEO's who became once again an autonomous force in the life of companies they oversaw.

The high interest rates of the 1980s, cost of funds, became a predominant consideration for the survival of the enterprise. Reagan's monetarism thus made the industrial firm dependent on its source of finance. It re-established the preeminent power of financial institutions in the United States. Wall Street was put back in charge. Mutual funds sprang up, allowing ordinary baby boomers to pool resources and have access to "professional" investment managers. A constant stream of money from pension contributions and shift of savings from bank accounts to mutual funds helped investment markets to grow. A modern fund management was born, ASSET MANAGER CAPITALISM. Insurance companies reengineered themselves into wealth managers. QUANTITATIVE FINANCE was born with four key principles for fund management. Harry Markowitz's DIVERSIFICATION, Eugene Fama's EFFICIENT MARKETS, MEAN/VARIANCE which estimated risk as standard deviation or variance as measure of volatility, and William Sharpe's CAPITAL ASSETS' PRICING MODEL that concluded: "if you took more risk then you needed higher returns." Old time investors cried with joy. They had been doing CAPMs without knowing it.

CAPM assumes that all investors hold portfolios of stocks that optimize the trade-off between risks and returns. If everyone in the market owns such portfolios, they can then be combined to create market portfolio. The risk of an individual stock is then measured relative to the theoretical market portfolio. Thus risk factor, known as beta, is then used to calculate the cost of equity, or the return that stockholders need to receive to make the risk worthwhile. The problem is that implementing CAPM is virtually impossible, because the theory assumes perfect information on company risk, an unlimited ability to sell stocks short, and the same time horizon for all investors. In addition, because risk and return profiles change, the market portfolio must be continuously upgraded which in reality involve significant transaction costs. The asset managers tend to be evaluated against S&P 500 or FTSE 100. Furthermore, evidence shows that asset managers 'chase returns' rather than optimize risk-return trade-offs in the CAPM assumes.

The assumption that the market behaves like a collection of independent, perfectly informed individuals was originally adopted in order to aid computation, but has turned out to be a persistent feature of orthodox economics. In 1965, 100 years after Jevons wrote his THEORY OF POLITICAL ECONOMY, Eugene Fama presented the EFFICIENT MARKET HYPOTHESIS. Echoing JEVONS, Fama imagined a market where there are a large numbers of rational profit maximizers actively competing, with each trying to predict future market values of individual securities and where important current information is almost freely available to all participants.

Fama's hypothesis was that such a market would efficiently allocate resources, and allocate financial risks towards economic entities that are most able to bear them. The efficient market hypothesis also states that market mechanisms tend to self-correct and eliminate any disequilibrium such as bubbles or crashes. Fama's hypothesis has been at the core of financial regulation over the past 40 years. The 2005 BASEL ACCORD of BANK OF INTERNATIONAL SETTLEMENT emphasized market discipline and self-regulation of large banks as core pillars of international financial regulation, and still does when many regard the EFFICIENT MARKET HYPOTHESIS as a myth born of NEWTONIAN theories of equilibrium and BACHELIER's random walk.

Orthodox economics assumes the market is made up of free individuals, who interact only to maximize their own utility, and that the economy can be modelled by aggregating over these individuals. Network theory, on the other hand, instead of seeing a group of people as nothing but a collection of individuals that act independently of one another, focuses on relationships between them. By analyzing the dynamics that occur during a period of relative economic stability, we will try to understand why and how market forces actually lead to financial instability rather than equilibrium that efficient market hypothesis professes.

Since the 19th century, the economy had been viewed as an essentially static system, which when perturbed from the outside by external events,

automatically self-adjusted to get back to its optimal equilibrium. Of course there is a constant supply of news to be assimilated, so the market never quite settles, but at any single moment it is nearly in a state of perfect balance. Since news is random and unexpected, it follows that price fluctuations, too, should be random – like the toss of a dice, or a draw from a pack of cards. One could not say whether its next move would be up or down for sure. However, as LOUIS BACHELIER argued in his 1900 dissertation THEORIE DE LA SPECULATION, the market's behavior was essentially random and it was "impossible to hope for mathematical forecasting" although it was still possible to calculate the odds using the laws of chance. If one assumed price changes were the result of many independent fluctuations, each with the same probability distribution, then they should follow the familiar normal, or bell-curve, distribution.

Mathematicians and physicists had already constructed sophisticated techniques for dealing with randomness. Application of these methods became known as ZAITEKU in Japan FINANCIAL ENGINEERING in the West. The reason we cannot predict the economy not because the market is irrational, but because it is too rational, FAMA argued. FAMA and BACHELIER seemingly argued for very similar conclusions. Their difference was that BACHELIER, 65 years earlier, saw the market as impenetrable to reason, while FAMA saw it as being itself the reason. The market was the sum total of "many intelligent participants", so its collective wisdom was greater than that of any one person. FAMA's thesis was based on empirical evidence, which showed that economic forecasters were consistently unable to predict market movements.

Benoit Mandelbrot in FRACTALS AND SCALING IN FINANCE: DISCONTINUITY, CONCENTRATION, RISK [Mandelbrot,1997][1] and in THE [MIS]BEHAVIOR OF MARKET: A FRACTAL VIEW OF RISK, RUIN, AND REWARD [Mandelbrot,2004][1] with R. I. Hudson in four strokes falsified the random-walk hypothesis. 1. There were more extreme price swings than random walk would predict because the data had much fatter tails than a bell-shaped curve had. 2. The extreme events were in fact quite extreme; large proportion of the total variance was explained by just a few violent price movements. 3. There appeared to be some clustering of price movements in time, a pattern punctuated equilibrium. 4. The statistics describing the data were not stationary as the random walk predicted, but changed over time. Not only did Mandelbrot falsified the random walk hypothesis, but he also proposed an alternative. Power law neatly explained the fat tails and extreme volatility of price movements that EFFICIENT MARKET HYPOTHESIS could not explain. Mandelbrot described the market prices as having fractal geometry.

David Orrell in TRUTH OR BEAUTY: SCIENCE AND THE QUEST FOR ORDER [Orrell,2012] observes: "Rational economic man reached his highest state of perfection with THE RATIONAL EXPECTATIONS THEORY of ROBERT LUCAS. This assumed not only that market participants were rational but also that they had a perfect model of the economy in their head, in the sense that they did not make systematic errors. As with the efficient market hypothesis, the theory assumed that markets were at static equilibrium. If prices were too high or too low that would imply that people were not being rational." [Orrell,2012 229] RATIONAL EXPECTATIONS does not imply that agents never make mistakes. Agents may make mistakes on occasion. But these mistakes are only random, so each agent is correct on average over time, and, at each point in time the aggregate decisions of a large pool of agents are rational.

In technical terms LUCAS defined expectations as the mean of a distribution of a random variable. As the number of observations increases, the distribution resembles a bell curve, a normal distribution, and the expectation coincides with the peak of the curve, the average of the observations. Similarly, the error or random events causing these errors adhere to the bell-shaped distribution, but their mean/expectation is zero. RATIONAL EXPECTATIONS HYPOTHESIS assumes that agents are rational and equipped with the same information and preferences, and treats the economy as the outcome of the decisions of only one individual, the REPRESENTATIVE AGENT. Agents who are identical in terms of their rationality, information sets and preferences will take identical decisions. So analyzing their decisions as a group is equivalent to analyzing their independent decisions. Therefore, mathematically, instead of maximizing the sum utility functions, you just have to maximize one utility function.

David Orrell points out that "The idea of rational behavior was also given a credibility boost in the 1970s by Richard Dawkins, who provided a link between genetics and natural selection. As he wrote in THE SELFISH GENE [Dawkins,1989][1], "If you look at the way natural selection works, it seems to follow that anything that has evolved by natural selection should be selfish." We are rational, utility maximizing machines because our genes are."[Orrell,2012 p.229] An implication of this was that economic success reflected superior genes. This is the core concept of "a chicken is just an egg's way of making another egg" – the organism is just a vehicle for the genome to be replicated in the next generation, and behavior is just this wispy epiphenomenon that facilitates the replication.

This gene-centered view can be divided in two. One is that the genome [i.e., collection of all the genes, regulatory elements, and so on] is the best level to think about things. The more radical view held by Dawkins, is that the most appropriate level is that of individual genes – [i.e., selfish genes], rather than selfish genomes. Moreover, most evolution historically took place in microorganisms and has involved a process called endosymbiosis, in which species exchange components or come together to form new species. Furthermore, biological systems have a remarkable capacity for self-organization in which highly organized can emerge without any planning or selection. Complexity scientists see patterns of nature emerging from internal dynamics, rather than just natural selection.

Dawkins emphasis on mutations and the survival of the fittest is consistent with the idea, going back to Democritus, that the world is determined by the random shuffling of the atoms. "Everything existing in the universe is the fruit of chance and necessity." But the random mutation and selection are clearly important drivers of evolution that does not grant them exclusivity. The difference between the mainstream reductionist approach and the complexity approach is revealing.

According to biologists the existence of any species is an accident, and its continued survival is always subject to cancellation by the all-powerful process of random mutation and natural selection as it occurs anywhere in the interdependent ecosystem. This blind process, overlong time periods, is held to explain not only the evolution of all living things from a presumed common ancestor, but also, in some versions, the spontaneous generation of the common ancestor itself from the primordial chemical soup. For human beings in particular, random mutation and natural selection are thought to determine not only such characteristics as eye color and height, but also intelligence, consciousness, morality, and capacity for rational thought. Neo-Darwinist theory has been extrapolated from a good explanation of many facts to the universal explanation of everything. Powerful though it certainly is, the neo-Darwinist theory cannot explain consciousness and purpose.

One cannot rescue neo-Darwinist theory from the domain of purposeless and randomness by pointing to the role of natural selection. Selection may sound purposeful, but in the accepted theory of natural selection chance dominates. Random mutation provides the menu from which natural selection chooses by the criterion of the odds of surviving and reproducing in a randomly changing environment. Economists do not go to tjev extreme of denying the existence of purpose. Economists recognize purpose in attenuated form under the rubric of individual preferences and do not generally consider them to be illusory. However, preferences are thought to be purely subjective, so that one person's preferences are as good as another's. Purpose has not been excluded, just reduced to the level of tastes.

Kate Raworth in DOUGHNUT ECONOMICS: 7 WAYS TO THINK LIKE A 21ST CENTURY ECONOMIST [Raworth,2017][1] calls for replacement of HOMO ECONOMICUS with more complex portrait of human behavior: First, rather than narrowly self-interested, we are social and reciprocating. Second, in place of fixed preferences, we have fluid values. Third instead of isolated, we are interdependent. Fourth, rather than calculate, we usually approximate. Fifth, far from having dominion over nature, we are deeply embedded in the web of life. The appropriate framework for sketching this portrait in mathematical terms seems to be quantum formalism.

The claim that investors cannot beat the market is the colloquial form of the more formal Effıcıent Market Hypothesıs, [EMH]. This hypothesis like most tenets modern financial theory, is only loosely related to reality, yet hold a powerful sway over academic economists and Wall Street. EMH claims that markets are highly efficient at incorporating new information into prices. If a company announces disappointing earnings, the market instantaneously marks down that company's stock price to reflect the new earnings outlook. It is simply the case that a single investor cannot benefit from the news in ways

that beat other investors. An investor can win or lose, but cannot outperform. If markets were efficient at incorporating new information as the hypothesis requires, there would be no flash crashes, panics, manias, or bubbles. Yet those events happen.

EMH exists in so-called weak, semi-strong and strong forms. The weak form tests our ability to beat the market using historical prices and returns only. Few analysts confine themselves to so little information. Research just outside these narrow bounds should produce superior returns. The semi-strong form takes into account historical prices and returns plus all public information. That sets a high bar for investors who try to outperform. The strong form includes all information, historical, public, and private. Yet no single investor could possibly have all the private information. That is what makes it private.

The main problem with EFFICIENT MARKET HYPOTHESIS is the notion of "intrinsic value". The theory was born out of the neoclassical belief that the economy has some kind of stable equilibrium – a unique set of prices that perfectly matches buyers and sellers. For a dynamic system such as the economy, there is no requirement that an equilibrium point even exist. The stable point was a mathematical convenience, modeled by 19th century economists after the physics of their time. Viewed in this way, it seems bizarre that unpredictability could somehow be taken as a sign of efficiency and rationality. The reason investors cannot accurately predict fluctuations in the price of gold is not because they cannot determine the substance's intrinsic value. It is because intrinsic value does not exist. The price of an asset reflects the market's consensus about its future value, which is highly variable and prone to all sorts of forces, including irrational ones.

One area where advanced mathematical techniques have been enthusiastically adopted is the proprietary statistical algorithms used by quantitative traders who are often mathematicians or physicists by training at banks and hedge funds. Analysts scour financial data for subtle but persistent patterns for a while that, according to efficient market theory, should not exist, and use them to devise trading strategies. Thriving through leverage and arbitrage, fast trading and risk shuffling, the traders in the major banks have long had access to virtually unlimited funds at near-zero interest rates after 2008 crisis, while the TREASURY and FED anointed most of them as TOO-BIG-TO-FAIL.

In effect the federal government, through FED and scores of other regulators, has socialized the downside of these institutions, enabling them to carry on what they call CREATIVE RISK TAKING. With zero-interest money from FED, the TOO-BIG-TO-FAIL banks bought trillions of dollars' worth of government bonds, and expropriated the spread. Zero interest rates resulted in easy money for highly leveraged WALL STREET speculators, cheap money for the government, but a barren credit landscape for entrepreneurial small businesses. Some 2,600 community banks went out of business. It seemed they were TOO-SMALL-TO-BAIL.

Although EFFICIENT MARKET HYPOTHESIS may not be good science, financial markets are evolutionary systems. Markets are social technology devised for integrating the views of large numbers of people to put prices on complex assets, and allocate capital, not to best use at times and very expensively. The competitive intensity of markets ensures that they are fast at processing information, and that there is pressure on their participants to continuously innovate. Andrew Lo in ADAPTIVE MARKETS: FINANCIAL EVOLUTION AT THE SPEED OF THOUGHT [Princeton University Press, 2014][1] calls the evolutionary effectiveness of markets ADAPTIVE MARKET HYPOTHESIS and argues that the theory of market efficiency is not wrong, but incomplete. Andrew Lo's paradigm explains how financial evolution shapes behavior and markets at the speed of thought revealed by swings of stability and crisis, profits and loss, and innovation and regulation.

The genius of EFFICIENT MARKET HYPOTHESIS was the way it co-opted the mantras of economic theory, "efficiency" and "rational", to free markets. The equations showed why free markets were so good at setting prices and creating wealth. They also rationalized away problems such as the unequal distribution of riches. Because the markets were rational and efficient, it followed that everything companies or individuals did was in the best interest of society, even if it did not look that way. Anything that impeded its workings, such as government regulation or unions or anti-globalization movements, was by definition inefficient and irrational. But the EFFICIENT MARKET HYPOTHESIS only predicts that we cannot predict, thus providing a convenient explanation for missed forecasts like the 2008 Fınancıal Crisis.

In 1974, PAUL SAMUELSON canonized FAMA's EFFICIENT MARKET HYPOTHESIS by suggesting that most stock-pickers should go out of business, for even the best of them could not always beat the market average. In line with his suggestions, the following year, VANGUARD launched an index fund for retail investors. It was not eagerly received, only raising $17million by 1980. WALL STREET propaganda machine denounced it "un-American". Index investing has prospered lately in the last two decades. Index funds have grown around 6 times faster than those managed by active fund managers who select stocks to buy and sell. Many investors get the average stock market returns for a fee of .03%.

SAMUELSON's case for an indexed fund is grounded in the idea that stock markets are "efficient". Any relevant news about a company's prospects is quickly reflected in its stock price. If there were obvious bargains, a little effort would reward the attentive at the expense of slothful investors. But, if more people are buying the index, might it become "deficient"? And might that, in turn, create opportunities for the very stock-pickers who SAMUELSON suggested should cease trading? In fact, the opposite is more likely. If index investing has displaced bad stock-pickers, it will have made the market more "efficient", not less.

The whole is the sum of its part, a tautology, is essential to an understanding of why this is so. With index investing the average investor can do as well as the stock market average. For some investors to beat the market, others must be beaten by it. Stock-pickers go to great pains to gather facts, to assess them and to trade them. In spite of the fact that the performance of most mutual funds does not justify these costs, the turnover of stocks has actually increased over time. Active investors are more active than ever. Another supportive observation of financialization.

The result, much applauded in business schools, was the rise of "stockholders' wealth maximization" as raison d'etre of corporations, and "short termism" as the emergent phenomena, at the top of the corporation. Financial targets were set and had to be met, whatever their implications for the long term viability of the enterprise. A company that failed to do so could be punished by a declining stock price and, ultimately, the discipline of a hostile takeover, followed by aggressive disruption of the techno-structure. The situation greatly favored the emergence of firms that, unlike the integrated industrial behemoths of the 1950s and 1960s, were purely focused on advanced technology. It is no surprise that high technology elements tended to separate from the large corporation, leading to the emergence of a separate technology sector in the 1990s, the platform company.

Most CEOs are criticized for being slaves to short-term profit targets. Yet few flout the orthodoxy in flamboyant fashion. Consider TESLA, a maker of electric cars. By September in 2017, it missed its production targets and lost $1.86billion of its free cash flow, the money firms generate after capital investment has been subtracted. No matter. When Elon Musk, its founder, muses aloud about driverless cars, space travel, TESLA's stocks rise. 66% since January to October 2017. AMAZON lost $4billion between 2012 and 2014 without being punished by the stock markets. Only 25, or 3.3%, of the Russell 1000 index of large American firms lost over $1billion free cash flow in 2016. In 2007 the share was 1.4%, and in 1997, under 1%. In 2017, NETFLIX and UBER are the other billion-dollar losing tech companies that claim their, so far unproven business models, will transform industries. The other $billion losers were energy companies in the doldrums as they adjusted to the plunge in oil prices. CHESAPEAKE ENERGY has lost at least $1billion of free cash flow a year for 14 years in a row. NEXTERA ENERGY managed 12 rears on the trot. Collectively, TESLA, UBER, NETFLIX, CHESAPEAKE ENERGY and NEXTERA ENERGY have burned $100billion in the past decade, yet they boast a total market value of about $300billion.

DuPont, on the other hand, grew from a start-up gunpowder maker in 1802 to a major global chemical, materials and life sciences company that has endured for over 2 centuries with more than 60,000 employees in 2005 and $27billion in revenue underperformed the broad market indices for much of its history. DuPont's management's focus had been on the endurance of the firm, not on short-term stockholders' wealth. Apple Inc. is different. In the spring of 2013, Tim Cooks, the company's CEO decided to borrow $17billion, when it already had $145billion sitting in the banks outside of the US, with another $3billion in profits in every month, for buy-backs to goose the company's lagging stock price. The tactic worked. The stock soared, making Apple the biggest according to market capitalization and yielding hundreds of millions of dollars in paper wealth for Apple' board members who approved

the tactic and for the company's stockholders of whom Tim Cook is one of the largest. APPLE seemed to have applied same level of creativity in financially engineering its balance sheet as it did engineering its products.

One of the quandaries of the last three decades has been the way in which reductions in spending on research and development have coincided with an increasing financialization of the private sector. While causality may be hard to ascertain that will meet Judea Pearl and Dana Mackenzie's expectation they explain in THE BOOK OF WHY: THE NEW SCIENCE OF CAUSE AND EFFECT [Pearl and Mackenzie,2018][1] , it cannot be denied that at the same time that private pharma companies have been reducing their research and development budgets, they have been increasing the amount of funds used to repurchase their own stocks, seemingly to boost their stock price, which affects the price of stock options and executive pay linked to such options. In 2011, along with $6.2billion paid in dividends, PFIZER repurchased $9billion in stock, equivalent to 90% of its net income and 99% of its research and development expenditures. AMGEN, the biggest biopharma company, has repurchased stock every year since 1992, for a total of $4.2billion through 2001, including $8.3billion in 2011. Since 2002 the cost of AMGEN's stock repurchases has surpassed the company's research and development expenditures every year except 2004, and for the period 1992-2011 it was equal to fully 115% of research and development outlays and 113% of net income[1]. Boosting stock prices does not create value, but facilitates extraction, rewarding stockholders and executives. The problem of stock buybacks is not isolated but rampant. In the last decade, S&P 500 companies have spent $3trillion on buybacks.

William Lazonick in SUSTAINABLE PROSPERITY IN THE NEW ECONOMY: BUSINESS ORGANIZATION AND THE HIGH-TECH EMPLOYMENT IN THE UNITED STATES [Lazonick,2009][1] chronicling stock buyback identifies two trends, when taken together, as a shift from a model of 'Retain and Invest" to "Downsize and Distribute". "Retain and Invest" strategy uses finance only to set up a company and start production. Once profits are being made loans are likely to be at least partly repaid because retained earnings are a cheap way of financing the next production cycle and investments to expand market share. "Downsize and Distribute" is different. It views companies merely as "cash cows" whose least productive branches have to be sold. The resulting revenue then distributed to managers and stockholders, rather than to others such as workers who have also contributed and are contributing to the business. The results may hamper the growth of the company. If the stockholders are happy, however, the strategy is justified.

Perversely it was the conservative Japanese who took trading within corporations to a new level. They were slavish lovers of American management theory. They had used the work of FREDERICK TAYLOR and EDWARD DEMING to revolutionize manufacturing. TOTAL QUALITY MANAGEMENT, JUST-IN-TIME and ZERO DEFECT. They would do the same with financial management. This was ZAITEC or ZAITEKU, financial engineering. The treasury, the financial function within companies, was to be a profit center. ZAITEKU meant trading in financial instruments to earn revenues for the company. Banks used corporate business to trade and make profits so corporations could use their own flows to make money as well. In management jargon, it was "internalization".

Japanese corporations embraced ZAITEKU with a passion. Following the PLAZA ACCORD in 1985, the yen appreciated, creating havoc among Japanese exporters who had come to rely on the cheap currency. The shift meant that these exporters had to change strategy, which in most cases meant moving production facilities offshore. Unfortunately, one cannot move a car plant to Ohio overnight. Japanese companies tried to use ZAITEKU to generate earnings to cover up the weak profitability of the main businesses. Japanese corporations traded foreign exchange, bonds, commodities, and even equities. Derivatives with their leverage and off-balance sheet nature, were ideal.

In 1967 Sheen Kassouf and Edward O. Thorp in Beat The Market: A Scıentıfıc Stock Market System [Kassouf and Thorp,1967][1] explained how to price convertible bonds which are hybrid securities made up of a bond, which pays a regular interest payment, and those thinly traded warrants, which give the owner the right to convert the security to stock [hence the name of the bonds]. Pricing a warrant was a difficult task, since its value depends on forecasting the likely price of the underlying stock at some future date. The system Thorp and Kassouf devised helped them make predictions about the future course of stock prices, and enabling them to discover which convertible bonds were mispriced. The future movement of a stock, a variable known as "volatility" is random, and therefore quantifiable. And if the warrant is priced in a way that underestimates, or overestimates, from its likely volatility, money can be made. THORP and KASSOUF were the first to devise a quantitative method to discover valuation metrics for warrants, as well as correlations between how much stock investors should hold to hedge their position in those warrants. Over time, this way of arbitraging came to be called DELTA HEDGING.

The most famous form of ZAITEKU was the "Japanese warrants arbitrage". Japanese companies issued bonds with attached equity warrants. The warrants gave the buyer the right to buy shares in the company, effectively a call option on the shares. The company received the premium for the option as a low interest rate on its borrowing. The Japanese companies competed with each other to get lower interest rates. Dealers competed with each other to give the Japanese companies lower interest rates. The coupon on the bond reached zero and in some cases the cost of the debt was negative. The companies invested the borrowed money in matching bonds, locking in the difference between the interest they received and the interest they paid, if they paid any at all. The companies booked the difference as profit. Under Japanese accounting rules, the shares to be issued if warrants were exercised did not seem to be taken into account.

Companies invested in bonds that they or other companies issued as part of the debt plus equity warrants issue. The warrants were stripped off and placed with someone, leaving only the bond. The warrant buyer paid a hefty premium to punt on Japanese stock markets going up. In 1980s the NIKKEI only went up. The premium allowed the holder of the bond to earn a decent rate of interest. This was all done with the magic of derivatives, an asset swap.

The company issued bonds with warrants at almost no interest cost, then they invested the proceeds in the same or near-identical bonds at higher rates to lock in profits. The dealers did not care. They were making money going in and coming out. In 1989, the Japanese bubble burst. Japanese companies reported losses, some totaling, billions of dollars. It was not fashionable any more to have treasuries as profit centers in Japanese corporations.

NIKKEI, after reaching a high of more than 39,000 in 1989, took a nosedive and everything else followed. Few warrants were ever exercised. The Japanese companies had sold the call options on their own stock at the top of the market and banked profits. The warrant buyers were the losers. In a perverse twist, the American and European companies, having exported ZAITEKU to Japan, began feverishly to copy it. Without heeding the lessons of how ZAITEKU's application ended in Japan, academics and commentators eulogized financial engineering as the revolutionary new thing, and some still do even after the 2008 financial crisis.

In ASSET MANAGER CAPITALISM that developed in the United States on the other hand, for those with exceptional imagination, scientific talent, quantitative wizardry, or just skills to persuade venture finance that they possess these traits, the prospects and outcomes were spectacular. They could raise huge sums, pay themselves well, and start new companies in a hurry. There emerged a new business elite: young, mysteriously knowledgeable, independent, and fabulously rich after their dot.com IPOs with a lot of hype from the media that they paid for, and help they got from FED's Chairman GREENSPAN's monetary policy, the GREENSPAN PUT, that eventually the taxpayers and/or owners of worthless bonds, Western retirement systems and their central banks would pay for.

At first glance, the new business elite of the 1990s appeared to be very different than salaried, bureaucratic engineers and organization men of the 1950s and the 1960s who ran the large corporations associated with ALFRED SLOAN at GENERAL MOTORS. In fact, they appeared to be a familiar type, much celebrated in the economics of an earlier age. The identification of the new class of business leaders with the old entrepreneurial archetype was irresistible in an age when ideas of FRIEDMAN and HAYEK were being aggressively promoted in business schools to justify the triumph of free markets. In fact, there was little similarity between the old and the new entrepreneurs. To a large degree, the new technology entrepreneurs were in fact the same people who had formerly worked in the great labs of the large corporations. There was also a large difference in what they did.

The "rugged entrepreneur" of the supposed old days triumphed by building smarter and cheaper and by working harder and by attracting and holding customers and market share. All of that took time, and time was something for which the information technology boom had no time. Instead, in the new

age, there was a shortcut. Getting rich simply meant getting the approval of the capital markets. The right connections, a patent, a trade secret, and a business plan where the preconditions for raising money. Actual business success would come later, if it came at all. One would find out, after the fact, who had a brilliant innovation and the capacity to pursue it and who did not. But all the executives were rich, at least for a while, as soon as the money had been raised.

The investment bankers and the technologists were closely allied in the emerging ASSET MANAGER CAPITALISM. Innovation in one area, Michael Milken's JUNK BOND MARKET, helped fuel the growth of the other. The financiers combined with the techno-entrepreneurs promoted a new vision of the NEW ECONOMY, a NEW PARADIGM, hence the 1990's business school heresy. EFFICIENT MARKET HYPOTHESIS holds that all the information available that could affect the market price is already embodied in the market price. So although the market may turn out to have been "wrong" in retrospect, in the sense that it priced a stock cheaply that subsequently soared, or priced expensively another one that subsequently plummeted. It is never wrong prospectively. That is to say, it never ignores or misuses information, leading to systematic mispricing. Accordingly, if market prices diverged substantially from what traditional valuation models suggested was fair and reasonable, there must be something wrong with traditional models. The search was on for new models suggesting that market values were fair and reasonable. Hence the idea of the NEW ECONOMY and the spate of new ways of valuing companies, especially those that did not make any profits and seemed unlikely to do so for the foreseeable future.

There is a difference between a manager running a company that is not his own and an owner-operated business in which the manager does not need to report numbers to anyone but himself, and for which he has a downside. Corporate managers have incentives without disincentives. The asymmetry is visibly present. Volatility benefits managers since they only get one side of the payoffs. The main point is that they stand to gain from volatility, the more variations, the more value to this asymmetry.

In 2018, Larry Culp, the new CEO of GENERAL ELECTRIC, was awarded a contract that could pay out $237million. In 2017, a CEO at one of America's 350 largest firms earned on average $18.9million, according to ECONOMIC POLICY INSTITUTE of Washington D.C., that is 312 times as much as the average worker's earnings- a ratio close to its peak, 344, in 2000. The similarity between 2000 and 2017 is the soaring value of stock options. The stock market was at the end of a long boom in 2000 and surged again in 2017, prompting many CEOs to cash in their stocks. Before enthusiasm for awarding stock options to executives took off as USA moved from MANAGERIAL CAPITALISM to ASSET MANAGER CAPITALISM, the ratio between CEO and worker pay was 32, just as CEOs started to be paid more in form of equity, the stock market took off. At the start of 1985 American stocks traded at on a cyclically adjusted ratio of 10, in 2018 the ratio is over 31 according to Robert Schiller of Yale University.

A FORTUNE study in 2013 showed that only 1% of the American companies poached a CEO from abroad, and many promote from the inside. In Japan CEOs have rarely been given stock options, and Japanese executive pay is a little more than a 10th of that in America, and about a quarter of the British level. Deborah Hargreaves in ARE CHIEF EXECUTIVES OVERPAID?[1] summarizes that CEOs' pay in FTSE 350 companies rose by 350% while pre-tax profits rose by 195% and revenues by 140% between 2000 and 2013. One problem is that the award of equity to executives means that the income-rich and the capital-rich are more than ever the same people in the USA and the UK.

Near industrial history of the United States, according to business school mantra, was to be seen as indistinguishable from a world of free and competitive markets. In the textbook sense, a very large number of very small firms, each produced a standard product by standard methods and taking prices as given by the market itself. The well-developed, highly stylized, utterly irrelevant principles of the free and competitive markets were to be applied to the world of unstable and changing corporations, whatever the violence to the facts. The business schools in America propagated the revival of conservative myth, the application of a set of aged ideas to a world in no way suited to receive them.

In Economyths: Ten Ways Economıcs Gets It Wrong [Orrell,2010] David Orrell states: "Orthodox neoclassical economic theory is a mathematical representation of human behavior, and like any mathematical model it is based on certain assumptions. In the case of economics, the assumptions are largely out of touch with reality. Many think the assumptions are reasonable because they are based on ideas from areas like physics or engineering that are part of the West's 2,500-year scientific heritage dating back to ancient Greeks. Superficially orthodox economic theory seems to have the look and feel of science, without empirical verification of sciences." [Orrell,2010 p.5]

The orthodox economic theory, in its linearity, rationality, and obsession with concepts such as scarcity and equilibrium, is PYTHAGOREAN to the core, and has been ever since the subject was modelled after physics in the 19th century. David Orrell adds: "Neoclassical economics was explicitly modeled after NEWTON's "rational mechanics". NEWTONIAN dynamics can be expressed through the calculus of variations as an optimization problem: objects moving in a field take the path of least action. LEIBNIZ had explained the idea by comparing God to an architect who "utilizes his location and the funds destined for the building in the most advantageous manner." Reasoning along the same lines, neoclassical economists assumed that in the economy, individuals act to optimize their own utility – defined rather hazily as being whatever is pleasurable for that person – by spending their limited funds. Economists could then make NEWTONIAN calculations about how prices would be set in a market economy to arrive at what WILLIAM STANLEY JEVONS called a "mechanics of self-interest and utility".[Orrell,2012 p.225]

David Orrell's synthesis is "A reason why mathematics works so well in physics is that, as far as we are told, subatomic particles such as electrons and quarks are the same everywhere in the universe. As a result, a hydrogen atom on Earth is the same as one in the Sun. People on the other hand, are different. To get around that problem, economists argued that what really counted was the behavior of the "average man". This concept was first introduced by the French sociologist, ADOLPHE QUETELET, who saw the average man as representing "perfect harmony, alike removed from excess or defect of every kind...the type of all which is beautiful – of all which is good". As economist FRANCIS EDGEWORTH put it, "the first principle of economics is that every agent is actuated only by self-interest." Thus was born HOMO ECONOMICUS, or "rational economic man" – an idealized expression of Nietzsche's APOLLONIAN PRINCIPIUM INDIVIDUATIONIS. [Orrell 2012 p.226]

Daid Orrell adds, "Using this imaginary being as the atom of the economy, economists argued that in a competitive market prices would be driven to a stable equilibrium via ADAM SMITH's invisible hand. If a particular good were too expensive, then more suppliers would enter the market and competition would drive the price down. If prices were too low, then suppliers would go broke or leave and the price would rise. The result, according to FRANCIS EDGEWORTH, would be "the maximum pleasure" for both individuals and society as a whole. In the 1940s, JOHN VON NEUMANN used "rational economic man" as the basis for his game theory, which studied the interactions between rational actors who are trying to optimize their own outcomes in artificial games." [Orrell 2012 p.226]

David Orrell enlightens the ideological use of the fixed point theorem during the COLD WAR. "In the 1960s, economists KENNETH ARROW and GERARD DEBREU used a method popular in game theory known as BROUWER's FIXED-POINT THEOREM to prove that, under certain conditions, free markets lead to optimal "fixed point" for the economy in which prices are set at their correct levels and nothing can be changed without making at least one person worse off. This result – a harmony of parts in which any change is for the worse - was soon being claimed as proof that capitalism was superior to communism. But to accomplish this feat, the powers of "rational economic man" had to be extended to include infinite computational power and the ability to devise plans for every future eventuality. The ARROW-DEBREU MODEL is called the crown jewel of neoclassical economics, and inspired the development of GENERAL EQUILIBRIUM MODELS which are still relied on by policy makers today. Unfortunately, numerous studies have shown their predictive accuracy is not much better than random guessing."[Orrell 2012 p,227] Philip Mirowski' MACHINE DREAMS [Mirowski,2002] provides a detailed history of COWLES COMMISSION's AND RAND CORPORATION's role in the development of the ARROW-DEBREU MODEL.

Markets, capital market in particular, are not equilibrium seeking systems. They are complex systems. Risk is not normally distributed. It is distributed along a power curve. Events are not random. They are path dependent. The most catastrophic outcome is not a linear function of scale. It is super linear

function. Capital markets and the global financial system are vulnerable to a collapse because of the dense interconnectedness of mega banks.

10. Fire [Finance, Insurance, Real Estate] on planet earth [ocean]. Is it arson?

The whole of economic life is a mixture of creative and distributive activities. At any given stage of economic development, successful societies maximize the creative and minimize the distributive. Societies where everyone can only achieve gains at the expense of others are generally impoverished. They are also usually intensely violent. A critical distinction that Roger Bootle makes in THE TROUBLE WITH MARKETS: SAVING CAPITALISM FROM ITSELF [Bootle, 2012][1] is between creative and purely distributive activities. Bootle's distinction is close to what William J. Baumol highlighted in his delineation of ENTREPRENEURSHIP, MANAGEMENT, AND THE STRUCTURE OF PAYOFFS [Baumol, 1993][1]. The market economy creates GDP growth not because every person is continually involved in activities that, in classic income-accounting terms, create value, but because on the average competition between individuals and firms are in their direct effects purely distributive.

Bootle suggests that as average income increases richer societies tend to become more litigious societies. In richer societies consumers are able to devote a significant slice of income to buying goods solely because they bear a brand. An increasingly rich economy is likely to be one in which more of productive activities are devoted to zero-sum and distributive competition. As the richer societies get, as measured by per capita GDP, the more arbitrary and uncertain some of the conventions required to calculate GDP becomes.

Rana Foroohar in MAKERS AND TAKERS: THE RISE OF FINANCE AND THE FALL OF AMERICAN BUSINESS [Foroohar, 2016][1] agrees with Adair Turner who in BETWEEN DEBT AND THE DEVIL[1] explains that rather than funding new ideas and projects that create jobs and raise wages, finance has shifted its attention to securitizing existing assets like homes, stocks, and bonds and such, turning them into tradable products that can be sliced and diced and sold as many times as possible, that is, until things blow up, as they did in 2008. Turner estimates that a mere 15% of all financial flows now go into projects in the real economy. The rest simply stays inside the financial system, enriching financiers, corporate titans, and the wealthiest fraction of the population, which hold the vast majority of financial assets in the United States and, indeed the world.

Rana Foroohar claims that America's shift to ASSET MANAGER CAPITALISM in which finance became an end of itself, rather than a helpmeet for Main Street, has been facilitated by many changes within the financial services industry. One of them is a decrease in lending, and another is an increase in trading, particularly the kind of rapid-fire computerized trading that now make up more than half of all US stock market activity. The entire value of the New York Stock Exchange now turns over once every 19 months, a rate that has tripled since 1970s, growing the size of the securities industry 5-fold as a share of GDP between 1980 and mid-2000s while bank deposits shrunk from 70 to 50% of GDP.

In this man-made ecology, the financial sector's share of the US GDP has soared from 2.5% in 1947 to 4.4% in 1977 to 7.7% in 2000. By then some 40% of corporate profits of the companies listed in S&P 500 were in the financial sector. These firms' share of the total S&P 500 market capitalization was approximately 25%. Even more startling, the combined income of the nation's top 25 hedge fund managers exceeded the compensation of the combined income of the CEOs of all companies listed in the S&P 500. In 2008, no less than one in every $13 in compensation in the US went to people working in finance. By contrast, after WWII a mere one in $40 was the compensation of the people who worked in finance. In the first half of 2015, the United States boasted $81.7trillion worth of financial assets, more than combined total of next three countries, China, Japan and the United Kingdom. One of the most pernicious effects of ASSET MANAGER CAPITALISM has been the rise of finance and its role in the growth of massive inequality.

The attenuation of ownership has reached a point where between one-third and one-half of most of the large corporations in the United States are owned by institutions, not by only mutual funds, but insurance and pension funds, charitable endowments, churches, colleges and universities, public service foundations, and private trusts funds generally. At first glance one might think that the vesting of ownership in such responsible hands of money managers would make for stability. Quite the contrary. The managers of funds are indeed responsible, but theirs is a fiduciary responsibility, which constrains them to accept whatever offer promises the highest immediate gain for beneficiaries and their asymmetric bonuses. If they do not, they may find themselves defendants in a suit for damages.

The predominant neoclassical economics has perceived increased financial activity – greater market liquidity, more active trading, financial innovation – as broadly positive development. This is because extensive financial activity is essential to 'complete' markets. The first fundamental theorem of welfare economics, demonstrated mathematically by KENNETH ARROW and GERARD DEBREU, illustrates that a competitive equilibrium is efficient. Complete and perfect markets deliver a PARETO-EFFICIENT equilibrium, in which no one person can be made better off without making someone worse off. And the development of the efficient-market and rational-expectations hypotheses suggested that financial markets are in fact efficient, and that the conditions required for efficiency and for rational and stable equilibria apply even in contracts between the present and the future, which financial markets provide. Together these ideas provided the intellectual underpinning for the powerful ideology of market liberalization and deregulation, an ideology that became increasingly dominant over the last several decades – the WASHINGTON CONSENSUS.

According to WASHINGTON CONSENSUS, almost all economic activities could be made more efficient if markets were allowed to operate with minimal interference. Free trade, product-market liberalization, and structural reform of labor markets were all perceived as elements of a universally relevant policy approach, and free financial markets with unrestricted flow of long and short term capital, and financial deepening with access to a wide array of different financial markets and services as essential to the efficient allocation of capital.

The political ideology was free-market capitalism. The intellectual underpinning was the concept of market completion. The idea that the more market contracts could exist, and the more freely, fairly, and transparently they could be struck, the closer we could get to the most efficient possible outcome, the one most favorable to human welfare. One of the consequences of the capital-account and financial-market liberalization that followed was a very steep increase over the last 30 to 40 years in the relative scale of financial activities within the economy, with dramatic increases in capital flows, in the financial markets' trading volumes, and in the size of financial institutions' balance sheets relative to real non-financial activities.

The financial system had grown too large. It had ceased to be a means to an end and had become an end in itself. The size and scale of financial market activity in relation to the underlying economy has led some to question whether unfettered free market economy had promoted finance, the servant, to the position of master of the economy and, more broadly, society. An excessively large financial sector relative to the GDP should be a cause of concern to those interested in long-term economic growth because financial crises are often associated with unsustainable growth of the financial sector. Mariana Mazzucato in THE VALUE OF EVERYTHING: MAKING AND TAKING IN THE GLOBAL ECONOMY [Mazzucato 2018][1] scrutinizes the way economic value has been accounted and reveals how neoclassical theory failed to delineate the difference between value creation and value extraction, allowing certain actors in the economy moving around existing value or, even worse destroying it to benefit themselves.

A 2011 study by the SWISS FEDERAL INSTITUTE OF TECHNOLOGY mapped the network of direct and indirect ownership links between 43,000 transnational corporations to make a map of financial power in the global economy. The research summarized that less than 1% of the companies were able to control 40% of the entire network. Most of these powerful companies were financial institutions from the "virtual" financial economy, companies that make money out of money. As the researchers point out, this dominance by a small group can be viewed as the outcome of a natural process and does not demonstrate conspiracy or collusion.

The distribution of power in the economy is related to the fractal structure which characterizes many natural systems. A common property of fractal objects is that their features exhibit what is known as scale-free, power-law statistics. There is no typical size or scale. The only rule is that the larger event or feature is, the less likely it is to happen. There is no such thing as "normal" pattern and extreme events are part of the landscape. Similar relationships hold for price changes in a stock market, the size of craters on the Moon, the diameters of blood vessels, the populations of cities, wealth

distribution in societies, and many other phenomena. But it is clear from the network map of the SWISS FEDERAL INSTITUTE OF TECHNOLOGY that the symmetrical neoclassical picture, which sees the economy as being made up of independent "average" firms of similar power, is rather misleading as Benoit Mandelbrot has argued since 1975 in FRACTALS: FORM, CHANCE AND DIMENTION [Mandelbrot 1998][1].

In the three decades before the crisis, the financial services industry has undergone exorbitant and utterly unwarranted growth, driven by financial liberalization, financial innovation, elimination of capital controls, and globalization of finance. This triumph of finance is inexorable so long as ownership carries no responsibilities. Irresponsible owners are classical HOMO ECONOMICUS par excellence, and they go where they can get the most of what they are interested in, which is money. Hence they put pressure on brokers to find them companies that will slake their thirst. Brokers pressured investment bankers to float the issues of such companies. Investment bankers pressured commercial bankers to give priority to such companies. Pressure, then was brought to bear on the management of public companies to do whatever needed to be done to thicken the bottom line. Frequently, merger-and-acquisition-and-diversification is the outcome. Bottom line is improved by rationalizing the merged companies by downsizing, closing plants and firing people. Finance remained relatively independent from the rest of economic activity, and even became predatory and destructive toward it.

One property of such networks is that they are susceptible to seizure-like failures. As Albert-Laszlo Barabasi wrote in BURSTS: THE HIDDEN PATTERNS BEHIND EVERYTHING WE DO, FROM YOUR E-MAIL TO BLOODY CRUSADES [Barabasi 2011][1] "Cascading failures are a direct consequence of a network economy, of Inter-dependencies induced by the fact that in a global economy no institution can work alone." [Barabasi 2011 p.] Orthodox neoclassical economic theory is based on a very particular type of network, one in which economic agents have no connection with one another at all, except to buy and sell.

11. The cesarean birth of FX market: privatization of the measuring stick of world's monies

We need to try to model the economy not as an efficient and independent machine, but as something more like a living ecosystem. ADAM SMITH's invisible hand is an emergent property of this system, which never reaches an optimal equilibrium, but instead is fundamentally dynamic and unstable, with complex effect on society. The financial network is both highly creative and prone to seizure-like crashes. The entire financial system is now described as a kind of virtual network of electronic information. Since NIXON's exit from BRETTON WOODS AGREEMENT, currencies have floated against one another. The result has been an explosion in the amount of currency dealing. Every day, around $5trillion is shuffled around computer networks, bouncing off satellites, relaying through computer terminals, like the neural signals of a giant electronic brain.

Excess credit creation of American banks and their affiliates in EURODOLLARs resulted in radical increases of foreign investments by American corporations in Europe in the 1960s. Then the US dollar was effectively the world's currency, and thus additional creation of dollars was expected to be diffused around the world without any adjustment in exchange rates until the world rebelled. When the US corporations tried to buy the world with the credit American banks and their affiliates created, France called the US's bluff that set the value of the US dollar at $35 for one Troy ounce of 24 karat gold with BRETTON WOODS AGREEMENT. France decided to convert US dollars into gold at the official fixed price, as BRETTON WOODS SYSTEM formally provided for. The US leadership had to make the decision either to keep its promise and redeem the excessively created dollars into gold, or break its promise and with it bring down the BRETTON WOODS SYSTEM of fixed exchange rates. France proceeded to demand conversion of dollars into gold, in an episode later called the "French raid on Fort Knox". Nixon decided to break US's promise. He closed the GOLD WINDOW. With this, the fixed exchange rate system had ended, and currencies started to float for the first time without any link to gold. The fiat money float began to emerge, FOREIGN-EXCHANGE [FX] market.

President Nixon ended dollar's tie to gold on 8/15/1971. Two decades later, monetary policies of ALAN GREENSPAN pushed the prices of financial assets and real estate up making them havens for investors to avoid US dollars' depreciation, as the US economy changed from an industrial powerhouse into a financial and consumption casino that imploded with 2007-2008 financial crisis. According to BANK OF INTERNATIONAL SETTLEMENTS [BIS], in 2013 at $5.3trillion per day, FX, currency trading dwarfed all the globe's stock markets and was 73 times greater than all global trade in goods and services. Only interest rate swaps were a match in daily volume some days.

It seems that nobody called Japan's bluff during the 1980s, when the credit Japanese banks created enabled Japanese corporations' purchasing sprees of buying foreign assets. The world seemed to have enjoyed not suffered from YEN ILLUSION. When BANK OF JAPAN abruptly stopped credit creation in 1989, JAPAN's double bubbles burst and capital outflows from Japan came to a halt and eventually reversed.

However, in this new world of floating currencies Nixon's decision gave birth placed a great burden on the newly born foreign exchange markets. If a country decides to create more purchasing power than is backed by its real economic activity, the task of recognizing this was now foreign exchange markets' by selling enough of this currency to reduce its value. The Japanese experience of the 1980s demonstrated that even the yen-dollar foreign exchange market, the most liquid market in the world, failed its responsibility. Apparently foreign exchange market participants for years were either unaware of the BoJ's excessive credit creation, or failed to understand its implications and act accordingly.

Free-floating exchange rates was another of Milton Friedman's free market prescriptions. Free-floating exchange rates were originally intended as a substitute for pre-1971 gold standard that Friedman despised. Friedman liked the idea of elastic money to give central bank planners the ability to fine-tune the money supply to optimize real growth and price stability. Gold, he considered, inelastic. And not suitable for the fine-tuning discretionary monetary policies needed. Friedman's prescription was that gradual changes in exchange rates would rise or lower relative prices between trading partners, and these changes in terms of trade would reverse trade deficits, mitigate trade surpluses, and restore equilibrium in trade without shock devaluations of the kind the United Kingdom experienced in 1964 and 1967. Friedman's academic prescriptions ignored the real world behavior of financial intermediaries like banks and hedge funds that create leverage and derivatives. Financialization dominated and amplified the smooth exchange-rate adjustments Friedman fantasized.

What followed was borderline hyperinflation in the late 1970s, and a succession of asset-bubble booms and busts in 1985 Latin American Debt, in 1987 US Stock market crash, in 1994 Mexican peso, in 1997 Asian debt, in 1998 Russian debt and derivatives, in 2000 dot.com stocks, in 2007 mortgages and in 2008 derivatives again. On two of those occasions, 1998 and 2008, the global capital markets came to the brink of total collapse.

The FORIEGN-EXCHANGE [FX] market is not transparent, but opaque. At its beginnings, it is mostly technologically old to accommodate its oligopolistic market structure. Old-boys' network. And, it is colossal. Most of its $5trillion of daily trading happened 'over-the-counter' [OTC], in deals negotiated between banks and private customers, rather than on exchanges. Many orders were still placed by phone. To gauge its market's size and structure usually mandates reliance on outdated surveys provided by outsiders. The most comprehensive review, by the BANK OF INTERNATIONAL SETTLEMENTS, is conducted only once every three years. Yet modernity is arriving in fits and starts. In April, 2019, it emerged that DEUTSCHE BORSE, Europe's third largest stock exchange, was negotiating to buy FXall, an electronic FX-trading platform, for a reported $3.5billion. It signals at a shake-up in a sector that has long been deemed antediluvian.

Since the publication of Michael Lewis's FLASH BOYS: A WALL STREET REVOLT [Lewis 2014][1] discussions of high frequency trading and accusations that the market is rigged were directed to stock markets. What is less known is that similar issues exist in spot foreign exchange markets [FX or FOREX]. Currencies provide certain market participants with significant economic advantages. FX is highly commoditized asset traded in global and significantly fragmented market with various models of trading, -bilateral, multilateral, wholesale, retail- in dark and lit markets. All are very conducive for computer algorithms. There are ample opportunities to take advantage of asymmetrical access to speed and information.

FX trade data is largely proprietary, opaque and not reported to national regulators to the same extent as data on other asset classes. In comparison to stock markets, there is less awareness. Furthermore, market participants are heterogeneous. The FX market trades 24 hours a day, five-and-a-half days a week. It is decentralized and highly fragmented. A growing portion of trading is being undertaken on electronic platforms or through large banks that internalize order flow via single-dealer platforms. About 41% of global FX trading involves just 2 currency pairs EUR v USD and USD v JPY. Spot FX has a relatively small average size USD1-2million. Relative simplicity, high liquidity, and small average trade size is amicable for high frequency trading. Voice trading is largely restricted to abnormally large trades and high net worth individuals and complex transactions.

Billions of dollars have been invested in creating a complex network of data centers, underground cables, and microwave signals, typified by SPREAD NETWORKS and SEABORN NETWORKS' 2017 launch of a submarine fiber optic cable system from data centers in Carteret, New Jersey to BM&F BOVESPA STOCK EXCHANGE in Sao Paulo, Brazil. The goal of these investments is to reduce 'latency', the time that passes between electronic messages, so that customers can execute, amend or cancel orders as quickly as possible. The proliferation of electronic trading venues and data centers, combined with the ability to purchase faster access and information, has created an asymmetry between more and less-informed participants. One of the most common methods of exploiting this asymmetry is to engage in what is referred as 'latency arbitrage', and is highly prevalent in FX markets. Latency is integral to the use of first-in-first-out [FIFO] order stacking in high frequency trading. FIFO order stacking refers to a method in which orders are placed at every potential price level possible before any other counterparty places orders. By stacking orders, an HFT algorithm can acquire this information before other market participants.

Front-running occurs when a market participant trades based on advance knowledge of pending orders from another market participant, allowing him or her to profit from that knowledge. The ability of certain firms to acquire faster access to venues has made it possible to obtain data on other firms' trading intentions, known as information leakage. Access to this data in conjunction with the ability to trade faster than other participants, provide certain firms with significant advantage. Firms can exploit this advantage by trading before slower, less informed participants with extremely small time periods, milliseconds or microseconds, and in a manner that is difficult to detect.

A number of additional forms of high-speed manipulation are based on cancellation of orders. Spoofing occurs when a market participant submits a flurry of orders to buy or sell a financial instrument in order to create the illusion of market liquidity. Once other market participants react to this apparent activity and the price changes as a result, the spoofer quickly cancels their orders and trades against those market participants, profiting at their expense. Layering is a similar tactic in which traders place and cancel orders on both the buy and sell sides to create the illusion of general market activity in the particular currency. Not every strategy, however, is designed to give the appearance of liquidity. Quote stuffing, for example, is a method by which algorithms flood the market to overwhelm data feeds and create delays. The ensuing confusion creates opportunities to mask activity. The liquidity mirage in FX refers to the illusion of liquidity created by the tremendous number of prices placed and ultimately cancelled. Speculative participants submit multiple orders on multiple venues based on the same data point, giving a false impression of the demand/supply for that particular currency at that particular price. This may reflect nefarious activity or simply legitimate strategies that involve amending orders.

In the age of high frequency trading, a great majority of venues monetize informational asymmetries by allowing users to pay more to acquire superior data before those that do not pay. They also let firms place their servers next to the trading venue, known as co-location. Then, they pay participants to direct trades toward their venue, commonly referred as 'payment for order flow'. In order to pursue latency-driven strategies, firms need to have faster access to trading venues than competition.

The FX market serves not only investors, but corporations and governments seeking to protect trade or bonds against currency swings. FX contracts can be 'spot' for immediate delivery, 'forward' for delivery at a later date, or 'swap' when currency is exchanged back at maturity. Buyers go through dealers, mostly big banks, which source liquidity. Specific needs, such as matching cash-flow dates, are met using OTC trades. This is not likely to change soon. Rather, DEUTSCHE BORSE is betting that buyers will abandon "voice" orders, placed via single banks, in favor of digital platforms that pool prices from multiple dealers. The trend is already boosting e-trading in spot FX. Over the last 10 years, volumes have doubled and FXall's share of this electronic activity has reached 40%.

FX trading becoming digital, and an increasing proportion of market making is performed by proprietary trading firms utilizing high frequency strategies. Further, participating FX markets are now faced with and increasingly fragmented landscape of execution venues, complicating a market that has historically been dominated by big banks. FX platforms pay for order flow, offer colocation services, and sell faster access to trade data. These services have created concern among FX participants and national regulators that brokers may be directing their clients' order flow to whichever venue offers the best rebate rather than the best possible price. Digital FX markets are now vulnerable to high frequency methods of manipulation, including spoofing, layering and quote stuffing. The same type of flash crashes that plague digitalized equites trading have also been witnessed in FX. These rapid changes in the price of individual currencies have nothing to do with the fundamental economic purpose of FX markets. The alleged economic purpose is to allow firms engaged in cross-border industry to pay for foreign goods and services and hedge the risks associated with future currency movements. Our ability to understand these developments is undermined by lax reporting standards.

The change has been slower with longer-dated FX-derivatives contracts, such as forwards. The longer the maturities, the fewer the transactions, and the harder it is to connect enough users simultaneously in order to get e-trading to work. But, tighter regulation is increasing costs, that asset managers are seeking to offset elsewhere. European regulators demand that they demonstrate that they are trading at the best possible price. E-trade, by connecting buyers with multiple dealers in an instant, as well as leaving a clear audit trail promises to achieve both. As long-dated contracts become more common, liquidity will be boosted.

As FX goes digital, the ranks of dealers are expected to be reduced. In the spot market, the trend has developed "principal" trading firms, which buy and sell on their account using algorithms. It has also fueled competition among banks, slashing margins and pushing smaller ones to exit the business, leaving bulk of the deals to handful of big banks, often in partnership with principal trading firms. A cozy arrangement for the time being. Maturities beyond a week have been little affected so far. The rise of centralized clearing is also helping to level the playing field. Only 3% of FX derivatives' trades currently go through clearing houses, which absorb the risk one party defaults. Clearing is set to become more attractive for traders, in part because regulators are requiring higher collateral to be held on some un-cleared FX deals. E-trading already makes it easier for users to find non-bank dealers. By moving counterparty risk, clearing will weaken the advantage that banks with big balance-sheets enjoy over the newer trading firms.

To deal with increases in the floods of money, major banks spent half a trillion dollars on information technology, decisively leading all other sectors on computer outlays. The work of maintaining the measuring stick function of money is estimated to cost 20% more in computer equipment than all the world's information technology for manufacturing new goods. With vastly greater speed and automation, the large banks with big balance sheets perform the role previously played by the gold peg, while at the same time putting constraints on every country to follow its own exchange policy.

Dangerously banking intensive, the system channels all the world's commerce through the portals of the great international banks. Just 10 in the United States and 15 in United Kingdom and enables these to collect fees. With 12.91% of total trading in 2016, the largest player was CITIBANK, J.P.MORGAN and UBS followed with 8.7% and DEUTSCHE with 7.9%[1]. Moreover, that work yields a volatile but steady rising proportion of all banking profits. In this emerged system of private SEIGNIORAGE – profiting from creating money – the largest traders capture hundreds of billions of dollar's equivalents every year from setting the measuring stick. FX market is a speculative ocean of currencies that banks surf for profits. These banks extract the fees as a kind of volatility tax on entities that use them to hedge currencies.

By various measures 90% to 97% of all transactions are judged to be "speculative" devoted not to enable trade in goods and services but to harvest

profits and fees from arbitrage and leverage. Transacting some 77% of the business are 10 banks in the Western countries. In the forefront of the foreign exchange operations are the US and Europe, with London accounting for 36% of all trades. Some 87% of transactions involve the US$, in which 63% of all international trade is denominated. Two thirds of emerging market external debt and two thirds of official foreign exchange reserves of all central banks are in US$s when GDP of the United States accounts just 23% of global GDP and only 10% of global trade. FED's soft power exerted via the dollar has become more important in the decade since the financial crisis and America's monetary policymakers' ability to create problems for their counterparts elsewhere.

Currency trading has been rising at least 20 times faster than productivity growth. Devoid of ISAAC NEWTON's gold standard that made economic valuations calculable and reliable as the physical dimension of traded items, China, Hong Kong, Singapore and Taiwan, that have spearheaded the global trade expansion in recent decades, have all largely opted out of the floating-currency system. Against agonized protests from the West, lately loudly from President Donald Trump's White House, they fix their currencies on the dollar as much as possible, and some of them impose controls on capital movements. Outside of the Asian emerging sector, world trade has inched up only slowly. Likewise, global GDP growth. A privatized SEIGNIORAGE conundrum.

12. Is planet earth [ocean] alive?

It is a habit of contemporary public relations to frame today's the global economy as 'economy' and, more insidiously, to present it as a natural phenomenon whose putative laws must be regarded with the same deference as the laws of physics. But as some argue cogently, our global economy is but one of many possible economies, and, unlike the laws of physics, we have political choices to determine when, where, and to what degree the so-called laws of economic behavior should be allowed to hold sway. An economy is a man-made ecology, or rather the man-made part of our larger ecology of interaction between the man-made and natural worlds. Neoclassical economic perspective generally fails to recognize that economy is merely one aspect of a whole ecological and social fabric. And at times economists have tried to remodel the environment to fit to the neoclassical model as during Russian transition to capitalism and globalization of finance at the end of 20th century explains Roger E. Backhouse in THE PUZZLE OF MODERN ECONOMICS: SCIENCE OR IDEOLOGY? [Backhouse 2010][1]

Planet Earth is a living system composed of human beings in continual interaction with one another and with their natural resources, most of which are, in turn, part of mega-living system, GAIA. Planetary physiology, GAIA, is the result of innumerable beings. GAIA is symbiosis seen from space. Any organism that appears or species that evolves at first has a chance. But to persist, life forms must survive not on their own but within a global environment. They become integrated, or they die away. In the long run organic beings confront their limits of their multiplication. They survive not alone but within a context of global life. Lynn Margulis and Dorion Sagan in WHAT IS LIFE? Margulis and Sagan 2000][1] argue that the strength of symbiosis as an evolutionary force undermines the prevalent notion of individuality as something fixed, something secure and sacred. A human being in particular is not a single, but a composite. Each of us provide a fine environment for bacteria, fungi, roundworms, mites, and others that live in and on us. Our bodies are actually joint property of the descendants of diverse ancestors. Survival seems always to require networking, more interaction with members of other species, which integrates surviving species further into global physiology.

The basic reductionist error of the social sciences is to divide this fabric into fragments, assumed to be independent and to be dealt with in separate academic disciplines. Those economists who wished to study economic phenomena as they actually existed, embedded within society and the ecosystem, and who therefore dissented from the narrow economic viewpoint were virtually forced to place themselves outside economic 'science', thus saving the economics fraternity from dealing with the issues their critics raised. Max Weber, for example, the 19th century critic of capitalism, is generally regarded as an economic historian. John Kenneth Galbraith and Robert Heilbroner are often thought of as sociologists. Kenneth Boulding is referred as a philosopher. Karl Marx, by contrast, refused to be called an economist and saw himself as a social critic, asserting that economist economists were merely apologists for the existing capitalist order. In fact, the term 'socialist' originally described those who did not accept the economists' atomistic view of the world.

By subsuming land within the category of capital, almost all post classical economists treated Nature to be a subset of the human economy, an endless pile of resources to be transformed into wealth. Where economists assume that needed resources will magically arise because the marketplace demands them, a more holistic model would begin with the observation that the economy only exists because resources are available. The economists also assumed that natural resources could always be substituted with some other form of capital, money or technology.

The reality, of course, is that the human economy exists within and entirely depends on Nature, and many natural resources have no realistic substitutes. The natural world is not a subset of the economy. It is the other way around. The economy is a subset of the natural world. This fundamental logical and philosophical mistake, embedded at the very core of mainstream economic philosophies, set society directly on a course toward the current era of climate change and resource depletion, and its persistence makes conventional economic theories, of both Keynesian and neoliberal varieties, utterly incapable of dealing with the economic and environmental survival threats to civilization in the 21st century.

In classical NEWTONIAN science nature was seen as a mechanical system composed of basic building blocks. In accordance with this view, DARWIN proposed a theory of evolution in which the unit of survival was the species, the subspecies, or some other building block of the biological world. But a century later it has become quite clear that the unit of survival is not any of these entities. What survives is 'the organism-in-its-environment'. Matt Ridley in NATURE VIA NURTURE[1] shows that nature evolves via nurture. An organism that thinks only in terms of its own survival will invariably destroy its environment and, as we are learning from bitter experience, will thus destroy itself.

From the systems point of view the unit of survival is not an entity, but rather a pattern of organization adopted by an organism in its interactions with its environment. Evolution is basically open and indeterminate. There is no goal in it, or purpose, and yet there is a recognizable pattern of development. The details of this pattern are unpredictable. In the systems view, the process of evolution is not dominated by 'blind chance' but represents an unfolding of order and complexity that can be seen as a kind of learning process, involving autonomy and freedom of choice.

The systems approach to economics will make it possible to bring some order into the present conceptual chaos by giving economists the urgently needed ecological perspective. According to the systems view, the economy is a living system composed of human beings and social organizations in continual interaction with one another and with the surrounding ecosystems on which our lives depend. Like individual organisms, ecosystems are self-organizing and self-regulating systems in which animals, plants, microorganisms, and inanimate substances are linked through a complex web of interdependencies involving the exchange of matter and energy in continual cycles. Linear cause-and-effect relationships exist only very rarely in these ecosystems, therefore linear models are not very useful to describe the functional interdependencies of the embedded social and economic systems and their technologies.

The nonlinear interconnectedness of living systems suggests two important rules for the management of social and economic systems. First, there is an optimal size for every structure, organization, and institution, and maximizing any single variable, profit, efficiency, or GNP for example, will inevitably destroy the larger system. Second, the more an economy is based on the continual recycling of its natural resources, the more it is in harmony with the surrounding environment. In The Turnıng Poınt: Scıence, Socıety, And The Rısıng Culture [Capra][1], Fritjof Capra offers a compelling vision of a reality, a reconstruction of science and the human spirit for a balanced future. In a world, where everything is anteceded and interconnected, there is no room for autonomous sources of causation. To claim otherwise is scientific heresy and a philosophical death wish. The entelechy, the uncaused causal agent, is fiction and its source is delusional. Fritjof Capra and Pier Luigi Luisi in THE SYSTEMS VIEW OF LIFE: A UNIFYING VISION [Capra and Luisi 2014][1] examine autopoiesis, dissipative structures, social networks, and a systemic understanding of evolution and develop a coherent framework by taking a broad sweep through history and across scientific disciplines.

13. Can cook ratios be cooked under the international bank of settlement's [bis's] watchful eyes?

The literal failure of the financial system, and the deep and long recession it triggered, offered a dramatic demonstration of the unsustainability of the way the global financial system had been operating. The huge burden of public debt created in the course of the financial breakdown remains, and remains unsustainable. The debt burden due to financial crisis comes on top of existing government debt burdens, sometimes acknowledged, more often off the books either as a deliberate sleight of hand or because they are implicit in the promise of future pension and welfare payments. As well as repaying the debts incurred in sorting out the banking crisis, taxpayers will have to shoulder the debts created by a system of pensions and social welfare, particularly in the rich countries.

The repaying of the public debt of the financial sector's bailout coincides with the developing demographic problem. In 2019, 40 countries have shrinking working-age populations, defined as 16-65 year-olds, up from 9 in late 1980s, according to the WORLD BANK. China, Russia, Spain joined recently. Thailand and Sri Lanka soon will. The balance between people over 65 and those working age, is known as the old-age dependency. It is likely to deteriorate faster because the ranks of employable are decreasing. In Japan where young people are few and life expectancy long, demographers expect 48 people over the age of 65 for every 100 people of working-age in 2020. In 1990 there were just 17. Some countries face gentle downward slopes. Others face steep slopes. Both China and France are gradually losing working-age people. Numbers in France are expected to fall slowly over the next few decades, but in China the numbers will soon plunge. Partly as consequence of its one-child policy.

For more than a generation Western governments have been borrowing on a large scale from their own citizens. But, the governments of the UK and the USA borrowed increasingly from foreigners, from much poorer countries, and are now also facing old-age dependency problems. The cost of these promises will be piled onto taxpayers as yet unborn or too young to vote plus, of course, the added to the costs of debts created by the bank bail-outs. In some countries the scale of the government debt is so large that it can depress those countries' potential to grow enough ever to meet the burden of repayment.

A growth strategy based on financial deregulation was first adopted by the US and the UK in the early 1980s, and later more extreme forms were implemented by Iceland, Ireland, Latvia and Dubai. What was encouraging more and more countries to adopt a growth strategy based on deregulated finance was the fact that in such a system it is easier to make money in financial activities than through other activities, or so it seemed until the 2007-2008 crises.

The financial crisis comes down to one simple fact: liquidity. In other words, the amount of outstanding discounted bills of credit and thus the amount of credit and debt of various agents has increased dramatically by comparison to what was in the 1970s. It seems inflation in the price of goods, or in costs, including wages, for the years 1970-1980 has been replaced by an inflation of financial assets in the 1990s and after.

The multiplication of liquidity means of payment on the basis of credit, the true source of the ex nihilo creation of money, has been observed at all stages of history of money and has taken different and highly technical forms lately with derivatives and collateral instruments. The key thing to understand is that transformations of the rules of governing monetary creation in the various different aggregates are all expanding.

The percentage of liquid assets, in other words, the means of mobilizing resources immediately in cash, which previously stood at 8% of their commitment: a proportion known as the COOK RATIO, has been modified. In order to determine the maximum credit that a bank can give in relation to its own funds, that is the capital it is able to mobilize very quickly in order to address repayment requirements,

operational risk has now been added, risk of losses due to people or systems failures. This seems to add a measure of improvement, but also a market rısk, so that the value of credit granted by the bank has to be adjusted to its market value. If the bank is listed and if the market is on the way up, the assets of the bank increase and the bank itself can grant more credit. If the reverse is true, the bank will have to increase its stockholders' equity by selling shares. This is pro-cyclical. Rather than countering and balancing cyclical movements, it accentuates them. It acts as an accelerator of market exuberance, as greenspan phrased it, during expansionary periods, and also a decelerator of depression during downturns.

Financial deregulation has been marked by a series of financial innovations such as the securitization of public debt, real estate loans, collateral debt obligations, agreements for insurance on payment default, swaps, leveraged buyouts. There is no point in asking which of these financial innovations and changes in accounting practice came first. Like the chicken and the egg, they emerged in rapid response to each other and each provides backup for the other. It was not clear what the unintended consequences of financial innovations would be at the time, but later we will able to observe what they were. Nationalization of liabilities financial institutions turned their losses into public debt.

Leveraging, or the ability to increase the amount of loans granted on the basis of advance deposits and more globally on the basis of the equity of financial institutions, has increased almost five-fold. Whereas formerly $1 of resources immediately convertible into cash would have allowed between $5 to $8 of credit, or fresh liquidity, the COOK RATIO, to be offered. By the eve of the crisis the figure was more in the region of $30 to $35.

Once a financial backwater with a reputation for excessive regulation, with its stock market only set up in 1985, Iceland was transformed into a new hub in the emerging global financial system. From the late 1990s, Iceland grew at an extraordinary rate and became the 5th richest country in the world after Norway, Luxemburg, Switzerland and Denmark. Ireland tried to become another financial hub through the same strategy, with its financial assets reaching the equivalent of 900% of GDP in 2007 and 11 times before the crisis. And then in 2008, Iceland and Ireland collapsed.

14. Accounting systems that mis-account: is the chinese accounting system a panacea or placebo for problems of recording and reporting economic activity in 21st century?

Financial accounting has evolved to generate annually published financial statements that are meant to provide corporate transparency. Thereby, enabling the investing public to evaluate corporate behavior and provide the capital markets with the information to help the markets function efficiently. The financial information is provided in three 'statements': the income statement, the cash-flow statement and statement of retained earnings and the balance sheet. But as the notorious implosions of Enron, and other corporate scandals in the late 1990s and early years of the first decade of the 21st century showed these accounting tools cannot be trusted to convey the true state of a business at all. And yet governments, managers, policy makers and shareholders alike depend upon this information when making decisions that affect the lives of everyone.

Almost a decade after ARTHUR ANDERSEN's demise, one of the biggest global accounting firms that enabled accounting scandal of ENRON, 17 days before the collapse of LEHMAN BROTHERS that made it apparent that ERNST & YOUNG's audits of the bank had been all but worthless, on the 28th of August, 2008 SECURITIES AND EXCHANGE COMMISION, [SEC], put forward a time table for switching to INTERNATIONAL FINANCIAL REPORTING STANDARDS, [IFRS], from US GENERALLY ACCEPTED ACCOUNTING PRINCIPLES, [US GAAP]. According to SEC, the world lost its trust in the US GAAP and its auditors after the accounting scandals that bankrupted very large American multinational corporations, WORLDCOM, ENRON, and ADELPHIA COMMUNICATIONS, destroying the savings of millions of investors who bought their stocks and bonds in late 1990s and early 2000s. The US GAAP were the accounting standards developed in the United States and imposed on the world after the Second World War through the two institutions created to manage the global economic system; the IMF and the WORLD BANK.

The US GAAP, the financial reporting standards required by SEC until 2008, evolved in a very litigious business eco-system and are highly detailed and address a vast range of specific situations, protecting companies, and auditors against lawsuits. Arthur Andersen folded because it was convicted for obstructing justice, not because of its connivance in fraudulent accounting. IFRS, by contrast, have traditionally been principles-based. IFRS lay out key objectives of sound reporting and offer general guidance instead of detailed rules. 25,000 pages of complex US accounting rules was to become obsolete and replaced by some 2,500 pages of IFRS. The proposed shift of rule-making authority was from the domestic to the international level. Government

regulators of Japan, Canada, Brazil and India committed themselves to requiring IFRS. The People's Republic of China's first choice was the IFRS, but later they decided to establish their own accounting standards.

The global convergence of accounting standards is largely driven by international integration of financial markets and the increasing complex multicultural structure of corporations. The shift of financial rule-making to INTERNATIONAL ACCOUNTING STANDARS BOARD, IASB, was privatization and internationalization of governance driven by governments' lack of requisite technical expertise, financial resources and flexibility to deal expeditiously with ever complex and urgent regulatory tasks. Tim Buthe and Walter Mattli in THE NEW GLOBAL RULERS: THE PRIVATIZATION OF REGULATION IN THE WORLD ECONOMY [Buthe and Mattli 2018][1] explain the post GREAT FINANCIAL CRISIS rule-making that is developing the blueprint for the 21st century.

Besides the IASB, two global private regulators are the INTERNATIONAL ORGANIZATION FOR STANDADIZATION, ISO and the INTERNATIONAL ELECTROTECHNICAL COMMISSION, IEC. In these organizations states and governments cannot be members. They are centrally coordinated global networks of technical committees from all over the world and involve tens to thousands of experts representing industries and other groups in developing and maintaining technical standards. ISO and IEC jointly account for about 85% of all international product standards. Product standards are technical specifications of design and performance characteristics of manufactured goods. TECHICAL BARRIERS TO TRADE negotiated during the URUGUAY ROUND trade negotiations from 1987 to 1994 incorporated in WORLD TRADE ORGANIZATION AGREEMENT, WTO, obliges all members to use international standards as technical basis for domestic regulations.

The annual financial statements of ROYAL BANK of SCOTLAND kept in compliance with the INTERNATIONAL FINANCIAL REPORTING STANDARDS were audited and signed by DELOITTE&TOUCHE, in February of 2008. By asset size RBS was bigger than the GDP of the UK. Two months later, RBS was sinking with a loss bigger than 100billion British Pounds. The behemoths of finance and banking regardless of the accounting standards they used brought the financial system down to be bailed out by tax-payers in 2008 causing massive unemployment around the globe. The financial crisis of 2007-2008 seemed to be a gross failure of both of the prevailing financial accounting systems. They both failed to present a true picture of the economic transactions and the true health of the financial institutions.

Just four major global firms – DELOITTE, PRICEWATERHOUSECOOPERS[PwC] ERNST & YOUNG [EY] and KPMG audit 97% of US public companies, all the UK top 100 corporations, and 80% of Japanese listed companies. They are the only players big enough to check the numbers for these multinational organizations, and thus enjoy effective cartel status. What is more, since audits are a legal requirement almost everywhere, this is a multi-state guaranteed cartel. The BIG FOUR then multiply their income from 3 fold through consultancy practices and tax services built on the back of their captive audit market. They are allowed to operate with limited liability, suitable only to the extent of the modest funds their partners invested in their firms rather than all their personal wealth. Compulsory rotation of auditors in which the BIG FOUR exchange clients every 10 years or so is what passes for competition at the top of world accountancy. The alumni of the BIG FOUR are the international and national standard-setters, ensuring the rules of the game to suit the major accountancy firms and their clients.

Unlike multinational corporation, which tend to be controlled by a single holding company, the BIG FOUR operate as federations of separate partnerships in each country. While all exploit their brands, the arrangement allows the firms main operations and global headquarters[HQs] to distance themselves from misdeeds elsewhere. The BIG FOUR make about a third of their income from auditing and related assurance services. They are consultancy firms with auditing sidelines, rather than the other way round. Where once they were outsiders scrutinizing the commercial world, the BIG FOUR are, in the 21st century, insiders burrowing ever deeper into it. Richard Brooks in BEAN COUNTERS: THE TRIUMPH OF THE ACCOUNTANTS AND HOW THEY BROKE CAPITALISM [Brooks 2018][1] concludes that bean counting is too important to be left to today's bean counters.

The years since ENRON's collapse saw a string of similar-sized calamities. During the 2008 FINANCIAL CRISIS, for example, auditors were enmeshed in collapse of major banks and financial services corporations. All the Bıg Four had clients that collapsed or required bailing out or nationalization.

DELOITTE was the auditor of BEAR STEARNS and FANNNIE MAE. KPMG was of CITIGROUP, the recipient of the biggest bail out. PwC was the auditor of AMERICAN INTERNATIONAL GROUP [AIG] and GOLDMAN SACHS. EY was of LEHMAN BROTHERS. Ian D. Gow and Stuart Keels in THE BIG FOUR: THE CURIOUS PAST AND PERILOUS FUTURE OF GLOBAL ACCOUNTING MONOPOLY [Gov and Keels 2014][1] conclude that with respect to their scale and consequences, the audit failings during FINANCIAL CRISIS and subsequent years were as bad as the downfall of ENRON, of WorldCom and of WASTE MANAGEMENT and others that led to the regulatory response, the SARBANES-OXLEY ACT of 2002. The audit failings of the BIG FOUR of the institutions that failed causing FINANCIAL CRISIS are supportive evidence of the failure of SARBANES-OXLEY ACT.

As multinational corporations emerged to be the economic managers of the world under the guiding light of WASHINGTON CONSENSUS, a highly profitable business line presented itself, BIG FOUR's taxation services which provided multinational companies' compliance with their international tax obligation by minimizing their overall tax liability. BIG FOURS's tax specialists helped multinational move income to low-tax locations. They set beneficial prices for inter-office movements of inputs, outputs and cash. They generated paper losses, exploited favorable tax treatment of debt and depreciation. The BIG FOUR dominate global tax avoidance industry, in which GOOGLE, IKEA, APPLE, MICROSOFT and many other multinationals pay very little tax on very considerable income. In 2018, BIG FOUR earned around $25billion from tax work globally. PARADISE PAPERS in 2017, PANAMA PAPERS in 2015 and the Luxembourg leaks or LUXLEAKS in 2014 revealed a lot about the tax advice provided by the BIG FOUR in the newly transparent world. LuxLeaks revealed 343 large corporations had used Luxembourg's accommodating tax office rubber stamped deals to minimize, or annihilate their tax liabilities arranged by the BIG FOUR.

The BIG FOUR's failings had become a systemic problem, exacerbated by changes in the profession itself. By 1995, half of US states legislatures had introduced limited liability partnerships, LLP, capping each partner's liability for failings anywhere in the firm at what he or she had put into the business. By mid-1990s the BIG FOUR re-formed as LLPs in low-tax state of Delaware.

The BIG FOUR are perfectly placed to capitalize on the age of big data, with troubling potential conflicts of interest. The firms offer firstly to use client companies' own data to improve their audits and, through that, their audit clients' performance. The promise, in effect, is to update the methods of cost accounting and scientific management for the digital age. KPMG's DATA & ANALYTICS, [D&A], division for example, promises to 'turn data into value'. From becoming strategic advisors to government departments to teaming up with tech companies, the BIG FOUR are to be found at every cutting edge. PwC's tie-in with GOOGLE and KPMG's tie-in with MICROSOFT are typical. The BIG FOUR are where management consultancy and information technology now meet, dominating the cyber-security business, notwithstanding the vulnerabilities in their own sprawling networks that a 2017 attack on DELOITTE exposed. By 2015, the BIG FOUR occupied top spots in cyber-security consulting. Between them, they earned $7.6billion.

The financial accounting systems were not the only problems. There are things profoundly wrong with the way we calculate GNP and GDP, our national income and stock of wealth. These numbers generate alarming anomalies, and yet these numbers continue to rule the policy decisions of governments, financial institutions, corporations and communities. The flawed numbers rule our lives. So sacred is the single GDP figure to the US economy that a complex ritual evolved around its announcement, rivalling in mystique and secrecy the selection and announcement of a new Catholic pope. 12 times a year, chief US statistician and his team lock themselves up in Washington without phones and internet, draw the curtains and carry out a task refined over 50 years to arrive at a single number through the convergence of some 10,000 data streams from recent economic activity in the US. That number must not be spoken out loud. Instead, it is explained in a press release the next day by the US PRESIDENT's COUNCIL OF ECONOMIC ADVISERS. So powerful is this figure that no one must utter it before its official revelation. It is released at 8:30 am the next day. And that presented a unique opportunity for President Trump to capture world's attention with his tweet before the revelation. But the GDP was not designed for this purpose. It was not conceived to be the primary gauge of the economic health

of a nation. It was not created to be a key tool for policymakers and investors. It was not born to govern the global financial markets. As a measure of national wellbeing, the GDP is a deeply flawed summary. It was developed in the 1930s in the United States to have a better handle to get the economy out of recession. Simon Kuznets, one of its creators, warned of the limitations of GDP measures, especially their exclusion of household production and other non-market activity, as well as the many omitted costs of ecological damage of economic activity. Global warming and other disasters are some of the consequences of mis-accounting of micro and macro-economic activity.

The internalization of the uniform approaches to estimate GDP by IMF and the WB created global neglect of assessing the cost of damages the developed nations have inflicted on the eco-system. The emerging economies are continuing the abuse of the eco-system at higher and faster rates. The fastest growing doubled its GDP every 7 years in the last two decades of 20th century. The GDP figures, of course, do not include the cost of environmental damage done in the process. On the contrary, actually, as the air quality deteriorates, the resources spent on cleaning the mess and additional health care necessary to reduce the negative impact increases, so does GDP. Some development.

Peoples' Republic of China until 1979 tried to manage its economy by a centrally planned model it imported from Moscow. The results were deemed unsatisfactory. And they were. The mis-accounting of economic activities of the centrally planned years created environmental disasters, also matched in the USSR. GDP accounting system was not designed to treat nature as a scarce good, but treated it as a 'free' good with infinite supply to be exploited. Environmental disasters could have been eliminated had they changed their metrics of micro and macro-economic activities. In importing the accounting systems of market economies, the decision makers overlooked the inherent biases and limitations of market based evaluations, prices, and the total neglect of the costs of public goods exploited in economic development that these accounting systems had.

Accountants, mostly until recently, have assumed that natural resources are so plentiful that any loss of them is insignificant, not worth worrying to count. They assumed, or were told to assume that natural resources like water, soil, forest and air were free gifts of nature. They did not consider that the natural world could be used up worn out in the way that buildings and equipment can. But just as the 19th Century railway entrepreneurs had to learn that human-made capital, rails and trains, wears out and must be depreciated, so some accountants are beginning to understand that nature's capital is also subject to wear and tear, and worse, depletion. GDP's main weakness lies in the fact that it is insensitive to depreciation of capital assets. From an environmental point of view, this is very critical. It actually can be catastrophic.

GNP accounting reflect key economic flows: production, consumption, savings, investment, but they do not measure the state of capital stocks. Social, human and natural resources, as well as human-made capital such as building and equipment from which production is drawn needs to be included. By selectively focusing on flows the GDP sends misleading signals to policy makers. Activities that maximize production in the short term need not preserve the capital stocks that are central to long-term prosperity. Indeed, focusing just on GDP actually creates incentives to deplete capital stocks because the returns are treated as income. Ultimately, not recording the costs of reinvestments to sustain healthy ecosystems creates and conceals ecological liabilities. Sustainability and climate change are the big challenges of our time. We need to stop denying the escalating environmental problems by leaving environmental costs off our books.

The national accounting system, GDP, only measures 'economic activity', not true income, much less welfare. Rather than separate cost from benefits and compare them at the margin we just add all final goods and services, including anti-bads without subtracting the bads that made the anti-bads necessary. Also depletion of natural capital and natural services are counted as income, as are financial transactions that are nothing but bets on debts, and then further bets on those bets. Since bads have no market value and are ignored, but bads are joint products in producing goods and services, and are everywhere: nuclear wastes, the dead zone in the Gulf of Mexico larger than the size of New Jersey, gyres of plastic trash in the oceans, the ozone hole, biodiversity loss, climate change from excess carbon in the atmosphere, depleted mines, eroded topsoil, dry wells, and exploding debt. Depletion and pollution are the two ends of the throughput needed for the production of goods and services.

It seems that international organizations like the IMF and the WORLD BANK, governments and businesses that are not held responsible for the environmental costs of the damages they inflict have vested interests in GDP measures which emphasize and even exaggerate economic growth. The United States published its first adjusted GDP for depletion of oil and other non-renewable resources in 1994. The figures with their downgraded estimate of US wealth proved so controversial and politically explosive that Congress shut down the program. The lawmakers solved the controversy by shooting the messenger.

From Beijing, the public and private accounting systems of the world do not look like ideal models to import in their totality. Actually, a good number of Chinese eco-system related problems could have been avoided had the decision makers been selective in using market metrics. The changes the Chinese will make in public and private accounting systems are very important with implications beyond their borders. China, for example, is a very important contributor to global warming. By rejecting KYOTO PROTOCOL, President Bush made US position clear on the issue. And so did Donald Trump in 2018 by rejecting PARIS AGREEMENT. The world needs a new leader to offer immediate solutions to a very pressing global problem. The new leader must reform public and private accounting systems to be better metrics of economic activity. We need to understand the new Chinese private accounting system.

On firms' balance sheets GOODWILL appears as an intangible asset and represents the differences between the price the company paid to buy another firm and the purchased firm's original book value. BLOOMBERG's estimate of the total GOODWILL for all listed companies in the world was $8trillion in 2018. Its estimate of total physical assets of all globally listed companies was $14trillion. Not surprisingly, the biggest goodwill reporters were mergers and acquisitions, [M&A], junkies. AT&T had $143billion; ANHEUSER-BUSCH INBEV had $137billion; GE had $82billion; BERKSHIRE HATHAWAY had $81billion. APPLE was a rarity. It had little goodwill because it has eschewed big deals. INTERNATIONAL ACCOUNTING STANDARDS BOARD, [IASB], which frames the rules in most countries apart from America, after an ongoing review, is planning a change. The existing rules are almost identical in America and Europe. When an acquirer buys a firm, it books the GOODWILL, the difference between what the firm has paid to buy the acquired and the acquired firm's book value, on its balance sheet. There is a queasy circularity about GOODWILL. The more companies bid up the price of acquisitions, the bigger the asset they can book. That may be a partial explanation why M&As peek at bull markets. The acquirer then periodically reviews this sum in an impairment test. The revised value is based on new forecasts of the expected cash-flows of the new post-M&A entity. The write-off appears as a loss on the buyer's income statement. Meanwhile, the process of impairment is horrendously subjective.

In the early turbulent stage of the global financial crisis in 2009, leaders at theG20 summit in Pittsburgh decided that the chaotic world of the DERIVATIVES that American law-makers made possible by deregulating them needed to be made safer by ensuring that they are to be centrally cleared. A decade later, the notional value of all derivatives outstanding that are parked as assets of multinational banks globally stands at $639trillion. 68% of them are centrally cleared through a handful of clearing houses. Thus, collectively these institutions contain one of the biggest concentrations of financial risk on the planet.

A subset of these derivatives are traded over the counter, [OTC], by dealers and investors rather than on exchanges. The ECONOMIST[1] finds OTCs worrisome. The notional value of these OTC DERIVATIVES, according to BIS, is $544trillion, of which 62% are centrally cleared, and traders who avoid clearing houses will be financially penalized when new rules are implemented. Hopefully, clearing houses will work as intended if they do not fail. The clearing house is to sit between market participants, and to guarantee that the buyer gets what the buyer bought and the seller gets the payment. Since, cash-equity trades are settled within 2 days, and a party going bust is minimal. But, the lack of transparency of bilateral trade of options stems from the buyers' and the sellers' of the option facing each other for the life of the option, and that played a big part in the 2008 financial crisis. Bilateral trades require each to keep tabs on the other's creditworthiness. When they do not know each other's positions, keeping tabs on the other's

creditworthiness is difficult. If the buyer wanted to close its position early, for example, it might sell an offsetting position to another buyer. If all trades centrally clear, however, that would be known to everyone. There will be greater transparency. The raison d'etre of central clearing.

Clearing houses are mostly for-profit institutions. Their profits are expected to rise with their transaction volume, but losses for bad trades are largely to be borne by the members of the clearing houses. That seems to be a standing temptation to lower standards. Skimpy margin requirements or shallow default funds increase the chance that default of a big trade would leave a clearing house with large unmatched positions. That would then need to be covered by 4 possible sources of capital: 1. Its owner, usually an exchange, 2. its members, usually investment banks, 3. its customers, mostly investment funds, 4. The taxpayer in extremis.

Clearing houses have collapsed in the past. A Parisian house collapsed in 1974 when its members defaulted on margin calls when sugar prices plummeted. One in Kuala Lumpur failed in 1983 when palm-oil futures crashed. When the Hong Kong Futures Exchange clearing house collapsed in 1987, the regulators closed the stock exchange while the government and city-state's largest banks arranged a bail-out.

The shift to central clearing has been in interest-rate derivatives and credit derivatives. Clearing houses are a new group of financial institutions that are assumed TOO-BIG-TO-FAIL. Without certainty about where a clearing house in distress can seek capital, its members and customers will be more likely to behave in ways that mean it needs that capital. Rules intended to protect taxpayers may have the paradoxical effect of putting them back on the hook. The perpetual MORAL HAZARD problem.

15. Is taxonomy alchemy?

Not many MBA programs offer 20th century French philosophy, if they did, they could certainly benefit from it. MICHEL FOUCAULT argued that how you structure information is a source of power. FOUCAULT was obsessed with taxonomies, or how humans split the world into arbitrary mental categories in order to tame the wild "profusion of existing things". When we flip these around, "we apprehend in one great leap…. the exotic charm of another system of thought." But most MBA students are familiar with Daniel Kahneman's THINKING, FAST AND SLOW [Kahneman 2011] [1] that explains how these two systems, fast being intuitive and emotional, and slow being deliberate and logical drive the way we think. Daniel Kahneman's term for FOUCAULT's perception of taxonomies is "framing".

Jeff Bezos, Elon Musk, Warren Buffet and Masayoshi Son understand its importance, and with the expertise of their public relations skillfully manage how outsiders see their firms. By 2015 investors began to see AMAZON as a low low-margin retail business. Mr. Bezos changed AMAZON's image by reframing AMAZON as a high-tech firm, AWS. Its new cloud business produced a consistent and fast-growing cash flow and broke away from serial loss-making. Warren Buffet is an accomplished taxonomist who insists that BERKSHIRE HATHAWAY is neither a conglomerate nor an investment vehicle, but a one-off that can only be analyzed using a special set of rules that he has provided in an "owner's manual". This framing has shielded BERKSHIRE HATHAWAY from scrutiny and criticism over the past decade, even as it has underperformed the stock market. If, of course, you do see BERKSHIRE HATHAWAY as one-off to be analyzed by a unique set of rules.

Masayoshi Son criticized for its weak cash flow and high debt of the telecoms and tech conglomerate began to describe it as a venture capital to be assessed using his venture capital measure of internal rate of return which is both flattering and unverifiable. He has since completed the shift by setting up the VISION FUND, a giant $100billion investment vehicle in London. Elon Musk infers that TESLA cannot and should not be judged in the present by its past performance, but judged in the future. With the help of image managers, by reframing how their firms are classified and subdivided, managers can be successful in changing perceptions, lowering cost of capital when the investors keep on buying their stocks and intimidating competitors. Taxonomies are not alchemy. Eventually the firms must succeed.

Since 1926, most stock market returns in America have come from a tiny fraction of shares claims Hendrick Bessembinder in DO STOCKS OUTPERFORM TREASURY BILLS?[1] Just five stocks [APPLE, EXXON MOBIL, MICROSOFT, GE and IBM] accounted for a tenth of all the wealth created for stockholders between 1926 and 2016. The top 50 stocks account for 40% of the total wealth created. More than half the 25,000 or so stocks listed in America in the past 90 years proved to be worse investments than Treasury bills. The rise that FAANG stocks [FACEBOOK, AMAZON, APPLE, NETFLIX, GOOGLE] have held since 2015 is not unusual. The clout of leading stocks in the S&P 500 has often been higher in the past, but they were not free cash destroyers. A 21st century conundrum. Hendrick Bessembider's results are supportive of another research, which states that most stock returns are made on relatively few trading days. In the first half of 2018, 3 companies AMAZON. NETFLIX, ALPHABET accounted for 71% of DJI and 78% of S&P 500.

One of the greatest quandaries of the last three decades has been the way in which reductions in spending on research and development have coincided with an increasing financialization of the private sector. While causality may be hard to prove, it cannot be denied that at the same time that private pharma companies have been reducing their research and development budgets, they have been increasing the amount of funds used to repurchase their own shares, seemingly to boost their stock price, which affects the price of stock options and executive pay linked to such options.

In 2011, along with $6.2billion paid in dividends, PFIZER repurchased $9billion in stock, equivalent to 90% of its net income and 99% of its research and development expenditures. AMGEN, the largest biopharma company, has repurchased stock every year since 1992, for a total of $42.2billion through 2011, including $8.3billion in 2011. Since 2002 the cost of AMGEN's stock repurchases has surpassed the company's research and development expenditures in every year except 2004, and for period 1992-2011 was equal to fully 115% of research and development outlays and 113% of net income. Boosting stock prices does not create value, but facilitates extraction, rewarding stockholders and executives. The problem of stock buybacks is not isolated but rampant. In the last decade, S&P 500 companies have spent $3trillion on buybacks.

A common critique of buy-backs is an inchoate sense that firms buying themselves is unnatural. But actually, buy-backs are like dividends. Cash moves from the firm to its owners. Buy-backs' advantage is their flexibility. Unlike with dividends, stockholders can elect to participate or not, and the firm can turn the tap on and off without disappointing investors.

A second claim is that buy-backs create shareholder wealth. Does withdrawing dollars from an ATM makes you richer? No. But, buy-backs can transfer wealth between stockholders. If one sells at a price that later turns out to be lower, it makes the seller wealthier and lower price in the future lowers the remaining stock holders' wealth. Though, buy-backs send signals about managers' intent in allocating capital. They are using cash for buy-backs.

A third criticism is that firms' main motivation is to manipulate either their stock prices or their earnings per share, EPS, which can be cosmetically boosted as the number of shares falls. A fourth is that executive-pay schemes that are designed around EPS, can encourage buy-backs. A fifth concern is that buy-backs lead to low investment. There is supportive data. The firms' cash flow has risen relative to GDP since 1990s, but a lower proportion has been spent on investment.

The sixth claim is that buy-backs are a good measure of whether corporate tax reform was in the public interest. They are not. Better alternatives are whether overall investment rises more than annual tax break, whether firms' wage bills are rising and whether these effects will last. Most criticism of buy-backs is motivated by legitimate concerns about serious problems, including excessively high profits and squeezed wages, concentrated ownership of firms and reluctance of the financial industry to back more capital hungry startups.

The negative signal sent by surging buy-backs is their increasing leverage. 54% of firms had buy-backs more than they earned in the first quarter of 2018. When firms splurge on their own stock, it is a sign of excessive optimism. Note that, last time they did was right before the 2008 crash.

Jan De Loecker and Jan Eeckhout in GLOBAL MARKET POWER[1] using financial statements of 70,000 firms in 134 countries, examined markups [selling prices divided by production costs] and found average markups rose from 1.1 in 1980 to 1.6 in 2016. America and Europe saw the biggest increases. But many emerging markets markups barely rose. In China they fell. That suggests rich-world firms may have been able to increase markups by outsourcing to cut labor costs. Another possibility is that corporate concentration may have increased because of lax antitrust enforcement or the

growing heft of companies benefitting from network effects, like internet firms. APPLE's staggering earnings was $60billion, or $8 per person on Earth.

As Peter Orszag, Obama's former DIRECTOR OF MANAGEMENT AND BUDGET, later at CITIGROUP, and Jason Furman, Silicon Barack Obama's CHAIR OF COUNCIL OF ECONOMIC ADVISORS, reported in a research paper that two-thirds of nonfinancial firms that had managed to achieve a return on invested capital of 45% or more between 2010 and 2014 were in either health care or information technology sectors. What allowed such gigantic profits and enormous CEO compensation in these sectors were market power. Silicon Valley saw no need to apologize. Theirs was the great technological and entrepreneurial success story of the late 20th and early21st centuries.

Antitrust, data protection and intrusive tax investigations were, as far as Tim Cook, CEO of APPLE was concerned, nothing more than "political crap", antiquated road bumps on the highway to the future. As tech oligarch Peter Theil of venture capital firm FOUNDERS FUND told audiences and readers, "Creating value isn't enough – you also need to capture some of the value you create." That depends on market power. "Americans mythologize competition and credit it with saving us from socialist bread lines." but Theil knew better. As far as he was concerned, "Capitalism and competition are opposites. Capitalism is premised on the accumulation of capital, but under perfect competition all profits get competed away. The lesson for entrepreneur is clear….. Competition is for losers." Theil is a Trump supporter an Ayn Rand libertarian who is critical of government and even education. Each year he offers hundreds of thousands of dollars to encourage students to drop out of college and start companies instead. Silicon Valley has had a core Ayn Rand liberalism that justifies their sense of freedom from any costly social responsibility for the downsides of their products and services. Theirs is an "Greed is good" ethos overlaid with contempt for government intervention and "move fast and disrupt everything" mentality.

It is to the George W. Bush era that dismantled most of the checks on industry concentration and helped to shape the present state of US economy. American industry reached levels of concentration arguably unseen since the original Trust era. A full 75% of industries witnessed increased concentration from 1997 to 2012 according to Gustavo Grullon[1]. The AT&T monopoly which had been forced to divide itself into 8 companies, was allowed to reconstitute itself into VERIZON and AT&T. AT&T bought DirecTV and TIME WARNER.

By the middle of the second decade of the 21st century, four companies, General Motors, Ford, Chrysler and Toyota, controlled more than 60% of the automobile market. Five media companies, News Corp., Google, Garnett, Yahoo, Viacom controlled 54% of the US media market. In household appliances manufacturing industry, Whirlpool, AB Electronics, General Electric and LG Electronics controlled 90% of the US market. Oil industry remains to be the most concentrated industry in the world, followed by telecommunications and electrical power generation and distribution industry. Three of the four biggest stockholding companies in the world are oil companies, ROYAL DUTCH SHELL, EXXONMOBIL and BP followed by ten banks, JPMORGAN CHASE, GOLDMAN SACHS, BOA MERRILL LYNCH, MORGAN STANLEY, CITIGROUP, DEUTSCHE BANK, CREDIT SUISSE, BARCLAYS CAPITAL, UBS and WELLS FARGO SECURITIES. In no other period in history have so few institutions wielded so much economic power over the lives of so many people.

Historically, six companies invited political backlash that only twice led to their breakup. First, the EAST INDIA COMPANY, a British private empire involved in opium production and trade supplying Chinese addiction among other equally awful things, lost its long standing legal monopoly over trade with India in 1813. In 1911, US SUPREME COURT broke up John D. Rockefeller's STANDARD OIL, and US DEPARTMENT OF JUSTICE's anti-trust division also initiated legal action against US STEEL, the other giant of the Gilded Age. DOJ went after IBM in 1969, and in 1974 DOJ sought to break AT&T's grip on telecoms, and did. And, the DEPARTMENT OF JUSTICE sued to dismember MICROSOFT in 1998.

17. In the age of weaponized interdependence of techological cold war, are multinationals national companies doing business abroad or are they stateless multinationals of Washington consensus?

The American tech company, QUALCOMM, doing 65% of its business in People's Republic of China, with most of its profits in 2017 booked in Singapore to minimize their taxes in the Unites States, convinced the Trump administration in March 2018 to block a hostile takeover by BROADCOM, another tech company listed in the United States but domiciled in Singapore for tax efficiency, on the grounds that QUALCOMM's independence was vital to ensure America's strategic technical supremacy over China. The predator, BROADCOM, on 11/2/2017, four days before its hostile bid, announced to shift its legal base to the US. President Trump's veto of the hostile takeover of QUALCOMM by BROADCOM for $117billion was one of the most aggressive applications of COMMITTEE ON FOREIGN INVESTMENT IN THE UNITED STATES [CFIUS].

This action was unusual in two respects. It was a hostile take-over, so there was no agreement in principle between buyer and seller for CFIUS to consider, and therefore no opportunity for mitigation by the parties. With that veto the Trump administration weaponized CFIUS. On August 13, 2018, President Trump signed into new legislation designed to strengthen the role CFIUS and to force it to give greater weight to national security considerations compared to the prior open borders approach to direct investment. This new law was FOREIGN INVESTMENT RISK REVIEW MODENIZATION ACT [FIRRMA] expands the types of transactions requiring CFIUS approval and introduces new categories subject to review, including "critical materials", and "emerging technologies". FIRRMA creates a white list "identified countries" that would not be subject to the new strict scrutiny due to their friendly relations with the United States, including parties to mutual defense treaties. What is new is that President Trump is refusing to play the free-trade game any longer. The United States will match China, Germany, South Korea and other countries with trade surpluses tariff for tariff and subsidy for subsidy.

THE PATRIOT ACT passed after 9/11 allowed the US Treasury to label foreign banks as threats to financial integrity and to ban them from the system for clearing dollar payments. In 2001-2003 America won the right to monitor SWIFT, which originally was the confidential global bank messaging system. Between 2002 and 2008 the TREASURY experimented with minor offenders. It brought to heel Victor Bout, an arms dealer; BANCO DELTA ASIA, a bank in Macau that traded with North Korea; and Nauru, a Pacific island with a sideline in exotic finance. Then went after a state owned Turkish bank, HALK BANKASI. Since 2008 Western banks have been fined for breaking American rules in the past, but not banned from dollar clearing.

The US TREASURY accused BANCO DELTA ASIA of laundering money for North Korea, prompting depositors to panic, other banks to keep their distance and Macau government to step in. The US TREASURY subsequently barred American financial institutions from holding a correspondent account for the bank, excluding BDA from the American financial system. "It is hard to escape the long arm of the dollar" was proven. Dollars dominance reflects what the economists call network externalities. The more people use it the more useful it becomes to everyone else. The dollar also benefits from a hub-and-spoke model for the exchange of currencies, the invoicing of trade and the settlement of international payments.

The global financial system is like a sewer and all of the pipes run through New York. This gives US TREASURY great punitive power and jurisdictional reach. However, not all dollar settlements are subject to American jurisdiction. It is possible to clear dollar payments in Tokyo and Hong Kong and elsewhere. But America's FEDWIRE and CHIPS, handled transactions were worth $4.5trillion a day in 2017. Hong Kong's system which runs through HSBC dealt with .8% of that amount. More over the ability of offshore dollars [Eurodollars] to enter and leave the American financial system if necessary is vital to their appeal. The liquidity of Hong Kong's system is buttressed by ~~HSBC~~'s ability to handle dollars in New York.

China is developing its own international payments system based on its currency. Russia and China have agreed to increasingly conduct trade in their own currencies, rather than US$s. President Trump's withdrawal from the Iranian deal Obama and American allies have concluded increased trading in in RMB-denominated oil futures contracts China launched in Shanghai recently. OPEC's price of its exports is still in US$, and OPEC's global exports are a very large part of international trade. Increasing crude oil trades in currencies other than US$ will result in gradual de facto de-dollarization of global finance.

At the end of 2017, ZTE was the world's fourth biggest telecoms-equipment maker, with an enterprise value of $17billion with a Chinese state owned enterprise, [SOE], as its main stock-holder. ZTE's US sales were only 15%. On

4/26/2018, the US DEPARTMENT OF COMMERCE banned American companies from supplying ZTE with components for 7 years. ZTE had admitted trading with Iran and North Korea and lied about remedies it had put in place. ZTE's stocks were suspended temporarily. Though, subsequently the Trump administration softened its position.

Companies that break the law or act in concert with banned governments do not deserve sympathy. But there are unsettling concerns drawn from US government use of such weapons against big foreign companies. First, any large company can be reached. No fewer than 2,000 big companies outside America issue dollar bonds. The total dollar debt owed by companies outside America is over $5trillion. Cross-border supply chains mean most firms rely on American tech components in some way. Second, these powers can be misused, either for overtly political end or because they are badly calibrated. After ZTE, the global business community worried that HUAWEI could be next. And was in December 2018.

IT supply chains are highly specialized and globally tangled. Cutting companies off, WEAPONIZING INTERDEPENDENCE, in military jargon, can cause serious disruptions. HUAWEI is China's most prized high-tech company. Its name proudly translates as "Chinese achievement". $150billion revenues put HUAWEI in the same league as MICROSOFT. SAMSUNG is the only company that sells more smart-phones. In superfast 5G mobile networks, HUAWEI is a global forerunner with valuable patents, and has the largest manufacturing capability of telecoms equipment in the world. Its demise can cause shock waves that would rattle all of the tech world. On May 15, 2019, President Trump barred American firms from using telecoms equipment made by firms posing a "risk to national security". His was a seismic decision. All technology firms are highly interconnected. No technology firm is an island.

On May 20, GOOGLE announced its decision of stopping to supply the proprietary components of its ANDROID mobile operating system to HUAWEI. INTEL, QUALCOMM, and MICRON have also joined GOOGLE and announced their decisions of stopping sales. Interdependence, we are told, cuts both ways. HUAWEI is a very important buyer of American high-tech. QORVO, the maker of wireless communication chips derives 15% of its revenue from HUAWEI. HUAWEI is also an important customer of MICRON. INFORMATION TECHNOLOGY & INNOVATION FOUDATION estimated the cost of export controls to American firms to be $56billion in lost sales over 5 years[1]. The stock prices of American technology companies fell as a result. TAIWAN SEMICONDUCTOR MANUFACTURING COMPANY, [TSMC], announced its decision to continue supplying HUAWEI. Last few years HUAWEI has consciously made strategic moves to become less reliant on American proprietary technology by increasingly making use of chips designed by HiSilicon, its in-house chip-design unit that TSMC produces for HUAWEI. Chinese chip factories are not capable of manufacturing HiSilicon's sophisticated designs. Despite years of efforts to be self-sufficient by manufacturing its own computer chips, China spent more in 2018 on importing chips than it did on importing crude oil.

In the globally tangled chip-industry supply-chains, many non-American companies make use of American parts and intellectual property. They may therefore consider themselves covered, wholly or partially, by the American ban. ARM, a SOFTBANK owned British domiciled company, whose technology powers chips in virtually every phone in the world, including those made by HiSilicon, announced its compliance with the COMMERCE DEPARTMENT's rules. That suggests that ARM will not grant HUAWEI new licenses. It is not, however, clear whether ARM will support existing licenses.

A return to business as usual seems unlikely even when the ban is lifted in exchange for trade concessions. President Trump's administration have to has twice demonstrated a willingness to throttle two big Chinese companies. Trust in American technology firms has been eroded. China has committed billions of dollars to efforts to boost its domestic capabilities in chip-making and technology. If the ban is, on the other hand, a tactic of the strategy of the US campaign to take down HUAWEI, HUAWEI will need to look for alternative chips and software that Chinese suppliers will try to provide. The Chinese IT companies do not seem to have other options. The global supply-chains put in place with American leadership look vulnerable. Interdependence that can be weaponized is weaponized to "Make America Great Again". Global supply-chains' vulnerabilities are exposed. Like the Japanese earthquake and tsunami induced wake-up call exposing the rigid interdependencies of the globalized supply-chains.

As, generally, is the pattern in developing economies in their catch-up phase, the Chinese domestic microchip industry started at the lower-value end of the process. Its comparative strength lies in assembly and packaging chips. Dozens of firms around Yangzi delta near Shanghai, for example, specialize in this sort of work. JCET, TIANSHUI HUATIAN, and TFME are better known ones. In the age of Technology Cold war, China is turning to design and manufacturing. Chinese firms critically rely on modifying designs from ARM. The SOFTBANK owned company's chips dominate the mobile-computing business and probably will be able to be a major if not a dominant supplier of smart devices that will make up INTERNET OF THINGS. According to company releases, ARM has plans to enter high-powered CLOUD-COMPUTING chips market.

Making progress in manufacturing high-tech chips turned out to be arduous for the Chinese companies. The Chinese up-starts face tough competition from incumbents in other countries with intimidating accumulated know-how of the best army of most trained engineers with decades of experience. Manufacturing is the most demanding part of chip making to replicate. The semiconductor manufacturing industry is about repetitive cycles of learning. HiSilicon's Kirin 980 was first smartphone chip to be produced on the 7-nanometer node, the current state of the art for squeezing in computer power. TSMC of Taiwan had the needed technology. Like APPLE and QUALCOMM, HiSilicon, had to have its chips manufactured in Taiwan, by TSMC. Furthermore, there were 29 companies with advanced fab facilities in 2001 after consolidation there are 5 in 2019. The suppliers of equipment for these fab facilities are even fewer. The Dutch, [ASML], is the dominant supplier of extreme ultra-violet lithography.

President Trump's tweets grumble about Chinese companies' pilfering American intellectual property. The idea that Chinese firms have some technology companies of their own to offer may seem unrealistic propaganda. Actually, Western technology firms increasingly show interest in Chinese tech. In some cases, they bought Chinese rivals outright. Such acquisitions date back to 2016. Most deals were small and involved niche industries. Maker of power-trains and sensors for electric vehicles, or agencies managing social-media influencers.

The French FAURECIA, leading global supplier of vehicle interiors, acquired JIANGXI COAGENT ELECTRONICS, which develops human machine interfaces in 2017. In 2018, XILINX, an American chip-maker acquired DeePhi Tech, a machine-learning start-up in Beijing. All told, American technology companies have invested $1billion in Chinese since January, 2018, according to DEALOGIC, a data provider. Chinese tech firms invested nearly four times as much, $3.8billion into those in America. In 216, APPLE put $1billion into DIDI CHUXING, and MICROSOFT took a stake in LAIYE, an AI BUTLER that handles voice commands through an app. INTEL has taken stakes in several start-ups, including, in 2018, a cloud-service provider and in 2019 a firm that writes software for cashier-free stores.

In 2018, ALPHABET paid $550million for a stake less than 1% in JD.com, the e-commerce competitor of ALIBABA. NVIDIA, an American maker of AI chips, invested in WeRide.ai, a Chinese self-driving tech, and TuSimple, an autonomous-truck stat-up. In 2018, INTUITIVE SURGICAL, a robotics company, took a stake in BRONCUS, a Chinese start-up.

In the last ten years or so, China has blocked only one foreign acquisition. And, that was Coca Cola's $2.4billion bid for Huıyuan Juıce, a soft-drinks company in 2009. In 2018, the Chinese "negative list" of areas where are restricted shrank from 63 to 48 industries. Chinese regulators surprised many by not blocking DeePhi, despite how strategic its technology could turn out to be defense related and thus un-acquirable.

In 2017, the Treasury considered sanctioning CCB and AGRICULTURAL BANK, two very big Chinese banks. According to BLOOMBERG the two Chinese banks have $344billion liabilities. Sanctions could be unsettlingly counterproductive. A realistic concern is that some countries will try to develop ways to escape America's dollar reach. Careful studies of the Treasury's implementation of its new soft-power of weaponized interdependence offer a step-by-step guide what a country needs to survive without America's permission: semiconductors, several global currencies, and clearing system, credit rating agencies, commodity exchanges, a pool of investors and shipping companies.

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