EFFECTS OF GERMAN-TURKISH INDUSTRIAL POLICIES ON MANUFACTURING INDUSTRY COMPETITIVENESS[1]

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ABSTRACT

The main purpose of this study is to examine the effects of German-Turkish industry policies on manufacturing industry competitiveness. In accordance with this purpose, firstly, industrial policies of both countries will be discussed theoretically within the framework of Industry 4.0 basic approach. Secondly, the manufacturing industries of both countries will be compared in terms of selected indicators such as productivity, capacity utilization rates, value added, production index, R&D expenditures and employment. During the implemantation phase, the competitiveness of German-Turkish manufacturing industries in exports will be analyzed for the years 1996-2019, which covers the post-Customs Union period. SITC Rev.3, 3-digit product and / or product groups in the UN Commercial Statistics Database (UN Comtrade) are used as the data set for the analysis in question. Competitiveness values in exports for a total of 134 products and / or product groups with low, medium and high technology intensity according to technology levels are calculated separately for both countries and technology groups with Béla Balassa's Revealed Comparative Advantage (RCA) Index. The answer of the question why German manufacturing industry exports between 1996 and 2018 is not strong or moderate and only weak compatitive in high technology density can be given with the shift of the production to Eastern countries especially to China due to the economic and geographical cost advantages. Turkey has moderate comparative advantage in exports by low technology intensity and weak competitive comparative advantage in exports in medium technology intensity.

Key words: *Germany, Turkey, Industrial Policy, Revealed Comparative Advantage Index*

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1. Introduction

Industrialization is considered as the leading force of economic development. Adopting the right industrial policies to create a strong structure in the industry, especially in the manufacturing industry, it holds a great significance. Industrial policies are generally associated with competition policies and take place in the form of various interventions that governments implement to promote sustainable development and increase the competitiveness of the industry in the country concerned. Industrial policies differ according to the aims, the tools used and the level of development of the country concerned. The government policies implemented may manifest themselves in the form of horizontal interventions that feed businesses with different policies, or they may occur with vertical interventions for a particular sector.

Germany is a leading country in the world in many industries, especially in the automotive industry. It is an undeniable fact that Germany has an extremely powerful industry. The question at this point is whether Germany has strong industrial policies. Germany was not as effective as Britain in formulating industrial policies and Britain contributed more than Germany to EU industrial policies as a natural result of the Industrial Revolution process. Germany's role in industrial policy as the country with the strongest industry in the EU can be stated as a strong sectoral specialization, a strong focus on research-intensive industries and the strong competitiveness of companies in Germany. In addition, ecological industrial policy, future-oriented environmental policy, strong education system and investment-friendly tax policy are other factors that increase the effectiveness of Germany's industrial policies.

The term Industry 4.0 is a concept used to express the fourth industrial revolution. It includes a new level of production organization and control of the entire value chain throughout the life cycle of products. The combination of people, objects and systems creates value creation networks that optimize costs, availability and resource consumption. Germany aims to be the leading provider of Industry 4.0 technologies with the aim of developing the innovative and internationally successful manufacturing sector.

When Turkey's industrialization process is examined, the reality is that the desired level is still not reached, despite the development plans, industrial plans and various reforms implemented. The reason for this can be considered as Turkey's current growth model. Turkey has had an import-led growth model and its savings rates are low, consumption tendency is high, foreign resource dependency is high and it has difficulties in investing. Due to low production in Turkey, there are certain problems regarding the emergence of diversification in the industry.

Turkey has set itself a target as keeping up with the West based on the example of Italy especially with the Third Five-Year Development Plan implemented in 1973-1977 and in this direction, it is aimed to create a competitive environment in order to integrate Turkish industry into the European Economic Community. However, structural reforms carried out in Turkey have not reached the desired level to produce high-tech products and to increase the R & D spending. That said, the ratio of R & D expenditure to national income in Turkey is under 1 percent. In developed countries, this rate ranges from approximately 1.5 percent to 4.5 percent.

In this study, German-Turkish industrial policies and industry 4.0 processes will be examined within the context of the relevant literature. The new international division of labor in the world will be discussed in terms of bringing Germany and Turkey the current industrialization process. German-Turkish manufacturing industries were examined with selected indicators such as productivity, capacity utilization rates, value added, production index, R&D expenditures and employment. The competitiveness of German-Turkish manufacturing industries in exports will be analyzed for the years 1996-2018, in terms of detecting the changes in the post-customs union period.

2. Industrial Policy in Germany and Industry 4.0: An Overview

It is not true that the industrial policy in Germany is designed as part of the holistic development plan by targeting certain industries and technologies, and industrial policy did not play a special role in the formation of general economic policy. Industrial policy has been developed by focusing more on different economic activities with relative advantages. Industrial policy is designed to deal with the problems in these economic activities separately, rather than counting each economic activity as part of the overall economic plan (Erber, 2016: 1).

In order to obtain value added and product variety in industry it is evident that the industrial policy should be supported from the main policy areas determined as competition, trade, innovation and education policies. The strong relationship between industrial policy and these policy areas in Germany played an important role in making Germany an industrial powerhouse. At this point, the fact that there are many industries with competitive advantage in Germany, which create an innovation-oriented economy, has brought Germany a strong position in international competition. Thanks to the trade policy that makes access to foreign markets strong, since the mid-1980s, Germany has had a large trade surplus and is one of the largest exporter of goods in the world.[1] Key institutions such as Helmholtz Association of German Research Centres, Max Planck Society, Leibniz Association, German

[1] Germany has become the world's third largest exporter of goods after the USA and China with $1561 billion worth of exported in 2018, see: World Trade Organization, **World Trade Statistical Review,** 2019, p. 100.

Research Foundation, Fraunhofer Society, which manage their main research on industrial and technology policies in Germany, have contributed to Germany being a center of innovation and production. The importance of the German education system, which meets the technical requirements of the industrialized German economy with the "dual" vocational education system, should not be overlooked.

Incorporating Industry 4.0, which was brought to the agenda at the Hannover Fair for the first time in 2011, Germany aimed one the one hand at minimizing the errors caused by human labor in production, ensuring flexibility in production and accelerating production, with the understanding of maximizing digitalization in the manufacturing industry and making production with high technology, one the other hand the competitive advantage of China and other Far East countries aimed to be eliminated, what was obtained due to cheap labor and tax facilities (Egilmez, 2018: 186-187).

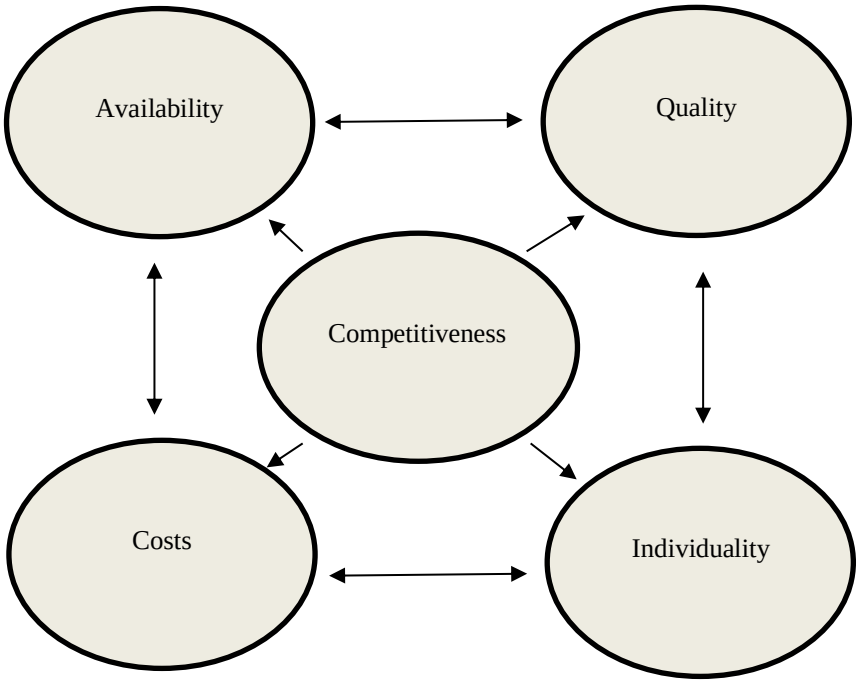


Figure 1. Competitive Factors of Industry 4.0

Source: Wiegand, 2018: 4

Global competition, uncertainties in resource costs, superior developments in information technology and the changing attitude of individuals lead businesses to be agile and to make ''smart production'' based on innovation, planning, design, implementation and management, which increases efficiency and encourages competitiveness (Banger, 2016: 147-149). The purpose of Industry 4.0 is to make the competitiveness sustainable by optimizing the four competitive factors of enterprises

at the same time, which are availability, quality, costs and individuality (see Figure 1).

Industry 4.0 represents a serious change in production processes, as in the first industrial revolution in the 19th century. The current process involves the digitalization of goods, companies' information technology (IT) structures, managements, industrial services, Internet of things (IoT) in industrial production one step further. This progress will change the fundamentals of industrial production at a global level (Turek, 2016: 259-260).

Large industrial enterprises in Germany appear to have a higher degree of digitalization than small companies. The reason for this can be shown as the very high initial investment cost of digitalization and this cost cannot be covered by subsequent cost savings. In addition, the very high network communication costs of digitalization attribute the competitive advantage to be brought by Industry 4.0 only to obtaining a monopoly-like position. This provides companies with lower pricing flexibility and the chance to supply their own market in the Industry 4.0 application. In addition, the very high network communication costs of digitalization attribute the competitive advantage to be brought by Industry 4.0 only to obtaining a monopoly-like position. This provides companies low price setting flexibility and the chance to supply their own market in the Industry 4.0 application (Bartholomae, 2018: 8).

When the situation is evaluated in terms of the automotive industry, in which Germany has highly advanced level of sectoral specialization, it is seen that access to foreign markets is essential for companies in the automotive sector. The growth of Germany in the automotive sector is occurring at increasing levels of motorization in markets in Eastern Europe, Asia, Latin America and other threshold countries, except the USA market. As of 2018, Germany has exported a total of approximately 4 million vehicles to world markets. Approximately 2.46 million of this vehicle was exported to European markets, while the rest was exported to other markets. In addition, many countries are constantly making regulations to support or even force companies to establish local production facilities. This results in high import taxes and non-tariff trade barriers. All this means that exports from Germany are getting more and more difficult (Verband der Automobilindustrie (VDA), https://www.vda.de/en/topics/economic-policy-and-infrastructure/trade/importance-oftrade-policy-for-industry-and-for-germany-as-an-industrial-location.html).

3. Industrial Policy in Turkey and Industry 4.0 Process: An Overview

It is useful to make a distinction between the period of economic reforms that started in 1980 and the period before 1980 in the industrial policy debate in Turkey. After 1980 Turkey abandoned the ‘‘import substitution industrialization’’ strategy, in which trade protection is an important element of industrial policy. (Atiyas and

Bakis, 2015: 1219). As a result of the decisions taken on January 24, 1980, it switched to an export-oriented industrialization strategy, in which the non-export-oriented statist policies ended, the economy was opened up to the outside world. (Uras, 2017: 163).

In line with the closed economy and import substitution industrialization strategy before 1980, imports of Turkey were regulated by various trade restrictions such as the annual import programs and tariffs, tariffs or similar taxes, additional taxes, import bans, quotas and exchange controls in the 1960s and 1970s (Akkoyunlu and Mihci, 2006: 2347). The export-oriented industrialization strategy implemented after 1980 has a nature to encourage foreign trade. It has forced Turkish industry to compete with imported goods, which has forced Turkish industrialists to produce cheaper and higher quality goods. (Koc et al., 2018: 8).

Intensified foreign trade with EU member countries after the implementation of the Customs Union Agreement in 1996 caused remaining of labor-intensive industries based on cheap labor in Turkey and concentrating capital-intensive high-tech industries in the developed industrial countries of the EU. Since this period, the share of the public sector in the manufacturing industry has decreased with the effect of the privatizations after 1980, SMEs has had an important place in the industrial structure and at the same time, industrial enterprises have generally concentrated in organized industrial zones and small-scale structures. Turkish industry has exhibited a largely foreign-dependent characteristic (Soyak, 2015: 66).

In the Tenth Development Plan implemented in 2014-2018, carrying out the transformation of the manufacturing industry to increase share of Turkey in world exports and international competitiveness, ensuring the transition to higher value-added structure and increasing the share of high-tech sector have been identified as the main objectives. Innovation and firm skills, effective participation of regions in production, integration between sectors, green technology and production and foreign market diversity have been determined as the main focuses of transformation in the manufacturing industry. It is aimed to increase productivity and domestic value added by promoting green production capacity, innovation, firm skills and intersectoral integration and to achieve stable high growth by foreign market diversity and improving regional production capacities (Ministry of Development, 2013: 89).

It has been foreseen that Turkey will experience problems in the digital conversion process required by the Industry 4.0 due to lack of investment and medium and long term problems in the labor market. In addition, the problem of cheap labor and the high cost of physical capital is another basic problem expected at the point of integration of technological innovations into the manufacturing industry (Dogru, Mecik, 2018: 1594). At this point, it is expected that Turkey takes advantage of the

existing relatively flexible, low-cost production workforce to provide logistical advantage and to take a competitive position against global companies (Bulut and Akcaci, 2017: 59-60).

In order to successfully complete the Industry 4.0 process, the production of industrial robots is one of the basic conditions for having a relevant position in the world in the digitalization phase. At this point, Turkey should take necessary steps regarding R & D spending and employment of R & D personnel. Training qualified R&D personnel, increasing the share of R&D expenditures in GDP and to utilizing current and potential resources of universities will contribute to the development of industrial robot technology that will provide high value added production (Kilic and Alkan, 2018: 44). It is necessary to develop an approach on be prepared Industry 4.0 and sustainable production. In this regard, there is an Industry 4.0 approach titled as ‘‘Government / Regional Support’’, ‘‘Accelerate Innovation’’, ‘‘Adoption of best Practices’’, ‘‘Establish Infrastructure’’, ‘‘Foster New Talent’’, ‘‘Develop a Roadmap’’ (Schober, 2017: 25).

4. The New International Division of Labor in the World: Germany and Turkey

According to Alain Lipietz (1998), the first phase of the international division of labor dates back to the 1960s and this phase justifies Adam Smith's intuition. While only certain products were being subject to international trade, production tends to concentrate where production conditions are favorable or manageable in terms of natural and cultural conditions in this system. The reason why there is a fairly stable trend in this concentration is that the economy of scale protects old production centers against new ones. The emergence of new production centers in this system could only occur within the scope of ‘‘natural’’ or ‘‘artificial’’ (protection of infant industries) monopoly protection (Lipietz, 1998: 137-138).

The Fordist division of labor could fall under three areas of responsibility, which are design, engineering and work organization; qualified manufacturing (especially machines) and unskilled manufacturing or assembly (routine work including maintenance). In other words, typical standardized procedures for Fordist mass production allowed for a geographical distinction between these three areas of responsibility. At the point of positioning the division of labor in the international arena, places where the relationship between quality and costs are best carried out was preferred. Just as research centers are not established where there are no engineers, routine work has been the most valuable in places where suitably qualified jobs are the cheapest. Therefore, creating an absolute advantage in the division of labor within an industry raised the question mark. The international economic order, in which production is shifted from industrialized countries with skilled workers and

more advanced technical capacities to underdeveloped and low-cost countries has created the second international division of labor (Lipietz, 1998: 136).

Fordism, a post-war development model, has clearly collapsed since the early 1980s. Alain Lipietz (1998), one of the representatives of the French Regulation School, defined the Fordism crisis in the 1980s as a supply-side crisis and stated that within the framework of the new hegemony, new understandings emerged in labor-capital relations, but a common opinion was not determined at the point of determining the way out of the crisis. Lipietz (1998) commented that intensifying international economic relations are shaped over continental blocks. In the context of the definition of center and peripheral countries that will create a new hierarchical order in the world economy, he stated that Asia and the Pacific region will gather around Japan, the American continent around the USA and the European continent around Germany. Common to all blocks is that the economies that bring them together are heterogeneous (Lipietz, 1998: 137-138).

Companies operating in Germany and Japan, which Lipietz (1998) considered as industrialized central countries, reorganized their production systems in the face of the crisis and gave up the understanding of direct (simple) control over employees, and transferred most of the organizational responsibility to employees. Considering that a system in which employees are included in the production system will have an effect that reduces costs and increases profitability, the state has undertaken the role of institutional and legal protection of the labor market in central countries such as Germany and Japan. In these countries, employers and workers have acted with a shared sense of responsibility in terms of sharing the costs of the crisis and overcoming the crisis by getting closer to each other. While the policies implemented by Germany and Japan against the crisis are defined as offensive strategy, the policies implemented by the USA, Canada and England are defined as defense strategy. In these countries, companies did not give up direct control over employees and preferred to act within the framework of a system in which labor processes were rationalized and Taylorism was more widely applied, social security services were interrupted, trade unions became weak, and employee-employer relations became flexible. While the first group, which includes Germany and Japan was improving their national economic performances, the second group, including the USA, Canada and the UK, experienced a loss of power (Kose and Oncu, 2000: 77-78). According to Lipietz (1998), within the framework of the third international division of labor, Instead of producing very different products in different ways or specializing in different fields within the same industry, the focus has been on producing similar products in different ways (Lipietz, 1998: 139).

Today, ‘‘E-commerce’’, ‘‘Industry 4.0’’ and ‘‘Sharing Economy’’ to reduce resource consumption are terms for economic progress, innovation and new aspirations, and

they shape the new international division of labor. These developments are seen as a paradigm shift in the economy and cause profound changes in production and organization (Bartholomae, 2018: 2).

Table 1. Leading exporters and importers in world merchandise trade (2018)

Rank	Exporters	Value (Billion dollars)	Share (%)	Rank	Importers	Value (Billion dollars)	Share (%)
1	China	2487	12,8	1	USA	2614	13,2
2	USA	1664	8,5	2	China	2136	10,8
3	**Germany**	1561	8,0	**3**	**Germany**	1286	6,5
4	Japan	738	3,8	4	Japan	749	3,8
5	Netherlands	723	3,7	5	United Kingdom	674	3,4
6	Korea, Republic of	605	3,1	6	France	673	3,4
7	France	582	3,0	7	Netherlands	646	3,3
8	Hong Kong, China	569	2,9	8	Hong Kong, China	628	3,2
9	Italy	547	2,8	9	Korea, Republic of	535	2,7
10	United Kingdom	486	2,5	10	India	511	2,6
31	**Turkey**	**168**	**0,9**	**25**	**Turkey**	**223**	**1,1**

Source: World Trade Organization, **World Trade Statistical Review,** 2019, p. 100.

Germany has an economy that has approximately 5 percent of world GDP as of 2018, ranking fourth in the world after the USA, China and Japan. Providing approximately 7.5 percent of world exports, Germany ranks third in the world after China and the USA. Turkey provides 0.9% of total world exports with 168 billion dollars (see Table 1).[1]

At this point, an answer is sought to the question of to what extent German production centers will provide competitive advantage in the development and application of Industry 4.0 technologies. Although it is expected that production will shift from high-wage centers in Germany to Central and Eastern Europe and the use of relevant process technologies at this point will create a disadvantage for Germany, the difficulty of imitating Germany's skilled workforce and strong industrial structure is expected to create a ‘‘digital export opportunity’’ for Germany (Krzywdzinski, 2016 :7)

A search for new markets has begun in order to increase the effectiveness of foreign trade policies, whose effectiveness has gradually decreased due to the crises in the 1990s and the existing economic problems. Turkey has actually made the transition to the Customs Union as of January 1, 1996 with. The Customs Union has led to an increase in international obligations and the initiation of harmonization with the EU

[1] In 2018, the world's total exports of goods were at the level of 19.6 trillion dollars.

Common Trade Policy for foreign trade within the framework of determined norms (Sandalcilar and Yalman, 2012: 55).

There is a long economic exchange between the European Union and Turkey. However there is no policy transfer despite the Customs Union agreement, which links the EU and Turkey since 1996. On the one hand, the customs union covers only industrial products and processed agricultural products, while keeping traditional agricultural products out of scope, one the other hand it brings Turkey the obligation to applicate EU's common customs tariff against any third country, while third countries do not have such a requirement against Turkey. This situation poses an asymmetric disadvantage in Turkey's foreign trade.

5. Comparison of German-Turkish Manufacturing Industries with Selected Indicators

5.1. Productivity

Productivity is the ratio of output (production) obtained in a certain period (for example one year) to the total of inputs or inputs used to achieve this output [Output / Input] or the utilization of production factors in a way that ensures maximum production with minimum resources. Productivity is literally a matter of raising wages without decreasing the shares of other income groups. The main condition for increasing productivity is to increase the production per input by using the existing means of production more effectively in a period (for example one year). Other ways to increase productivity are increased production without changes in production inputs; providing the same production with less input; increasing production by reducing inputs; Increasing production at a higher level while decreasing inputs (Tuna and Yalcintas, 1999: 93-94).

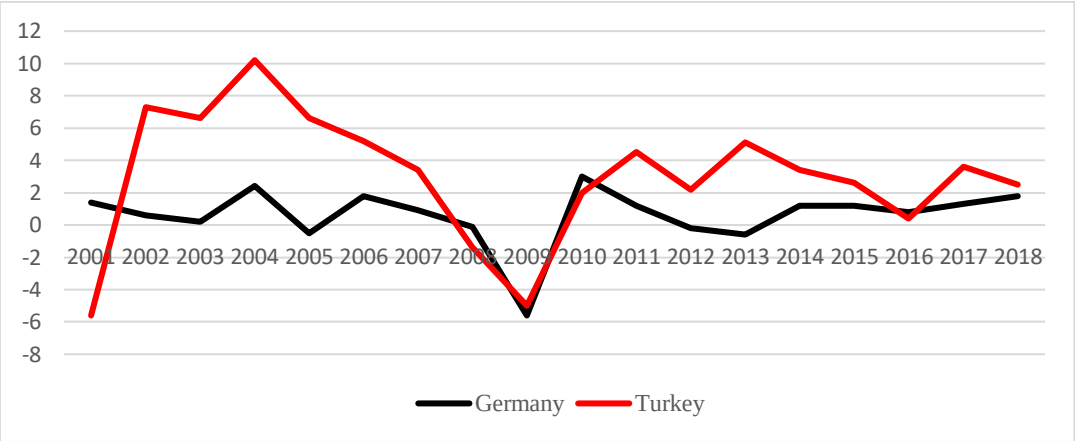
Table 2. Relative Productivity of Selected OECD Countries to Germany (1980-2018, Germany's GDP Produced Per Hours Worked, US $, PPP,%)

	1980	1985	1990	1996	2000	2005	2010	2015	2016	2017	2018
Germany / Turkey	2,5	2,2	2,1	2,2	2,2	1,9	1,8	1,6	1,6	1,6	1,6
Germany / USA	0,9	0,9	1,0	1,0	1,0	1,0	0,9	0,9	0,9	0,9	0,9
Germany / Korea	6,6	5,1	3,9	3,2	2,7	2,2	1,9	1,8	1,8	1,8	1,8
Germany / Japan	1,7	1,6	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4	1,4
Germany / United Kingdom	1,6	1,1	1,2	1,2	1,1	1,1	1,1	1,1	1,1	1,1	1,1
Germany / Switzerland	0,8	0,8	0,9	1,0	0,9	1,0	1,0	1,0	1,0	1,0	1,0

Source: OECD, " GDP per hour worked ", (Online) https://data.oecd.org/lprdty/gdp-per-hour-worked.htm, created by the author using 10.06.2020 data.

In Table 2, the relative rates of GDP per hour worked in the manufacturing industry to Germany in selected OECD countries, which measure how efficiently labor inputs between 1980-2018 are combined with other production factors and how they are used in the production process are given. Germany recorded relative decrease in labor productivity per hour worked, according to Turkey and Korea. Although there is no significant change when compared to other countries, productivity increase alone should not be seen as a sufficient data to make up the difference in GDP between countries.

Chart 1. Annual growth rate of output per worker in Germany and Turkey (2001-2018, GDP constant 2010 US $)



Source: ILO, ‘‘Annual growth rate of output per worker (GDP constant 2010 US $)’’, (Online) https://www.ilo.org/shinyapps/bulkexplorer1/?lang=en&segment=indicator&id=SDG_A821_NOC_RT_A, 15.07.2020.

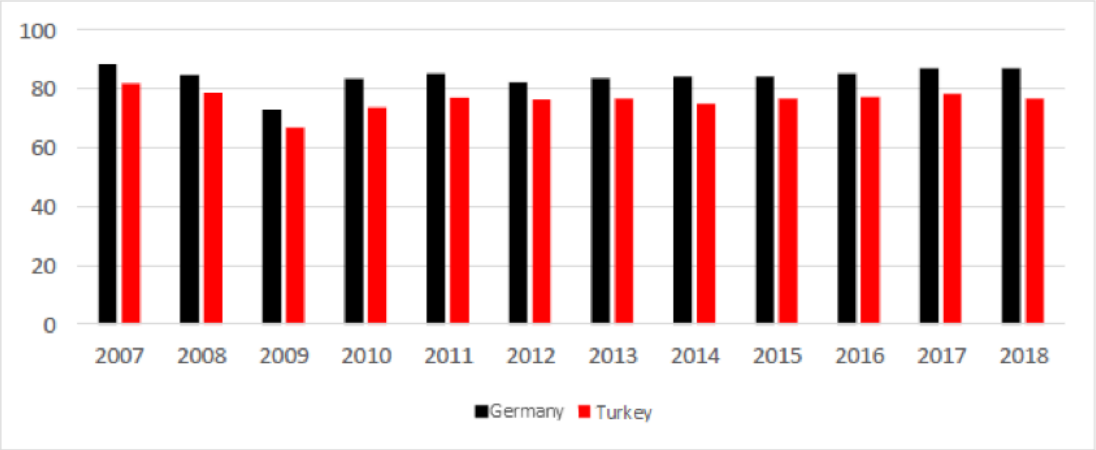
Chart 1 shows Annual growth rate of output per worker in Germany and Turkey between the years 2001-2018. Annual productivity per worker employed in Germany decreased by 0.5% in 2005, 0.1% in 2008, 5.6% in 2009, 0.2% in 2012 and 0.6% in 2013, while in other years an increase was observed. In Turkey, there was a decrease by 5.6 % in 2001, 1.4 % in 2008 and 5 % in 2009. In other years, there was an increase.

5.2. Capacity Utilization Rates

Capacity Utilization Rate is a rate that indicates the used portion of the total production capacity calculated on the basis of an enterprise or country scale. The manufacturing industry, which is the most dominant sector in the industrial sector, where physical production is carried out, is taken into account in the Capacity Utilization Rate calculation. The ratio of the actual production amount realized by a production unit or manufacturing industry organization in a certain period (for example one year) to the maximum potential amount that can be physically produced

is defined as the Manufacturing Industry Capacity Utilization Rate. Capacity utilization rates, which play an important role in evaluating economic activities, used in conjunction with other factors to explain investment, inflation, productivity, profit, and output behavior (Koc et al., 2017: 6).

Chart 2. Capacity Utilization Rates of Manufacturing Industry in Germany and Turkey (2007-2018, %)



Source: Eurostat, __Industry - quarterly data‘‘, (Online) http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do, TCMB, Capacity Utilization Rate of Manufacturing Industry (%) (Weighted-NACE REV.2)(Monthly), (Online) https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse_21/6007/DataGroup/turkish/bie_kko2/20.06.2020.

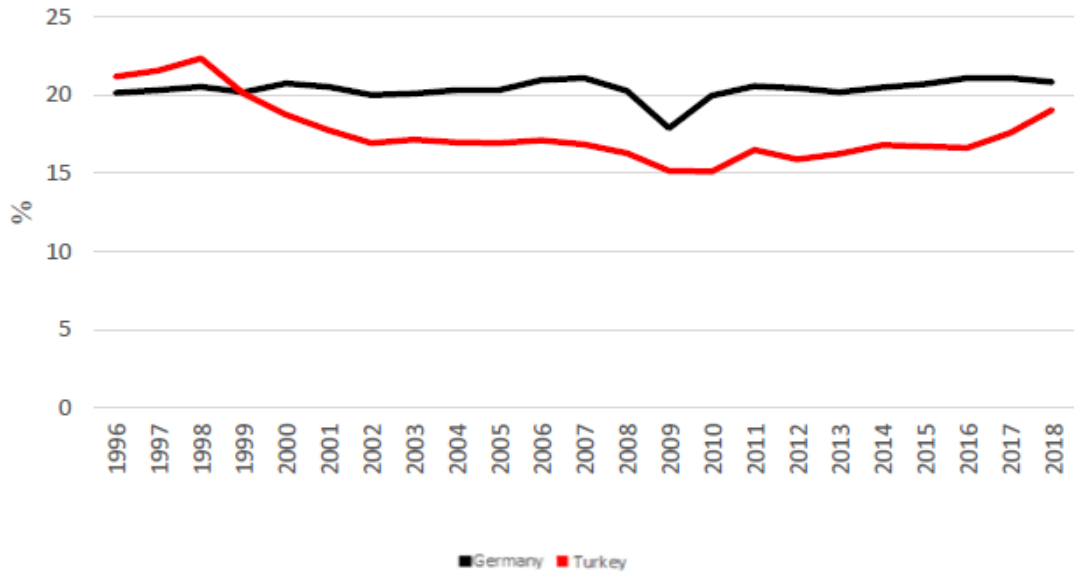
In Chart 2 manufacturing capacity utilization rate in Germany and Turkey between 2007- 2018 is given. Capacity utilization rate in manufacturing industry, which was 88.5 % in 2007 in Germany, was 87.1 % in 2018 with various fluctuations. Capacity utilization rate in manufacturing industry in Turkey was 81.9% in 2007 and it decreased relatively to 76.8 % in 2018. In Germany, average capacity utilization rate in manufacturing industry for the last 12 years was at the level of 84 %, which was 76.3 % in Turkey.

Considering that energy cuts in production, machine breakdowns, holidays, strikes, working hours and worker problems generally reduce the capacity, approximately 90% capacity is considered as full capacity. The relative reduction by the manufacturing industry capacity utilization rate in Turkey is an indicator of increased costs. At this point, due to the lack of transportation and infrastructure, the high share of the transportation costs, the shortage of skilled labor, the high tax and premium burden on employment, the high prices of electricity, natural gas, fuel oil and VAT and SCT rates collected on these inputs are thought to increase costs (Koc et al., 2017: 20).

5.3. Value Added

According to the definition of the United Nations Industrial Development Organization, the manufacturing industry value added is ‘‘the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs.’’ In other words, the value added of the manufacturing industry is obtained by subtracting the goods obtained from other sectors and used as manufacturing industry input from the value of the goods produced by the enterprises operating in the manufacturing industry within a certain period of time (for example, one year), and it is expressed as a percentage of GDP. In order to measure the value added of the manufacturing industry, it is necessary to limit the type of economic activity and the region where the activity takes place. The boundary of manufacturing as an economic activity is defined by the International Classification of All Economic Activities (ISIC).

Chart 3. Manufacturing Value Added in Germany and Turkey (%)



Source: The World Bank, " Manufacturing, value added (% of GDP) " (Online) https://data.worldbank.org/indicator/NV.IND.MANF.ZS?end=2018&locations=TR-DE&start= 1960 & view = chart, 05.04.2020.

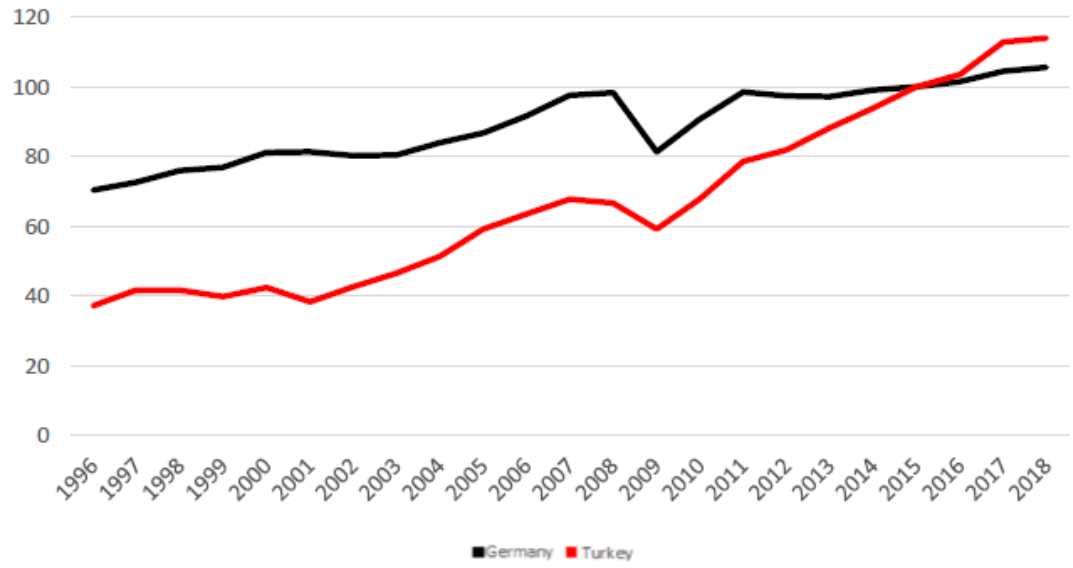
In Chart 3 manufacturing value added rates in Germany and in Turkey between 1996-2018 are given. While the manufacturing industry value added of Germany was 20.1% in 1996, it was around 20% for 23 years (excluding the level of 17.9% in 2009) and 20.8% in 2018. In Turkey, manufacturing value added, which was 21.1% level in 1996, decreased to the level of 15.1% in 2009 and was 19.1% in 2018 with a relative increase afterwards.

As in the case of Germany, the use of capital-intensive, advanced technologies during the production of the final manufacturing product, which will be considered as a part of the manufacturing value chain in developed countries, will directly contribute to production as well as increase the added value (ECSIP Consortium, 2014: 22). In Turkey, the use of mainly labor-intensive technology, the low labor productivity (See Table 2) elements such as value-added manufacturing industry in the production of low products are listed as the reasons for the production of products with low added value in the manufacturing industry.

5.4. Production Index

Production index refers to the production of manufacturing industry enterprises. This indicator is measured with an index based on the reference time that expresses the change in production output volume. Manufacturing industry production is expressed as an index level due to the base year (2010 in Chart 4). In other words, manufacturing industry production index does not express absolute production volumes or values; but it shows the percentage changes by years (Investopedia, (Online) https://www.investopedia.com/terms/i/ipi.asp).

Chart 4. Manufacturing Production Index in Germany and Turkey (1996-2018, 2010 = 100)



Source: OECD, ‘‘Industrial production: Manufacturing’’, (Online) https://data.oecd.org/industry/industrial-production.htm, 07.06.2020.

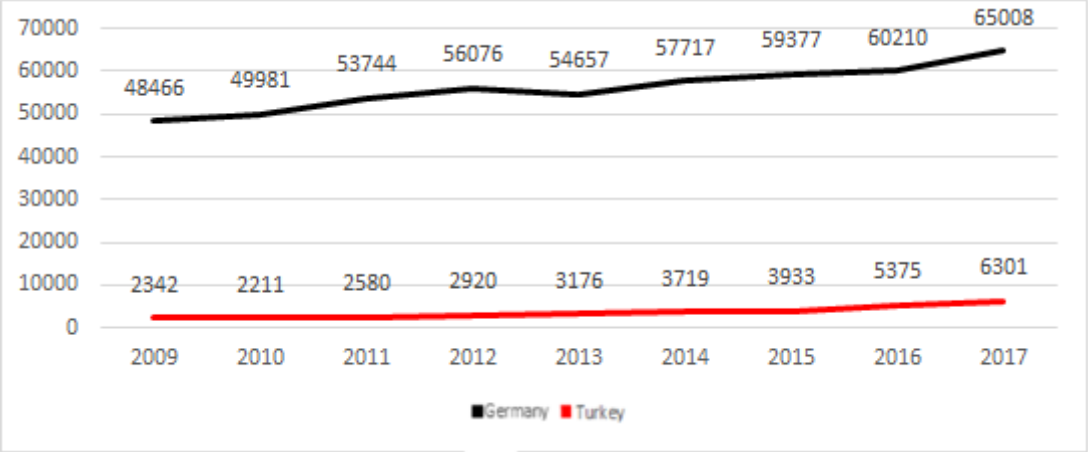
In Chart 4 Manufacturing Production Index in Germany and Turkey between 1996-2018 is given. The chart shows both in Germany and Turkey manufacturing industry production has shown an upward trend (except 2009). It can be said that the increase in the manufacturing industry index plays a very important role in economic growth due to the direct effects of the increase in manufacturing industry production on the

growth of the industrial sector and employment, and the indirect effects of the developments in the fields of machinery, metals, automotive and technology on sectors such as agriculture, transportation, education and finance.

5.5. R&D Expenses

Allocating sufficient resources to R&D is not only about creating new products for companies in a country and it can be used to augment an existing product or service. R&D spending helps companies stay ahead of market trends and stay in the center of attention. Allocating resources to R & D can be used for research to gain innovations and to reduce the costs of more efficient production processes or more efficient products (Investopedia, (Online) https://www.investopedia.com/ask/answers/043015/what-are-benefits-research-and-development-company.asp).

Chart 5. Manufacturing R & D Expenditures of Commercial Enterprises in Germany and Turkey (2009-2018, with 2010 fixed prices, in Million US $)



Source: OECD, ‘‘Business enterprise R&D expenditure by industry’’, (Online) https://stats.oecd.org/Index.aspx?DataSetCode=BERD_INDU, 03.06 2020.

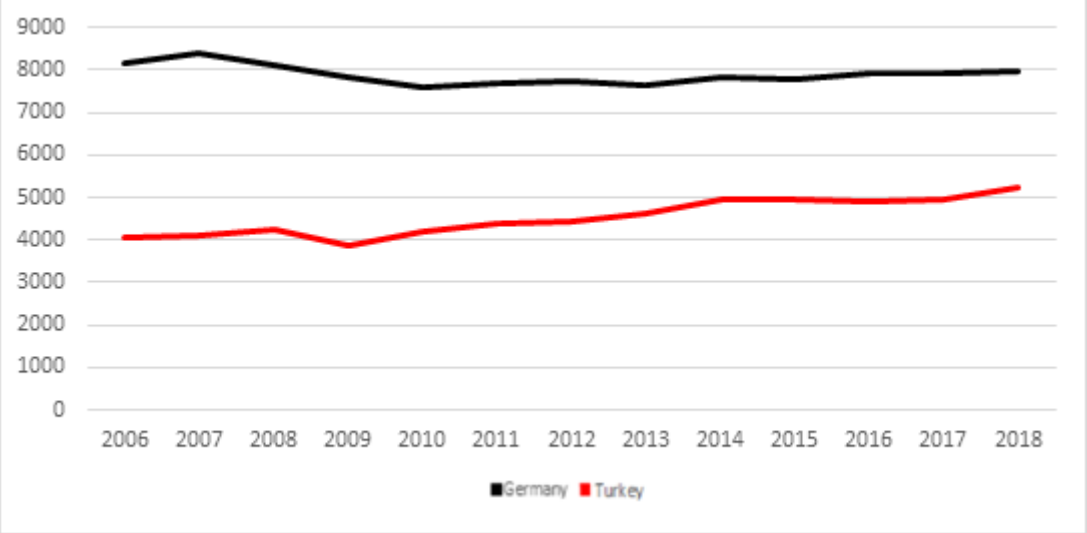
In Chart 5 the annual R & D expenditures of commercial companies operating in Germany and Turkey brtween the years 2009-2018 are shown. R&D expenditures of commercial companies showed an increasing trend in both countries. In Germany, it increased from 48 Billion 466 Million US $ in 2009 to 65 Billion 8 Million US $ in 2018. In Turkey, it reached to 6 Billion 301 Million US $ in 2018 from 2 billion 342 Million US $ in 2009. R & D expenditures of commercial firms in Turkey is not yet at a sufficient level for the modernization of the industry through the production of goods based on new technology.

5.6. Employment

In the case of deindustrialization, the employment share of the industrial sector increases at the beginning and after the development process in developed countries such as Germany; then it begins to decrease. The increase of manufacturing

production in Turkey has not directly affected employment. Unlike developed countries, in the process of structural development in Turkey the share of agriculture in total employment has decreased, multi-service industry has experienced an increase in employment in industry and there has been an increase in service sector employment rather than industry.

Chart 6: Manufacturing Employment in Germany and in Turkey (2006-2018, Thousand People)



Source: OECD, ''Employment by Activity'', (Online) https://data.oecd.org/emp/employment-by-activity.htm, 15.08.2020.

In Chart 6, employment in the manufacturing industry between 2006-2018 in Germany has been shown. Manufacturing industry employment, which was 8 million 145 thousand persons in 2006 in Germany, decreased relatively to 7 million 993 thousand persons in 2018. In Turkey, it it increased relatively from 4 million 67 thousand people in 2006 to 5 million 228 thousand people in 2018.

6. Determination of Germany's and Turkey's Export Competitiveness in Manufacturing Industry Product Groups: Analysis of the 1996-2018 Period

6.1. Aim

As examined in detail in the theoretical part of our study, in order to understand the role of a country in competitive advantage, it is necessary to mention especially the industries where competition is international. This will also reveal why countries are changing their trading power to gain competitive advantage against their best competitors in increasingly developed industries and segments (Porter, 1990: 81-417).

The aim of our research is to reveal the competitiveness of international export of manufactured products in Germany and Turkey between the years 1996-2018. SITC Rev.3, 3-digit product and / or product groups in the UN Commercial Statistics Database (UN Comtrade) are used as the data set for the analysis in question. Competitiveness values in exports for a total of 134 products and / or product groups with low, medium and high technology intensity according to technology levels (Lall's technological classification of exports) are calculated separately for both countries and seven technology groups with Béla Balassa's Revealed Comparative Advantage (RCA) Index.

6.2. Manufacturing Industry Exports of Germany, Turkey and the World: An Evaluation of the Period 1996-2018

Table 3. Export of Manufacturing Products: Germany – Turkey
(1996-2018, *1000 USD $)

Year	Total Exports of Germany	Manufacturing Exports of Germany	Share (%)	Total Exports of Turkey	Manufacturing Exports of Turkey	Share (%)
1996	524.165.984	443.622.638	84,6	22.788.848	16.925.277	74,3
1997	512.440.270	438.028.818	85,5	26.005.111	19.581.588	75,3
1998	543.555.256	472.425.615	86,9	26.619.912	20.601.149	77,4
1999	542.835.572	468.667.947	86,3	26.587.173	21.035.505	79,1
2000	549.606.741	459.828.479	83,6	27.485.359	22.329.655	81,2
2001	571.426.720	494.998.396	86,6	31.333.944	25.616.439	81,8
2002	615.997.391	536.829.406	87,1	35.761.981	30.016.103	83,9
2003	748.531.267	628.960.882	84,1	47.252.836	39.556.766	83,7
2004	911.742.096	762.097.865	83,6	63.120.948	53.368.761	84,6
2005	977.131.972	840.958.860	86,1	73.476.408	59.936.175	81,6
2006	1.121.962.887	953.298.191	84,9	85.534.675	69.628.646	81,4
2007	1.328.841.354	1.097.503.363	82,6	107.271.749	87.626.000	81,7
2008	1.457.462.950	1.215.305.481	83,4	132.002.384	106.888.930	80,9
2009	1.125.844.047	946.035.494	84,1	102.138.525	81.922.246	80,2
2010	1.267.743.108	1.067.401.665	84,2	113.979.451	90.269.445	79,2
2011	1.483.802.558	1.243.901.360	83,9	134.915.251	105.657.529	78,3
2012	1.410.146.320	1.181.801.326	83,8	152.536.652	118.562.163	77,7
2013	1.450.937.515	1.211.431.259	83,5	151.796.483	118.521.176	78,1
2014	1.498.238.432	1.252.782.030	83,6	157.714.945	123.870.895	78,5
2015	1.328.500.248	1.120.616.529	84,4	143.850.376	113.382.866	78,8
2016	1.337.236.557	1.123.265.336	84	142.529.583	114.157.644	80,1
2017	1.446.642.435	1.239.020.313	85,7	156.992.940	125.919.327	80,2
2018	1.562.418.816	1.333.758.822	85,4	168.023.390	135.893.957	80,9

Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/; The World Bank, ‘‘Manufactures exports (% of merchandise exports)”, (Online) https://data.worldbank.org/indicator/TX.VAL.MANF.ZS.UN?locations=DE-TR, created by the author using 10.07.2020 data.

According to Table 3, the share of manufacturing products in total exports of Germany and Turkey are fluctuated. While 84.6 % of Germany's export value, which was 443 billion 622 million US $ in 1996 consisted of manufacturing industry products, 85.6% of the export value, which was 1 trillion 333 billion 758 million US $ was obtained from manufacturing industry products in 2018. Turkey, meanwhile had a manufacturing export value of 16 billion 925 million US $ in 1996, which provided 74.3 % of total exports in 1996 and 135 billion 893 million US $ in 2018, which achieved 80.9 % of total exports.

Table 4. Manufacturing Industry Exports of the World (1996-2018, *1000 USD $)

Year	Total Exports of the World	Manufacturing Exports of the World	Share (%)
1996	5.146.629.151	3.834.053.243	74,5
1997	5.335.677.739	4.034.003.385	75,6
1998	5.300.934.842	4.099.602.934	77,3
1999	5.508.187.439	4.242.025.861	77,0
2000	6.311.127.227	4.653.562.316	73,7
2001	6.071.625.514	4.492.038.266	74,0
2002	6.379.270.499	4.749.186.630	74,4
2003	7.419.840.065	5.476.746.969	73,8
2004	9.018.392.766	6.593.735.492	73,1
2005	10.170.063.099	7.282.847.324	71,6
2006	11.886.316.783	8.291.666.997	69,8
2007	13.563.461.356	9.468.123.623	69,8
2008	15.689.690.062	10.372.353.012	66,1
2009	12.212.875.340	8.238.014.071	67,5
2010	14.899.415.924	9.889.410.059	66,4
2011	17.692.676.930	11.370.948.505	64,3
2012	17.489.146.844	11.287.378.131	64,5
2013	18.094.741.271	11.119.504.777	61,5
2014	17.671.376.905	11.389.656.197	64,5
2015	16.116.425.670	10.629.799.117	69,3
2016	15.593.039.590	10.682.635.490	68,5
2017	16.927.547.799	11.708.615.530	69,2
2018	15.438.730.519	10.246.376.660	66,4

Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/; The World Bank, ‘‘Manufactures exports (% of merchandise exports)”, (Online) https://data.worldbank.org/indicator/TX.VAL.MANF.ZS.UN?locations=DE-TR, created by the author using 10.07.2020 data.

Considering the total export data of the world in Table 4, in 1996, manufacturing industry products with a value of 3 trillion 834 billion US $ constituted 74.5% of the total world exports of 5 trillion 146 billion 629 million. In 2018, manufacturing industry products made up 66.4% of the total world exports of 15 trillion 438 billion 730 million with a value of 10 trillion 246 billion 376 million US $. It is possible to say that there was a serious decline in the share of manufacturing industry products in world exports in the 1996-2018 period.

Germany and Turkey as examples of countries within the general framework, holds a very important place in the world in terms of total exports of manufacturing products. This resulting table reveals the importance of our research.

6.3. Literature Review

Some of the studies in the literature in order to measure the competitive advantages of countries can be stated as follows:

The study conducted by Nayak et al. (2013) on the transformation of the technological structure of India's manufacturing industry exports in the post-liberal period between 1990-2011 by applying the Gravity model has revealed that the technology structure of India's manufacturing industry exports has shifted from low-tech to medium-low-tech intensity in those years, and the reasons for the continuity of the low-tech export structure of the manufacturing industry are shown as low-level R&D in the manufacturing industry, relatively low foreign direct investment and competitiveness (Nayak et al., 2013: 1-36).

In the study conducted by Altay and Gürpınar (2008), Revealed Comparative Advantage Index (RCA), Relative Export Advantage Index (RXA), Relative Import Advantage Index (RMA), Relative Trade Advantage Index (RTA) etc. indexes are calculated by using the import and export values of the Turkish furniture industry between 2001 and 2006. According to the Turkish furniture industry competitiveness index value in the study, to be reached over 1 year in their respective RCA value of the furniture sector in Turkey shows that it has a competitive advantage in the international arena (Altay and Gurpinar, 2008: 257-274).

Fertö and Hubbard (2003) examined the competitiveness of Hungarian agriculture and food processing for the period 1992-1998 in terms of four indicators of comparative advantage. The study showed that Hungary has a comparative advantage in a variety of agro-food products, including animals and meat. The results complement the findings of studies using price and cost-based approaches in determining competitiveness in grains and crops (Fertö and Hubbart, 2003: 247-259).

Khatibi (2008) conducted a study analyzing Kazakhstan's ompetitiveness in exports compared to the EU-27. Empirical analysis by using Balassa's revealed comparative advantage (RCA) showed that although Kazakhstan had a comparative advantage in some sectors, especially energy and manufactured goods, its competitiveness decreased between the respective years (Khatibi, 2008: 1-12).

Shahab and Mahmood (2013) analyzed trade expertise in leather products among selected Asian economies for the period 2002-2009, with a particular focus on Pakistan, using the RCA Balassa Index criteria. The analysis shows that Pakistan has a comparative advantage in leather products across all selected economies during the respective period (Shahab and Mahmood, 2013: 133-139).

6.4. Methodology and data sources

With this study it is aimed to reveal the competitiveness of Germany and Turkey in the manufacturing exports in the international arena by subgroups determined according to ISIC. Rev.3 Classification. or this purpose, Balassa's Revealed Comparative Advantage Index (RCA) calculated for 3-digit sub-product groups in the manufacturing industry. Balassa's RCA approach assumes that the true form of comparative advantage can be observed from post-trade data. With this approach, Balassa tried to measure whether countries have a comparative advantage for the relevant product or industry (Balassa, 1965: 99-123).

The formulation of the Balassa index is as follows:
$RCAij = (xij / Xj) / (xiw / Xw)$
Here, RCAij shows the declared comparative advantage index for product i of country j.
xij: country j's export of goods i
Xj: total exports of country j
xiw: world export of i goods
Xw: total world exports

RCA> 1 is an indication that country j has a comparative advantage in i goods. In other words, the share of that good in the country's total exports is greater than its share in world trade.

RCA <1 shows that country j has a comparative disadvantage in i goods.

The detailed classification of the value ranges of the index in question is expressed as follows (Hinloopen and Marrewijk, 2001: 8):

$0 < RCA \leq 1 \rightarrow$ Not competitive

$1 < RCA \leq 2$ → Weak competitive
$2 < RCA \leq 4$ → Moderate competitive
$4 < RCA$ → Strong competitive

Lall (2000) classified the goods subject to foreign trade into five main groups according to their technology level within the scope of SITC Rev. 3 (Standard International Trade Classification) prepared by the United Nations. This classification is shown in Table 5:

Table 5: Lall's SITC Rev. 3 Classification

1. PP- Primary Products	4. Medium technology manufactures
2. RB- Resource based manufactures	MT1- Automotive products
RB1- Agro/forest based products	MT2- Medium technology process industries
RB2- Other resource based products	MT3- Medium technology engineering industries
3. Low technology manufactures	5. High technology manufactures
LT1- Textile/fashion cluster	HT1- Electronics and electrical products
LT2- Other low technology	HT2- Other high technology

Source: Lall, 2000: 7

Within the scope of the study, low-technology manufactures (LT1, LT2) in the 3rd group, medium-technology manufactures in the 4th group (MT1, MT2, MT3) and high-technology manufactures in the 5th group (HT1, HT2) were included in the analysis. 20 products and / or product groups in the low technology manufactures (LT1) group, 24 products and / or groups in the low technology manufactures (LT2) group, 5 products and / or product groups in the medium technology manufactures (MT1) group, 28 product and / or product groups in the medium technology manufactures (MT2) group, 38 product and / or product groups in the medium technology manufactures (MT3) group, 11 products and / or product groups in the high technology manufactures (HT1) group and for 8 products and / or product groups in the high technology manufactures (HT2) group; in total, 134 products and / or product groups were calculated and the value of each technology sub-group was taken as basis. The reason for excluding the primitive goods (PP) in the first group and resource-based goods (RB1, RB2) in the second group in the analysis is the customs union between EU and Turkey has been only covering industrial products and processed agricultural products, while it excludes traditional agricultural products.

Revealed Comparative Advantage is calculated separately for Germany and Turkey within OECD ISIC. Rev.3 Classification for seven technology groups in total. Relevant data were obtained from the UNCTAD database for the period 1996-2018.[1] Products and / or product groups within OECD ISIC. Rev.3 Classification can be accessed from the UNCTAD database.

6.5. Findings

The results of the analysis made for measuring the export competitiveness of Germany and Turkey on the basis of technology groups are shown in the relevant Tables and Charts.

Table 6. Competitiveness of Germany in Exports According to Technology Intensity: Balassa Index Results

Year	LT1	LT2	MT1	MT2	MT3	HT1	HT2
1996	0,56	1,05	1,69	1,35	1,42	0,64	1,19
1997	0,54	1,03	1,71	1,38	1,42	0,63	1,24
1998	0,55	1,03	1,73	1,34	1,39	0,63	1,26
1999	0,54	1,03	1,75	1,37	1,40	0,61	1,34
2000	0,51	1,04	1,85	1,42	1,41	0,63	1,42
2001	0,51	1,06	1,90	1,37	1,45	0,67	1,47
2002	0,50	1,03	1,88	1,33	1,44	0,66	1,29
2003	0,49	1,03	1,90	1,31	1,43	0,65	1,28
2004	0,48	1,15	1,83	1,26	1,41	0,70	1,36
2005	0,51	1,08	1,95	1,30	1,48	0,73	1,44
2006	0,52	1,13	1,93	1,34	1,53	0,69	1,50
2007	0,50	1,09	1,90	1,26	1,45	0,67	1,44
2008	0,57	1,17	2,03	1,11	1,55	0,72	1,61
2009	0,57	1,18	2,09	1,30	1,49	0,67	1,71
2010	0,55	1,17	2,21	1,25	1,51	0,68	1,73
2011	0,60	1,18	2,31	1,26	1,55	0,69	1,81
2012	0,55	1,10	2,27	1,13	1,55	0,63	1,92
2013	0,60	1,17	2,27	1,37	1,64	0,69	1,96
2014	0,53	1,03	2,26	1,27	1,55	0,64	1,87
2015	0,50	1,06	2,28	1,20	1,51	0,65	1,88
2016	0,53	1,05	2,14	1,25	1,48	0,66	1,91
2017	0,58	1,06	2,15	1,26	1,51	0,59	1,90
2018	0,55	1,04	2,18	1,29	1,48	0,58	1,92

Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/, calculated by the author using 10.04.2020 data.

[1] The purpose of the inclusion of the 1996-2018 years to the analysis is to examine the competitiveness of German-Turkish industry since 1996, when Customs Union Agreement between EU and Turkey were signed, until the end of 2018.

Table 6 shows the results of the Balassa Index, which reveals Germany's competitiveness in exports according to technology density between the years 1996-2018. According to the findings obtained from the table, Germany had a comparative disadvantage in the ‘‘Textile/fashion cluster’’ (LT1) and ‘‘Electronics and electrical product’’ (HT1) technology groups during the said period. Commodity groups in which Germany had competitive power in exports according to its technology level are ‘‘Other low technology’’ (LT2), ‘‘Automotive products’’ (MT1), ‘‘Medium technology process industries’’ (MT2), ‘‘Medium technology engineering industries’’ (MT3) and ‘‘Other high technology’’ (HT2). Germany had a weak comparative advantage in the technology groups ‘‘Other low technology’’ (LT2), ‘‘Medium technology process industries’’ (MT2), ‘‘Medium technology engineering industries’’ (MT3) and ‘‘Other high technology’’ (HT2) during the period 1996-2018. In the ‘‘Automotive products’’ (MT1) technology group, where Germany had a weak comparative advantage in the 1996-2007 period, it had a moderate comparative advantage between 2008-2018. As a result of the analysis based on the average values of the technology groups; Germany had a comparative disadvantage in low technology manufactures in the period 1996-2018, and a weak comparative advantage in medium technology manufactures. In high-tech goods, it had a comparative disadvantage until 1999, and a weak comparative advantage in the period 2000-2018. To summarize, Germany is a country that has competitive power in exports in medium and high technology manufactures. However, an important factor in having a comparative disadvantage can be shown to be shifting production to Eastern Europe and China, especially as put forward in the "Electric and Electronic Goods" (HT1) technology group. However, an important factor in having a comparative disadvantage can be shown to be shifting production to Eastern Europe and China, especially as put forward in the ‘‘Electronics and electrical product’’ (HT1) technology group.

Table 7. Competitiveness of Turkey in Exports According to Technology Intensity: Balassa Index Results

Yıl	LT1	LT2	MT1	MT2	MT3	HT1	HT2
1996	5,09	1,28	0,39	1,07	0,47	0,17	0,12
1997	5,03	1,31	0,29	1,12	0,48	0,20	0,23
1998	5,19	1,23	0,31	1,01	0,52	0,28	0,19
1999	5,11	1,30	0,58	0,96	0,56	0,24	0,46
2000	5,34	1,40	0,63	1,10	0,61	0,27	0,62
2001	4,80	1,43	0,83	1,16	0,69	0,28	0,41
2002	4,86	1,38	0,94	1,19	0,70	0,35	0,15
2003	4,74	1,44	1,14	1,04	0,76	0,34	0,27
2004	4,46	1,62	1,45	1,09	0,78	0,36	0,25
2005	4,37	1,60	1,52	0,97	0,88	0,37	0,15
2006	4,09	1,69	1,69	1,00	0,96	0,34	0,18

2007	3,96	1,71	1,78	0,97	1,01	0,29	0,18
2008	3,52	2,08	1,83	1,09	1,01	0,26	0,13
2009	3,44	1,83	1,78	1,11	1,01	0,27	0,15
2010	3,70	1,87	1,72	1,23	1,00	0,26	0,17
2011	3,63	2,06	1,69	1,13	1,06	0,27	0,16
2012	3,37	1,94	1,40	1,13	0,98	0,25	0,18
2013	3,48	2,09	1,57	1,12	1,09	0,23	0,22
2014	3,40	2,03	1,53	1,07	1,06	0,22	0,20
2015	3,08	1,78	1,49	0,99	0,95	0,21	0,22
2016	3,11	1,72	1,63	0,93	0,93	0,20	0,21
2017	2,94	1,79	1,85	0,92	0,96	0,18	0,29
2018	2,97	1,81	1,88	0,82	0,92	0,19	0,32

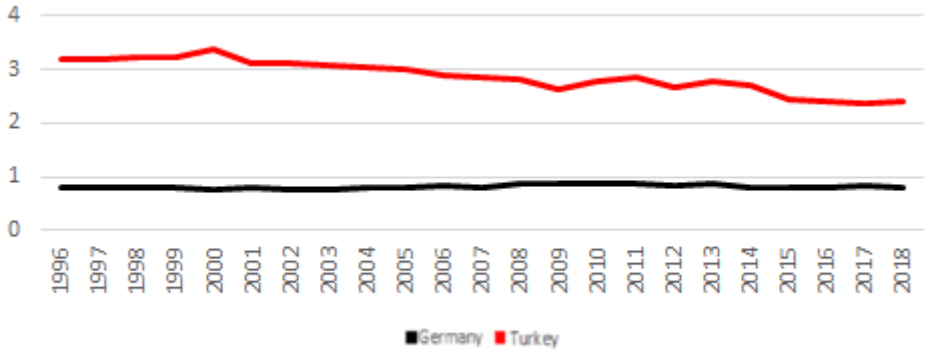
Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/, calculated by the author using 10.04.2020 data.

Table 7 shows the results of the Balassa Index, which reveals Turkey's competitiveness in exports according to technology density between the years 1996-2018. According to the findings obtained from Table 6, had a comparative disadvantage in the ‘‘Electronics and electrical product’’ (HT1) and ‘‘Other high technology’’ (HT2) technology groups during the period in question. Turkey had strong comparative advantage in the ‘‘Textile/fashion cluster’’ (LT1) technology group during the period from 1996 to 2006, where it had a moderate comparative advantage in the period 2007-2018. Turkey had weak comparative advantage in the ‘‘Other low technology’’ (LT2) technology group from 2015 to 2018. Turkey had a comparative disadvantage in the ‘‘Automotive products’’ (MT1) technology group during the period of 1996-2002, where it had had a weak comparative advantage between 2003-2018. In the ‘‘Medium technology process industries’’ (MT2) technology group, only three years of comparative advantage were not achieved in Analyzing ‘‘Medium technology engineering industries’’ (MT3) technology group shows that Turkey lost its competitive advantage in 2012 and it faced a competitive disadvantage until 2018, where it had weak comparative advantage between 2007-2011. As a result of the analysis based on the average values of the technology groups, Turkey had a moderate comparative advantage in low technology manufactures. The comparative disadvantage of medium technology goods as of 1996 turned into a weak comparative advantage in 2003, and the weak comparative advantage was preserved until the end of the period. The analysis has revealed that had a comparative disadvantage in the high technology manufactures throughout the period. To sum up, Turkey is a country which has export competitiveness in low and medium technology manufactures.

After analyzing export competitiveness of Germany and Turkey in detail based on the Balassa Index, It would be meaningful to show the comparisons of the two

countries for the three technology groups separately by using charts based on average values.

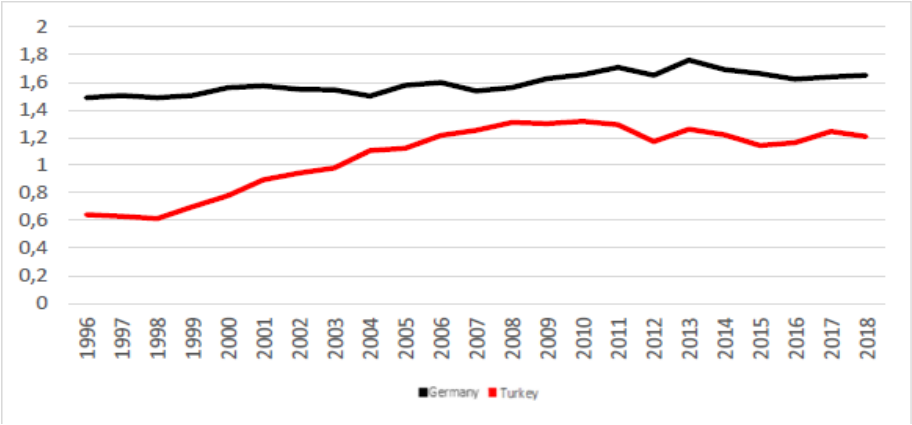
Chart 8. Competitiveness of Germany and Turkey In Low Technology Density (1996-2018)



Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/, calculated by the author using 10.04.2020 data.

In Chart 8 low-tech export competitiveness of Germany and Turkey are shown comparatively. While Germany had a comparative disadvantage in manufactures with low technology density during the 1996-2018 period, Turkey had a moderate comparative advantage during the period. However, this superiority tends to decrease.

Chart 9. Competitiveness of Germany and Turkey In Medium Technology Density (1996-2018)

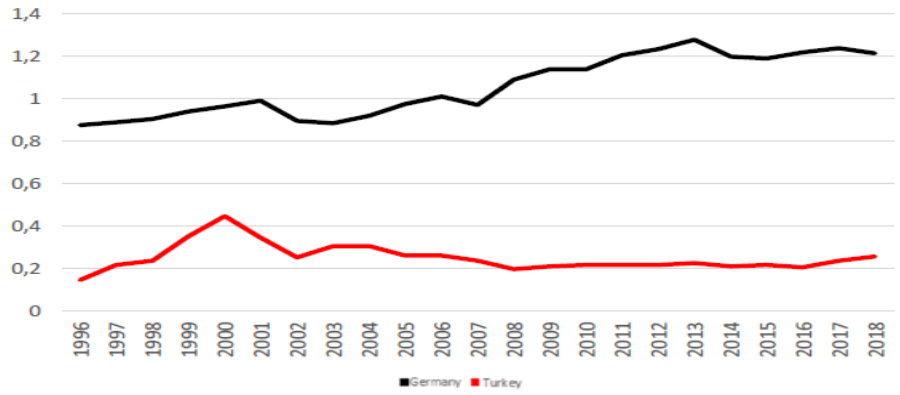


Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/, calvulated by the author using 10.04.2020 data.

In Chart 9 medium-technology export competitiveness of Germany and Turkey are shown comparatively. Germany had a weak comparative advantage in manufactures with medium technology intensity during the 1996-2018 period and this superiority tended to increase relatively during the period. Turkey had a comparative

disadvantage at the beginning of the period and it had a weak comparative advantage from 2003 to 2018, which tends to increase relatively.

Chart 10. Competitiveness of Germany and Turkey In High Technology Density (1996-2018)



Source: UN Comtrade Database, (Online) https://comtrade.un.org/data/, calculated by the author using 10.04.2020 data.

In Chart 10 high-technology export competitiveness of Germany and Turkey are shown comparatively. While Germany had a comparative disadvantage in manufactures with high technology intensity until 1999; it had a weak comparative advantage during the period 2000-2018. Turkey had a comparative disadvantage in export competitiveness in high technology density between 1996-2018.

7. Conclusion

Germany has designed its system of industrial policy through vertical applications in the form of strong sectoral specialisation and focusing on technology-intensive industries through the strong competitiveness of its companies. Germany also has been promoting its industrial policy with horizontal intervention areas such as ecological industrial policy and accompanying investment-friendly tax policy, environmental policy for the future and Industry 4.0 applications.

The new international division of labor that emerged in the world just before the 21st century is an indication that the world order is changing rapidly and the differences in economic growth and development between countries tend to increase geometrically from an arithmetic increase. At this point, the United States and China have reached a very efficient economic structure in which they hold a large part of the world global trade due to the enormous GDP increases they have experienced since just before the 21st century. China has become an important production center especially since the beginning of the 21st century; has been included in the eastern bloc and in the global economic order as an important economic powerhouse. At this

point, it is known that today industrialized countries such as Germany reduce their labor costs by moving their factories to this country. The analysis that reveals Germany's competitive power in the international arena in the export of manufacturing industry products within the framework of Balassa's Comparative Advantages Index values research covering the years 1996-2018 confirms that the production centers have shifted around the world, especially since the beginning of the 21st century.

Turkey is a country, which allocates its production to low and medium-tech sectors on a large scale and focuses on these sectors. It is considered correctly to focus on the production and export of products with high technology density to produce value added in the industry in Turkey. The fact that the positive quantitative developments in manufacturing industry production are not supported by qualitative transformation naturally reflects on the export structure. Mainly low-technology products are exported; exports become dependent on imports. At this point, it is necessary to design the Turkish industrial policy in a way that will transform the foreign trade structure, increase the necessary industry incentives and thus, support the industry. Furthermore, Turkey should protect its competitiveness against the EU, which makes up about half of its export value. For the protection of competitiveness, it would be correct to base its manufacturing industry on technology investments rather than physical investments.

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