Türkiye'de İmalat Sanayilerinin Dinamikleri

Maya Moalla| ORCID 0000-0003- 4076- 2790| mayamoalla@hotmail.com

Mersin Üniversitesi, Mersin, Türkiye

ROR ID: https://ror.org/04nqdwb39

İsmail Tuncer | ORCID 0000-0003-0180-7415| ituncer@mersin.edu.tr

Mersin Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İktisat Bölümü, Mersin, Türkiye

ROR ID: https://ror.org/04nqdwb39

Öz

Ekonomik büyümede yapısal değişimin rolü gelişmiş ülkeler için iyi belgelenmiştir, ancak gelişmekte olan ülkeler üzerine yapılan çalışmalar sınırlı kalmaktadır. Bu çalışma, Türkiye'nin imalat sektöründe 2010-2015 yılları arasında 4 haneli sektör düzeyinde yapısal değişimin işgücü verimliliği üzerindeki etkisini inceleyerek bu boşluğu doldurmayı amaçlamaktadır. Türkiye İstatistik Kurumu'nun NACE Rev.2'ye göre sınıflandırılmış Yıllık Sanayi ve Hizmet İstatistikleri'nden elde edilen 59214 işletmeye ait mikro veriler kullanılarak shift-share yöntemi uygulanmıştır. Sonuçlar, bu dönemde yapısal değişimin ekonomik büyüme üzerinde olumsuz bir etki yarattığını, işgücü verimliliği artışının ise büyük ölçüde sektör içi büyüme etkisinden kaynaklandığını göstermektedir.

Anahtar Kelimeler

Ekonomik Büyüme, İşgücü Verimliliği, Yapısal Değişim, Shift-Share Analizi

Atıf Bilgisi

Moalla, Maya. Tuncer, İsmail. "Türkiye'de İmalat Sanayilerinin Dinamikleri". Hitit Ekonomi ve Politika Dergisi Cilt No 4/Sayı No 2 (Aralık 2024), 72-86

Geliş Tarihi	14 Kasım 2024
Kabul Tarihi	28 Aralık 2024
Yayım Tarihi	30 Aralık 2024
Değerlendirme	İki Dış Hakem / Çift Taraflı Körleme
Etik Beyan	Bu makale, Prof. Dr. İsmail Tuncer danışmanlığında hazırlanan ve 13-15 Haziran 2023 tarihleri arasında Endonezya'nın Lampung Eyaleti, Bandar Lampung şehrinde düzenlenen "1. Uluslararası İslam Ekonomisi, İş Geliştirme ve Çalışmaları Konferansı (1. ICIEBDS)"nda özet olarak sunulan "Üretkenlik Büyümesinde Yapısal Değişikliklerin Önemi: Türkiye Örneği" başlıklı doktora tezinden alınmıştır.Bu çalışmanın hazırlanma sürecinde bilimsel ve etik ilkelere uyulduğu ve yararlanılan tüm çalışmaların kaynakçada belirtildiği beyan olunur.
Yazar Katkısı	%50 - %50
Benzerlik Taraması	Yapıldı – iThenticate
Etik Bildirim	hepdergi@gmail.com
Çıkar Çatışması	Çıkar çatışması beyan edilmemiştir.

Finansman	Bu araştırmayı desteklemek için dış fon kullanılmamıştır.
Telif Hakkı & Lisans	Yazarlar dergide yayınlanan çalışmalarının telif hakkına sahiptirler ve çalışmaları CC BY-NC 4.0 lisansı altında yayımlanmaktadır.

Manufacturing Industries' Dynamics in Türkiye

Maya Moalla| ORCID 0000-0003- 4076- 2790| mayamoalla@hotmail.com
Mersin Üniversitesi, Mersin, Türkiye
ROR ID: https://ror.org/04nqdwb39

İsmail Tuncer | ORCID 0000-0003-0180-7415| ituncer@mersin.edu.tr
Mersin Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, İktisat Bölümü, Mersin, Türkiye
ROR ID: https://ror.org/04nqdwb39

Abstract

The role of structural change in economic growth is well-documented for developed nations, yet studies on developing countries remain scarce. This study seeks to bridge this gap by exploring the influence of structural change on labor productivity in Turkey's manufacturing sector at the 4-digit industry level from 2010 to 2015. Using microdata from the Turkish Statistical Institute's Annual Industry and Service Statistics, classified by NACE Rev.2, and covering 59214 firms, we apply the shift-share method. The results indicate that structural change exerted a drag on economic growth in this period, while labor productivity growth was largely driven by the within-growth effect.

Keywords

Economic Growth, Labor Productivity, Structural Change, Shift Share Analysis, Turkey

Citation

Moalla, Maya. Tuncer, İsmail. "Manufacturing Industries' Dynamics in Türkiye". Hitit Journal of Economics and Politics Volume 4/Issue 2 (December 2024), 72-86.

Date of Submission	14 November 2024
Date of Acceptance	28 December 2024
Date of Publication	30 December 2024
Peer-Review	Double anonymized - Two External
Ethical Statement	This paper is drawn from a PhD thesis titled The Significance of Structural Changes to Productivity Growth: The Case of Turkey, supervised by Prof. Dr. İsmail Tuncer, and presented as a summary at the "1st International Conference on Islamic Economics, Business Development, and Studies (1st ICIEBDS)" which took place in Bandar Lampung City, Lampung Province, Indonesia, from June 13 to 15, 2023."It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.
Author Contribution	50%, 50%
Plagiarism Checks	Yes - iThenticate
Conflicts of Interest	The author(s) has no conflict of interest to declare.
Complaints	hepdergi@gmail.com
Grant Support	The author(s) acknowledge that they received no external funding in

support of this research.

Introduction

Overall labor productivity evolution might be driven by the continual process of resource reallocation from low to high productive activities and vice versa. The resource reallocation may be intertwined with the dynamics of the innovation process. In this work, the resource reallocation is referred to as the structural change process. This process indicates the covariance between the overall evolution of labor productivity and labor productivity in the pre-evolution (Andersen & Holm (2014); Andersen (2004) and Holm (2014)). The innovation effect indicates the part of labor productivity that can be credited to the intra-firm effect. The structural change process impacts significantly economic development. Contemporary developed nations are those who transform their structure from a low productive capacity to high productive one successfully (Lin, 2012). In turn, developing or less developed countries ought to change their structure by moving towards higher productive activities, sectors, or industries to provide more welfare to their citizens. The patterns of structural change are ascribed to demand as well as supply conditions. From the perspective of the demand-side, the trajectory of the structural change process is controlled by the relative prices and preferences. Put differently, at higher income levels, a shift of demand from primary to manufacturing goods and then to secondary goods takes place stimulating consequently the process of structural change. One another factor that affects the trajectory of the structural change process from the perception of demand-side is trade determined by natural resources, commercial policies, and type of specialization. From the supply-side perspective, improvements in technology lead to productivity heterogeneities among industries. Those differentials affect the structure of production and employment shares and might be translated into cost advantage backed by lower prices or higher profits backed by reinvesting in imperfect capital markets. Literature review revealed that structural changes' velocity and direction are governed by the association between the technological progress from one side and relative prices and preferences from another side (Baily, Bartelsman & Haltiwanger (2001) and Kruger (2008)). There is a reciprocal affiliation between structural change and productivity improvements. Changes in one lead to changes in the other. However, a vicious cycle of stagnation and poverty may emerge if productivity growth and structural change are both low (Matsuyama, 2008). Van Long & Poschke (2017) and Alvarez-Cuadrado posit that the elasticity of substitution between the production factors has an influence on the process of structural change process from the supply side. With low per capita GDP, the price of goods with low substitutability between production factors will be high; over time the availability of capital stemming from increasing GDP per capita levels will decrease the relative prices of those goods stimulating the transformation of resources towards the sectors characterized by low elasticity of substitution between capital and labor. Herrendorf, Herrington & Valentinyi (2015) have come to the conclusion that labor-augmenting technological progress is a principal component behind the process of structural change. The differences in the capital shares induce transformation from primary to secondary and from secondary to tertiary sectors; however, the differences in substitutability somewhat diminish the differences in capital shares. Moreover, Sachs & Warner (2001) documented that at higher levels of GDP, the role of natural resources and population size becomes more important in the process of structural transformation among industries. They claimed that in the natural resource-rich countries manufacturing shares were susceptible to corrosion caused by the "natural resource curse" or "Dutch disease". Up until

1980, Turkey followed an industrialization policy that had been characterized by the high protection of domestic producers from import competition. This policy is typically labeled as an import substitution industrialization strategy; which ended in a serious crisis at the end of the 1970s. The poor economic conditions in the 1980s induced the policymakers to carry out basic changes in the economic policies with a view to moving from the import substitution industrialization strategy towards the deregulation of domestic financial markets and the liberalization of domestic and foreign goods trade. Stabilization didn't be achieved by liberalization during the 1990s. Turkey suffered high public debt, serious budget deficits, sharply increasing inflation rates, and high real interest rates. The direct consequence of these problems was the severe crisis of 1999-2000 during which 50% of the banks were wiped out because they were forced to increase domestic interest rates to finance budget deficits resulting increase in foreign exchange risk over time. The productivity evolution's decomposition into the validities of selection, and innovation has been a frequently utilized instrument for analyzing the correlation between the micro and macro productivity evolution for developed nations, however; only a handful of empirical studies have been accomplished for developing countries (Rodrik, McMillan & Sepulveda, 2016). In an effort to address a portion of this discrepancy, this study aims to identify the main factors influencing the overall growth of labor productivity in the manufacturing sector of Turkey between 2010 and 2015. Numerous theories and empirical evidence suggest that the manufacturing industry plays a vital role in driving sustainable development (Szirmai, Naudé & Alcorta, 2013). The manufacturing sector has long been recognized as a catalyst for economic evolution owing to its effectiveness in attracting resources from low-value-added sectors. This dynamic stimulates the process of structural change, which is a key element in driving modern economic evolution (Kaldor (1960) and McMillan & Rodrik, 2011). For developing nations seeking to achieve sustainable development and generate viable employment opportunities, the manufacturing sector presents a promising avenue. It not only allows for the rebalancing of the economy towards more productive activities but also offers a relatively inclusive employment foundation with increased labor productivity. ((UNIDO (2013), Tregenna (2014) and Szirmai (2012)). The main objective of this research is to explore the mien of structural change on overall productivity evolution by investigating within-, static-, and dynamic-growth miens. To the best of our knowledge, this is the first study to apply firm-level shift-share investigation in Turkey. The structure of the paper is as follows: Section 2 displays the existing literature, Section 3 exhibits the data and methodology, and Section 4 shows the conclusion.

Literature Review

The structural change pertains to the shift in employment from one sector to another. This process can be driven by various factors, including changes in technology, changes in patterns of consumer demand, and changes in comparative advantage. Heterogeneity in productivity dynamics or income elasticities of demand can also be a driving force behind structural change. Some sectors may experience more rapid productivity growth than others, which can lead to a reallocation of labor and resources toward those sectors. Similarly, changes in income elasticities of demand can lead to shifts in consumer preferences, which can in turn lead to changes in the composition of economic activity and employment. The direction and velocity of structural change can have significant implications for the process of economic evolution. If structural change leads to a reallocation of production factors from lower to higher value-added sectors, this can help to increase overall productivity and foster economic

growth. This is because higher value-added sectors tend to have higher productivity levels and are better able to generate new technologies and innovations. This can lead to a virtuous cycle of growth, where higher productivity levels in turn lead to further increases in productivity and value-added. However, if the structural change leads to a reallocation of production factors from higher productivity sectors to lower productivity sectors, this can slow the process of economic evolution and impede growth. This is because lower productivity sectors are less able to generate new technologies and innovations, and may be less efficient at utilizing resources. This can lead to a vicious cycle of low productivity and stagnant growth. Therefore, policymakers often try to encourage structural change in a way that promotes the reallocation of production factors to higher value-added sectors. This can involve policies aimed at improving education and skills training, promoting research and development, and creating a favorable environment for entrepreneurship and innovation. Although the idea of structuralism has been employed by different economic schools of thought, its origins finds its foundation in classical economists such as Adam Smith and David Ricardo. Smith (1776) emphasizes the weight of the division of labor as a driver of economic growth. According to Smith, the division of labor results in enhanced productivity as it enables workers to specialize in specific tasks, thereby increasing their efficiency and effectiveness in their respective work. This, in turn, can increase the output of goods and services and stimulate economic growth. Ricardo (1817) argued that changes in the availability and price of resources could lead to shifts in the structure of the economy. Specifically, Ricardo focused on the role of non-renewable resources, such as land and minerals, in the economy. He argued that as these resources become scarcer or more expensive, producers will shift towards using resources that can be produced or replaced, such as labor and capital. This, in turn, can lead to changes in the overall makeup of the economy, as industries that rely heavily on non-renewable resources may decline, while those that use more renewable resources may grow. Marx (1885) argued that economic evolution is driven by the class struggle between capitalists and workers, which can lead to the development of new industries and the displacement of older ones. He also believed that technological advancements would lead to an increase in the productivity of labor, which would in turn create new opportunities for investment and growth. However, Marx saw this process as inherently unstable and prone to crisis, due to the contradictions and conflicts inherent in the capitalist system. Rostow (1960) argued that for a traditional economy to move to the next stage, it needs to go through a take-off process, where investment in a particular sector(s) leads to increased productivity, industrialization, and economic growth. This take-off process is essential for an economy to move from a subsistence-based economy to a more advanced industrial economy. In Lewis's (1954) model, the "big push" refers to the need for a coordinated effort to promote the development of the modern sector. The modern sector, with higher productivity and wages, can absorb surplus labor from the traditional sector, where productivity and wages are low. As more labor moves to the modern sector, the traditional sector will become less crowded, and wages will rise, leading to a further increase in productivity. This process of structural transformation is driven by sectoral differences in productivity and wages and is referred to as the Lewis model or the dual-sector model. Both Rosenstein-Rodan (1943, 1961) and Nurske (1953) believed that sustainable economic growth required a balanced approach to development that included investment in multiple sectors and careful planning and management of resources. Kuznets (1961, 1971) held the view that technological advancements played a pivotal role in promoting economic growth and exerted significant impacts on the overall structure of the

economy. His argument revolved around the notion that technological progress triggered shifts in labor and capital allocation across industries by inducing changes in the income elasticities of demand. As some industries become more profitable, they attract more resources, while others may lose their appeal and decline. Kuznets also highlighted the role of urbanization and changes in the spatial distribution of the population in driving economic evolution. He argued that technological progress could create new opportunities for employment and innovation in urban areas. Rosenberg (1963) argued that the lack of an organized domestic capital goods sector was a major obstacle to economic growth in underdeveloped economies. He believed that the production of capital goods, such as machinery, was essential for the development of a technological foundation on which further technical progress could rely. Without a domestic capital goods sector, underdeveloped economies were unable to produce the machinery and other equipment needed to support modern production methods, and therefore could not grow and develop. Rosenberg's argument was centered on the belief that economic growth is primarily driven by technological advancements and that the capacity to innovate and adapt to new technologies is crucial for achieving long-term sustainable economic evolution. He believed that the production of capital goods was a critical component of this process, as it allowed firms to adopt new technologies and modernize their production processes. Abramovitz (1986) believed that structural change was a crucial factor in the catch-up process. As underdeveloped economies shift their resources from traditional to modern sectors, they become more productive and better able to adopt new technologies. This leads to increased efficiency and higher levels of economic evolution. Abramovitz also emphasized the weight of knowledge diffusion in promoting catch-up growth. He argued that underdeveloped economies need to acquire knowledge and technology from more advanced economies in order to modernize their production processes and compete in global markets. In addition, Abramovitz believed that investment and demand expansion were important drivers of catch-up growth. Underdeveloped economies ought to invest in physical and human capital to support modern production methods, and they need to expand domestic demand to support the growth of their domestic industries. Perez (1985) argued that the full potential of new technological paradigms is solely realized through a process of institutional and social restructuring. She believed that technological change creates new economic opportunities and requires new organizational structures, social norms, and institutional arrangements to be fully realized. According to Perez, the introduction of new technologies can disrupt existing patterns of economic activity and create winners and losers. In order to ensure that the benefits of technological change are widely shared, she argued that it is necessary to restructure social institutions to create new opportunities for employment, education, and training. Perez also emphasized the importance of social and institutional adaptation in promoting economic growth. She believed that societies that can adapt to new technological paradigms are more susceptible to experiencing sustained economic growth over the long term. Many empirical studies have demonstrated the important role of structural change in economic development such as: Echevarria (1997), Denison (1967), Kaniovski (2002), Dietrich (2012), Van Ark &Timmer (2003), Caselli and Coleman (2001), Fan et al. (2003). However, some studies have suggested the negative miens of structural change on aggregate economic performance such as Fagerberg (2000), Ngai & Pissarides (2007), Meckl (2002), and Timmer and Szirmai (2000). Further research is required to enable comprehension of the essence of the mechanism through which structural change affects economic evolution positively or negatively. Further investigation is essential to better grasp the nature of the

mechanisms through which structural change affects economic evolution positively or negatively. Although there is general agreement on the significance of structural change in economic development, the precise mechanisms and pathways by which it influences this development are not yet comprehensively comprehended.

Data Material and Methodology

During the period spanning from 2010 to 2015, the microdata from the yearly Industry and Service Statistics, compiled by the Turkish Statistical Institute (TSI), was utilized. The data was classified according to the four-digit level of the NACE Rev.2 classification system. Throughout the examined period, there were a total of 59,214[1] firms included in the study. All calculations had been implemented in the Regional Directorate of the Turkish Statistical Institute headquartered in Adana. The analysis utilizes three variables: the total value added (VA) by firms, the total full-time equivalent employment across firms over time, and industry classification. Additionally, to account for inflation, we will adjust the data using the Producer Price Index (PPI), with 2003 set as the base year. To explore the affiliation between structural change and economic development, we will employ the shift-share analysis method. This analysis will allow us to investigate the hypothesis of a "structural bonus and burden." According to this hypothesis, if labor shifts from low-productivity sectors (high labor intensity) to high-productivity sectors (high capital intensity), there will be a positive connection between structural change and economic evolution. Conversely, if labor shifts from capital-intensive sectors to labor-intensive sectors, it predicts a structural burden or a negative relationship between structural change and overall economic development. The accumulated labor productivity (LP) at time t can be expressed as:

$$LP^t = \sum_{i=1}^{n} \frac{Y_i^t}{L_i^t} \frac{L_i^t}{L^t} = \sum_{i=1}^{n} LP_i^t S_i^t \tag{1}$$

Where, subscript i represents industries ($i=1,...n$), S_i denotes the share of sector i in total employment at time t, and LP labor productivity of sector i at time t. Taking the difference between aggregate labor productivity levels at the final (f_y) year and base year (b_y) and dividing both sides by LP^{by}:

$$\begin{aligned} &\frac{LP^{fy} - LP^{by}}{LP^{by}}(labor-productivity-evolution) = \\ &+ \sum_{i=1}^{n} \frac{\left(LP_i^{fy} - LP_i^{by}\right)S_i^{by}}{LP^{by}}(within-growth) \\ &+ \sum_{i=1}^{n} \frac{\left(S_i^{fy} - S_i^{by}\right)LP_i^{by}}{LP^{by}}(static-shift-effect) \\ &+ \sum_{i=1}^{n} \frac{\left(S_i^{fy} - S_i^{by}\right)\left(LP_i^{fy} - LP_i^{by}\right)}{LP^{by}}(dynamic-shift-effect) \end{aligned} \tag{2}$$

[1] We mean by the total number of the firms: those are existing only in 2010, those are existing only in 2015 and those are existing in both 2010 and 2015.

Where *LP* denotes the aggregate manufacturing labor productivity, LP_i represents labor productivity of any sub-manufacturing industry *i*, S_i symbolizes the employment share of the ith sub-manufacturing industry in the total manufacturing sector. The shift-share analysis decomposes the overall labor productivity evolution into three elements: the within-growth, the static, and the dynamic effects. The within-growth one can be explained as the productivity improvements stemming from inside industries comprising sectors or from within firms comprising industries. It will have a positive mien on the overall progression of labor productivity only if firms succeed in improving their labor productivity in the final year when compared to their productivity in the base year. The static shift effect is relevant to the impact of changes in the employment distribution among firms or industries with varying levels of productivity on the overall evolution of productivity. It will have a positive mien on the overall progression of labor productivity only if the firms can increase their employment shares in the final year compared with those in the base year. This expresses the structural bonus hypothesis means that:

$$\left(S_i^{fy} - S_i^{by}\right)LP_i^{by} > 0 \tag{3}$$

The dynamic shift is relevent to the mien of changes in the employment distribution across industries or firms with varying productivity growth rates on the overall evolution of productivity. If firms can simultaneously increase (or decrease) their labor productivity while also increasing (or decreasing) their employment shares in the final year compared to the base year, it will have a significant mien on the overall evolution of productivity. The structural burden hypothesis predicts labor transformation towards sectors with low productive capacity.

$$\left(S_i^{fy} - S_i^{by}\right)\left(LP_i^{fy} - LP_i^{by}\right) < 0 \tag{4}$$

By combining the results of both mechanisms, we can derive specific predictions that facilitate feasible and rapid economic development. This involves ensuring the efficient allocation of resources to firms or industries with high productivity capacity, as well as the accumulation of necessary skills and improvement of institutional competencies to foster sustained productivity gains across various economic sectors. The policy that expands one of these two challenges is good for the other challenge. Nevertheless, such a nexus is not conditional. It is within reach to achieve a significant structural change without corresponding improvements in fundamental factors, and vice versa. Insufficient investment in fundamental factors does not hinder rapid progress in structural transformation, but slow structural transformations coupled with low investment in fundamentals result in a lack of overall evolution. Even with the likelihood for countries to become richer when investing in fundamentals; it will not be an easy way to attain persistent growth without rapid industrialization that fuels evolution. This is for the reason that the manufacturing industries promote unconditional convergence and absorb large amounts of the surplus labor force from the rest of the economy. Brazil, for illustration, underwent a golden age of classical structural transformations towards the manufacturing and modern service sectors till the 1980s when the within-sector enrichments in productivity participate a leading role in attaining maintained productivity evolution and a few productivity gains come from the structural change process. The explanation for that might be the reverse structural changes i.e., the reallocation of the labor force from sectors with high productive capacity to ones

with low productive capacity. The same is valid for Latin American countries between 1950 and 2005, where the majority of productivity gains were achieved through consistent investments in human capital, institutional improvements, and technological advancements. Overall, there is a positive relationship observed between the evolution of labor productivity and changes in employment shares throughout the period under study (Pearson corr.=0.015 and p-value= 0.83). Even for the continuing firms, there is a positive nexus proved by Pearson corr.=-0.11 with p-value=0.11. Industries that were able to simultaneously increase their labor productivity while also increasing their employment shares experienced the highest level of labor productivity evolution, for instance, the production of perfumes and toilet preparations (2042), the manufacture of household and sanitary goods, and toilet requisites (1722), the production of bodies (coachwork) for motor vehicles, as well as trailers and semi-trailers (2920), and the production of other non-ferrous metals (2445). The key patterns of the labor productivity evolution for those industries are prone to both within-growth and structural change. Moreover, some industries were able to achieve high labor productivity evolution rates stemming from the within growth despite the adverse structural change brought drag on them. Some of those sectors are the manufacture of wallpaper (1724), production of pleasure and sporting boats (3012), the manufacturing of central heating radiators and boilers (2521), the production of ceramic insulators and insulating fittings (2343), the manufacture of plaster products for construction (2362), the production of fiber optic cables (2731), and the manufacturing of machinery for paper and paperboard production (2895). The largest drop in the labor productivity evolution was in the industries with negative within growth contribution regardless of the contribution of the structural change positive or negative. When investigating the nexus between the labor productivity of these industries and the export changes during the studied interval from 2010-2015; we notice that the firms of (1722) decreased their exports from 0.62% in 2010 to 0.60% in 2015. The firms of (2920) increased their exports from 0.16% in 2010 to 0.25% in 2015. The firms of (3012) decreased their exports from 0.18% in 2010 to 0.05% in 2015. The firms of (2731) increased their exports from 0.40% in 2010 to 0.42% in 2015. The firms of (2895) increased their exports from 0.32% in 2011 to 0.41% in 2015. Since technological progress is the vital component that stimulates economic growth, we divided data into four groups classified according to Nace Rev 2.: manufacturing industries with high-, medium-high-, medium-low, and low technologies. Table (1) demonstrates the annual evolution rate of labor productivity in the Turkish manufacturing industries for the period from 2010 to 2015 at the firm level. The other columns point to within-, static- and the dynamic-shift effect, respectively according to the technological intensity. The basic source of overall labor productivity evolution during the period from 2010 to 2015 stemmed from the within-industry component. The negative impact of the structural change component indicates that it hinders the labor productivity evolution in the Turkish manufacturing industries, causing a drag on overall progress (structural change effect= static shift effect + dynamic shift effect). These results align with those of other empirical studies, including the works of Tuncer & Altıok (2013), Tuncer & Moalla (2020a), Tuncer & Moalla (2020b), and Moalla (2020), where structural change was found to have a minimal effect, either positive or negative, on the overall labor productivity trend in Turkey. However, some other studies, for example, work by Atiyas & Bakış (2013) documented a positive structural change effect, particularly for the periods of 1990s and initial years of the 2000s at the more aggregated level of industry classification.

Tablo 1. Decomposition of Turkish Manufacturing Industries' Labor Productivity according to technological intensity during the period (2010-2015)

	Labor productivity growth	Within-growth	Static-shift	Dynamic-shift	Total
High-TECH	0,022	0,048	-0,017	-0,010	0,022
%		224%	-78%	-46%	
Medium-high TECH	0,064	0,070	-0,007	0,001	0,064
%		110%	-11%	1%	
Medium-low TECH	0,061	0,064	-0,001	-0,003	0,061
%		105%	-1%	-4%	
Low TECH	0,058	0,079	-0,017	-0,004	0,058
%		137%	-30%	-7%	

The results revealed that the firms of pharmaceutical preparations (2120) which is a high technological industry achieved the highest within growth effect although those firms decreased their employment shares (-0.34) during the period from 2010 to 2015. In contrast, those firms achieved high labor productivity evolution associated with adverse structural changes ((-0.018) + (-0.011) =-0.028). Almost 45% of the high technological firms decreased their employment shares. Furthermore, almost 82% of them achieved high labor productivity growth. Only the firms of manufacture of irradiation electromedical and electrotherapeutic equipment (2660) and the firms of manufacture of loaded electronic boards (2612) have negative labor productivity evolution. The firms of manufacture of other parts and accessories for motor vehicles (2932) which are classified as medium-high technological firms; achieved the highest within growth effect associated with the highest structural change effect. Almost 84% of the medium-high technological firms achieved positive labor productivity growth during the studied interval. Furthermore, almost 55% of them decreased their employment shares. A high positive contribution of the structural change effect had been achieved by the firms of the manufacture of air and spacecraft and related machinery (3030) and the firms of manufacture of agricultural and forestry machinery (2830). Between the firms that had been classified as medium-low TECH, the firms of manufacture of basic iron and steel and of Ferro-alloys (2410) achieved the highest within growth effect despite the negative contribution of the adverse structural change during the studied period. Almost 84% of medium tow TECH firms achieved a positive within evolution effect, while 46% of those firms experienced an adverse structural change effect. The firms of manufacture of household and sanitary goods and of toilet requisites (1722) which had been classified as low TECH achieved the highest within growth effect associated with positive structural change contribution. Almost 57% of low-tech firms experienced adverse structural change effects. Although the firms of manufacture of tobacco products (1200) achieved positive labor productivity growth, those firms had been considerably affected by the adverse structural change that took place during the studied period. Figure (1) shows the impact of the mentioned effects based on the Principal Component Analysis (PCA) during the period (2010-2015). The results revealed that utilizing the conventional shift-share analysis, the first principal component has negative associations with the within growth effect, but the second component has positive associations with

the within growth and the structural change mien.

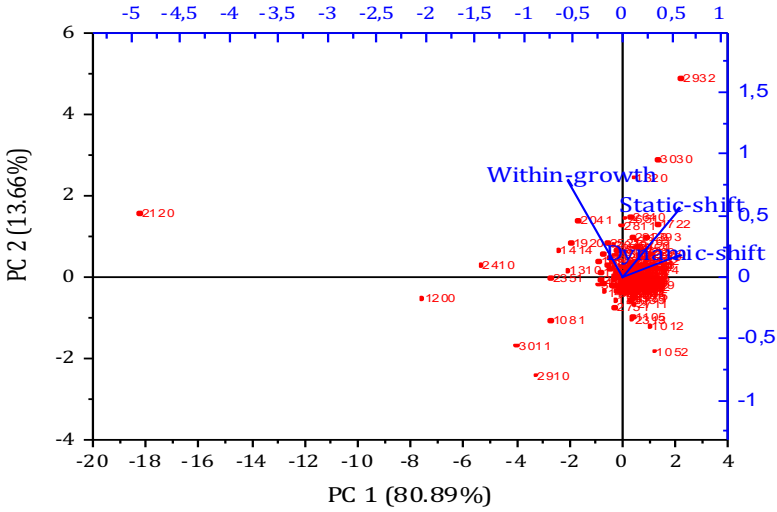

Figure 1. Biplot of shift-share analysis during the period of (2010-2015)

Conclusion

Literature scrutinizes two sources of economic growth: internal sources stemming from technological and external sources stemming from structural change stemming from the resources' transformation from activities with weak- towards high-productive capacity. Structural change can accelerate or decelerate economic growth according to its direction and velocity. For example, it accelerates the economic growth in newly industrialized Asian countries; but it decelerates it in some Latin American and African countries. As far as our understanding goes, structural change's contribution to economic evolution has been extensively studied and documented in developed countries. However, there remains a gap in empirical research focusing on developing countries in the existing literature. Therefore, this study aims to address this gap by questioning the magnitude of the structural change concerning labor productivity evolution within the Turkish manufacturing industries at a detailed four-digit level. The investigation focuses on the period between 2010 and 2015. The microdata of Annual Industry and Service Statistics set down by the Turkish Statistical Institute (TSI) classified according to NACE Rev.2 had been utilized. Based on conventional methods, our findings indicate that the within-sector effect makes up a significant portion of the overall productivity gains in the Turkish manufacturing industry. However, it appears that structural change hurts aggregate labor productivity evolution, acting as a drag rather than a boost. One possible explanation for these findings could be the implementation of innovative technological processes achieved through (R&D) activities, which have contributed to the advancement of labor productivity evolution. However, Turkey's manufacturing industries do not expand competently enough during the period of (2010-2015) owing to the Turkish incentive system lacking major selectivity across industries. Another possible explanation is that the intense

competition resulting from trade liberalization compelled low-productivity firms to either improve their productivity or exit the market, leaving only the high-productivity firms capable of maintaining or increasing their market shares. Another contribution of this work may be determining the eligibility for incentives. Put differently, the firms that had the highest labor productivity were: The production of perfumes and toilet preparations (2042), the manufacture of household and sanitary goods and toilet requisites (1722), the production of wallpaper (1724), the manufacturing of bodies (coachwork) for motor vehicles and the production of trailers and semi-trailers (2920), the construction of pleasure and sporting boats (3012), other non-ferrous metal production (2445), and the manufacture of central heating radiators and boilers (2521). Finally, comprehensive selective policies such as bettering the ineffective regulations and reinforcing the innovation incentives should be executed to enable all firms to attain higher levels of productivity gains. Moreover, a comprehensible strategy of flexicurity should come to pass to protect labors affected by structural change. In the short run, advancing education policies and productivity-boosting know-how practices may enable attaining faster labor productivity evolution.

Acknowledgment: We would like to express our gratitude to TurkStat for granting access to the microdata set of the Annual Industry and Services Statistics Database and for providing an outstanding research environment.

References

Abramovitz, M. (1986). Catching Up, Forging Ahead, and Falling Behind. *The Journal of Economic History*, *46*(2), 385-406. doi: 10.1017/s0022050700046209.

Alvarez-Cuadrado, F., Van Long, N., & Poschke, M. (2017). Capital-labor substitution, structural change and growth. *Theoretical Economics 12*(3), 1229-1266.

Andersen, ES. (2004). Population thinking, Price's equation and the analysis of economic evolution. Evol Inst Econ Rev, 1(1), 127–148.

Andersen, ES., Holm, JR. (2014). The signs of change in economic evolution: An analysis of directional, stabilizing and diversifying selection based on Price's equation. J Evol Econ, 24(2), 291–316.

Atiyas, İ., Ozan, B. (2013). Structural change and industrial policy in Turkey, REF Working, 2013-3, from http://ref.sabanciuniv. edu/sites/ref.sabanciuniv.edu/files/str_ch_refwp.pdf.

Baily, M. N., Bartelsman, E. J., Haltiwanger, J. C. (2001). Labor productivity: structural change and cyclical dynamics. Review of Economics and Statistics, 83(3), 420-433.

Caselli, F., & Coleman II, W. (2001). The U.S. Structural Transformation and Regional Convergence: A Reinterpretation. Journal of Political Economy, 109(3), 584-616. doi: 10.1086/321015.

Denison, E.F. (1967). Why Growth Rates Differ. Brookings, Washington DC.

Dietrich, A. (2011). Does growth cause structural change, or is it the other way around? A dynamic panel data analysis for seven OECD countries. Empirical Economics, 43(3), 915-944. doi: 10.1007/s00181-011-0510-z.

Echevarria, C. (1997). Changes in Sectoral Composition Associated with Economic Growth. International Economic Review, 38(2), 431. doi: 10.2307/2527382.

Fagerberg, J. (2000). Technological progress, structural change and productivity growth: a comparative study. Structural Change and Economic Dynamics, 11(4), 393-411. doi: 10.1016/s0954-349 x (00)00025-4.

Fan, S., Zhang, X., & Robinson, S. (2003). Structural Change and Economic Growth in China. Review of Development Economics, 7(3), 360-377. doi: 10.1111/1467-9361.00196.

Herrendorf, B., Herrington, H., Christopher, V. (2013). Sectoral technology and structural transformation. Manuscript: Arizona State University.

Holm, JR. (2014). The significance of structural transformation to productivity growth. Journal of Evolutionary Economics, 24, 1009–1036.

Kaldor, N (1960). Essays on Value and Distribution, Gerald Duckworth and Co., London

Kaniovski, S. (2002). On the structural dimension of competitive strategy. Industrial and Corporate Change, 11(3), 557-579. doi: 10.1093/icc/11.3.557.

Kruger, J. (2008). The sources of aggregate productivity growth: US manufacturing industries, 1958-1996. Bull Econ Res, 60(4), 405–427.

Kuznets, S. (1961). Quantitative Aspects of the Economic Growth of Nations: VI. Long-Term Trends in Capital Formation Proportions. Economic Development and Cultural Change, 9(4, Part 2), 1-124. doi: 10.1086/449936.

Kuznets, S. (1971). Economic Growth of Nations: Total Output and Production Structure. Harvard University Press, Cambridge, MA.

Lewis, W. (1954). Economic Development with Unlimited Supplies of Labour. The Manchester School, 22(2), 139-191. doi: 10.1111/j.1467-9957. 1954.tb00021.x

Lin. (2012). New structural economics: A framework for rethinking development and policy. Washington, DC: World Bank.

Marx, K. (1885). III: Schematic presentation of accumulation and supplementary remarks. In: Hagemann, H., Landesmann, M., Scazzieri, R. (Eds.), The Economics of Structural Change, Vol. I, Critical Writings. 2003, Edward Elgar, Aldershot.

Matsuyama, K. (2008). Structural Change. In S.N. Durlauf & L.E. Blume (eds.), The New Palgrave Dictionary of Economics, 2 ed., Palgrave Macmillan.

McMillan, Margaret, S., Rodriki, D. (2011). Globalization, structural Change and productivity growth. NBER Working, 17143.

Meckl, J. (2002). Structural Change and Generalized Balanced Growth. Journal of Economics, 77(3), pp.241-266.

Moalla, M. (2020), Mechanısms 0f Schumpeterian Competitıon in Turkısh Manufacturıng Industries, Mersin University Journal of Social Sciences Institute, 4(1), pp.121-135.

Ngai, L., Pissarides, A. (2007). Structural Change in a Multisector Model of Growth, American Economic Review, 97, 429–443.

Nurske, R. (1953). Problems of Capital Formation in Underdeveloped Countries. Basil Blackwell, Oxford. - References - Scientific Research Publishing. [online] Available at: <https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/referencespapers.aspx?referenceid=1359597>.

Perez, C. (1985). Microelectronics, long waves and world structural change: New perspectives for developing countries. World Development, 13(3), pp.441-463.

Ricardo, D. (1817). On rent. In: Hagemann, H., Landesmann, M., Scazzieri, R. (Eds.), The Economics of Structural Change, Vol. I, Critical Writings. 2003, Edward Elgar, Aldershot.

Rodrik, D., McMillan M., Sepulveda C. (2016). Structural Change, Fundamentals, and Growth: A Framework and Case Studies. Washington, DC. International Food Policy Research Institute. 81-100.

Rosenberg, N. (1963). Capital goods, technology, and economic growth. In: Hagemann, H.,

Landesmann, M., Scazzieri, R. (Eds.), The Economics of Structural Change, Vol. I, Critical Writings. Edward Elgar, Aldershot.

Rosenstein-Rodan, P. (1943). Problems of Industrialisation of Eastern and South-Eastern Europe. The Economic Journal, 53(210/211), p.202.

Rosenstein-Rodan, P. (1961). Notes on the theory of the big-push. In: Ellis, H.S., Wallich, H.C. (Eds.), Economic Development for Latin America. Macmillan, London.

Rostow, W.W. (1960). The Stages of Economic Growth: A Non-communist Manifesto. Cambridge University Press, Cambridge.

Sachs, J. D., Warner, A. M. (2001). Natural resources and economic development: The curse of natural resources. European Economic Review, 45, 827-838.

Smith, A. (1776). In: Campbell, R.H., Skinner, A.S., Todd, W.B. (Eds.), An Inquiry into the Nature and Causes of the Wealth of Nations. Oxford, Clarendon Press, 1976.

Szirmai, A., (2012). Industrialisation as an engine of growth in developing countries 1950–2005. Structural Change and Economic Dynamics 23 (December (4)), 406–420.

Szirmai, A., Naudé, W., Alcorta, L. (2013). Pathways to Industrialization in the Twenty-First Century: New Challenges and Emerging Paradigms. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199667857.001.000

Tregenna, F. (2014). A new theoretical analysis of deindustrialisation. Cambridge Journal of Economics, 38(6), 1373-1390.

Tuncer, İ., Altiok, M. (2011). Türkiye imalat sanayinde yapısal değişim ve üretkenlik: 1980 - 2008 dönemi. Anadolu Üniversitesi Sosyal Bilimler Dergisi.

Tuncer, İ., Moalla, M., (2020a). Structural change and growth prospects in the Turkish manufacturing industry. Bulletin of Economic Theory and Analysis, 5(1), 1-20.

Tuncer, İ., Moalla, M., (2020b). Structural change and aggregate labour productivity in the Turkish non-farm business industries. In Hatirli, S., Koç, Ş. Demirel, O.,Theoretical and applied studies on Turkish economy. IJOPEC, 1, 155-173.

UNIDO. (2013). Sustaining employment growth: The role of manufacturing and structural change. Vienna: UNIDO.

Timmer, M. and Szirmai, A. (2000). Productivity growth in Asian manufacturing: the structural bonus hypothesis examined. Structural Change and Economic Dynamics, 11(4), pp.371-392.

van Ark, B., Timmer, M. (2003). Asia's productivity performance and potential: the contribution of sectors and structural change. In: Paper Presented at the RIETI-KEIO Conference on Japanese Economy: Leading East Asia in the 21 century, Tokyo.