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REGIONAL LABOUR PRODUCTIVITY GROWTH AND STRUCTURAL CHANGE IN TURKISH ECONOMY

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Abstract

Structural change is labelled as the shift of resources from low productive sectors to those with high-value-added. The structural change process can stimulate the evolution of the economy by increasing productivity. This study examines structural change and the bases of labour productivity evolution in 26 regions of Turkey for 2010-2020 period. Therefore, the Shift-Share Analysis method was employed in the study. The TURKSTAT gross domestic product in chain-linked volume, index and percentage change (2009 = 100) and employment by kind of economic activity data were utilized. The consequences revealed that the within-sector effect is the primary basis of productivity evolution in 26 regions of Turkey. The structural change has a positive but minor bearing on total labour productivity evolution in almost all regions. The within-sector effect is more dominant in the agricultural sector, but the bearing of structural change is negative. Similarly, the within-sector effect is stronger in the regions' industrial sectors (except for TR71, TRA1, TRA2, TRB2). The bearing of structural change in the services sector was better than in other sectors. As a result, it has been observed that the labour force is not directed to high-value-added sectors, particularly in the agricultural and industrial sectors, but the situation is better in the services sector.

Keywords: Structural Change, Productivity Growth, Shift-Share Analysis.

Jel Codes: J21, R11, 040.

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TÜRKİYE EKONOMİSİNDE BÖLGESEL İŞGÜCÜ VERİMLİLİK ARTIŞI VE YAPISAL DEĞİŞİM

Öz

Bir ekonomide kaynakların düşük verimli sektörlerden yüksek verimli sektörlere kayması yapısal değişim olarak tanımlanmaktadır. Yapısal değişim de verimliliği artırmaktadır, bu durumda da ekonomik büyüme daha dinamik ve istikrarlı bir hal almaktadır. Çalışmanın amacı, 2010-2020 dönemi için Türkiye'nin 26 bölgesinde (İBBS Düzey-2) yapısal değişim ve emek verimliliği artışının kaynaklarını analiz etmektir. Analizleri yapabilmek için çalışmada, Shift-Share Analiz yöntemi kullanılmıştır. Bunun için TÜİK veri tabanında yer alan iktisadi faaliyet kollarına göre gayri safi yurtiçi hasıla, zincirlenmiş hacim, endeks ve değişim oranları (2009=100) ve istihdam verileri kullanılmıştır. Bulgulara göre, Türkiye'nin 26 bölgesinde verimlilik artışının temel kaynağı sektör-içi etkidir. Yapısal değişim etkisi neredeyse tüm bölgelerde pozitif olmasına rağmen emek verimliliği artışı üzerinde küçük bir etkisi vardır. 26 bölgenin tarım sektöründe sektör-içi etki daha baskın ve yapısal değişim etkisi negatiftir. Aynı şekilde bölgelerin sanayi sektöründe (TR71, TRA1, TRA2, TRB2 hariç) de sektör-içi etki daha baskındır. Ancak hizmetler sektöründe yapısal değişim etkisi daha iyi durumda olduğu görülmüştür. Dolayısıyla tarım ve sanayi sektöründe işgücünün yüksek verimli sektörlere yönelmediği ancak hizmetler sektöründe bu durumun daha iyi olduğu görülmüştür.

Anahtar Kelimeler: Yapısal Değişim, Verimlilik Artışı, Shift-Share Analizi.

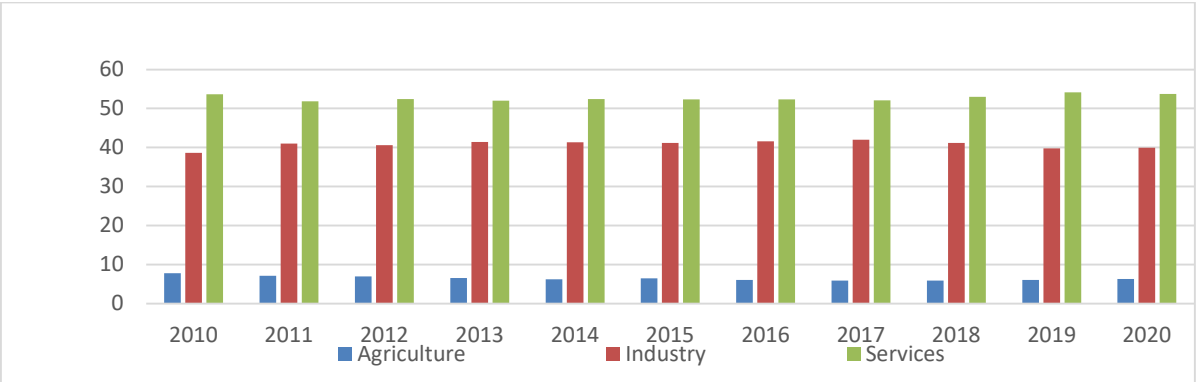
JEL Sınıflaması: J21, R11, 040.

1. INTRODUCTION

The neo-classical perspective proposes that under perfect competition conditions, economic growth will occur thanks to long-term capital formation, labour force expansion, and technological changes. This approach didn't give the demand changes and the transformation of production resources between sectors much attention due to the assumption of equal marginal returns to all uses of labour and capital. Likewise, the neo-classical approach presumes that resources will efficiently be distributed between producers and consumers over time under perfect competition conditions. Thus, the shift of labour and capital from one sector to another does not increase the total output. However, the structural change approach suggests that structural change occurs, especially under disequilibrium conditions. With this respect, the factor of mobility has a significant bearing on growth and productivity evolution. Put differently, and this approach argues that the reallocate of labour and capital to more productive sectors accelerates economic evolution by increasing productivity and stimulating the process of structural change (Chenery, 1986, p. 13; Syrquin, 1986, p. 229-237; Chenery et al., 1986, p. 227). Therefore, the structural change phenomenon in the process of development and growth of countries is defined as the shift of production factors (especially labour) from primary to secondary and then to the tertiary sector, as stated by Kuznets (1973, p. 248). Perhaps the most distinctive feature of the structural change is that while the manufacturing industry segment increases in both the economy and employment, that of the agricultural sector decreases

(Chenery & Syrquin, 1986, p. 38-39; Kubo et al., 1986, p. 189). Kaldor (1967, p. 5-6) considered the manufacturing industry as the dynamic sector and the driving force that stimulates economic growth by means of structural change. Thus, the structural change process or the sectoral shifting is one of the most robust and dynamic features of economic growth and development (Chenery et al., 1986, p. 1-2; Swiecki, 2017, p. 96). McMillan & Rodrik (2011, p. 27) argue that globalization is a significant factor in increasing productivity since it provides access to global markets and increases competition. However, McMillan & Rodrik (2011, p. 27) emphasize that total efficiency in the economy is a function of sharing resources across sectors. However, the direction of the structural transformation process is critical for economic growth. The bearing of sectoral shifts in the economy on growth can be attributed to productivity changes. Therefore, sectoral shifts-based productivity is one of the important ingredients of modern economic evolution. The sources' transformation from primary activities to high-value-added ones increases productivity (Doğruel & Doğruel, 2018, p. 269). Therefore, productivity is an important dynamic for growth. With this respect, the principal motivation of this study is to analyse the structural change process and the undercurrents of sectoral labour productivity evolution in 26 Turkish regions (Statistical Regional Units Classification NUTS Level 2) for the period of 2010-2020. Considering these circumstances, figure 1 shows the sectors' weights in GDP during the period from 2010 to 2020. The services sector has a significant mien in the Turkish economy. Its share in GDP is 53% on average. The industrial sector is essential ingredient of GDP. Its share in GDP is 41% on average. The agricultural sector's share in GDP is low. Its share in GDP is 6% on average.

Figure 1. Sectors' Share in GDP (%)

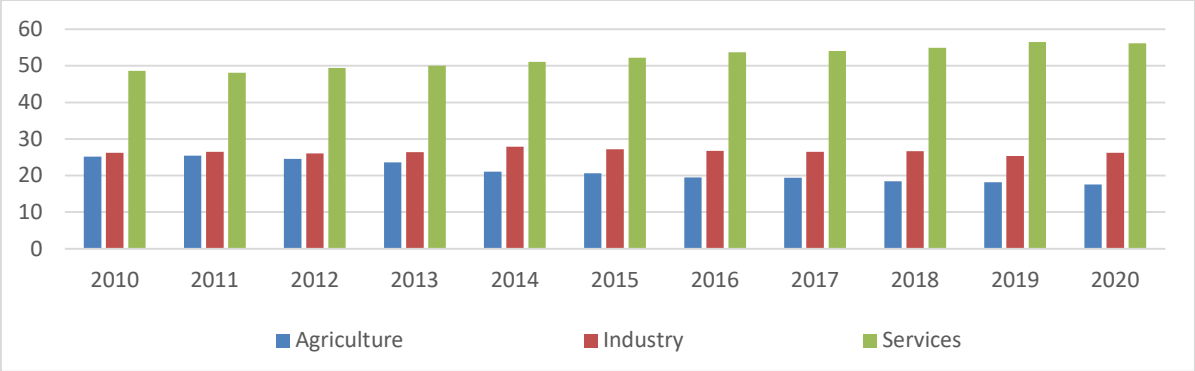


Source: TURKSTAT

Figure 2 depicts the share of sectoral employment in total employment. Like figure 1, the services sector's weight in total employment is higher than other sectors. During the course of the period, its share in total employment is on average 52%. The industrial and agricultural

sectors displayed similarities at the commencement of the period; however, while the industrial sector gained more importance (reached to 27%), the weight of agriculture declined to 21% towards the end of the period.

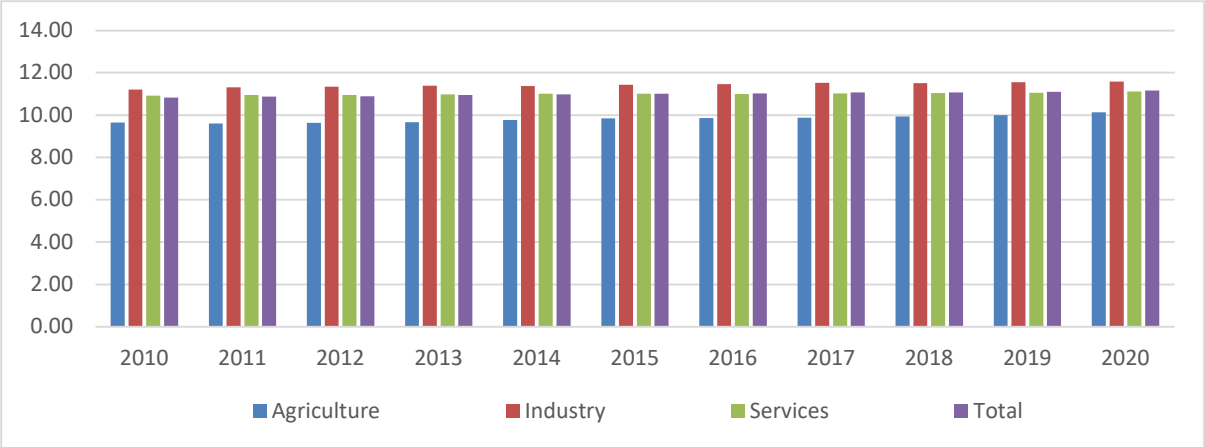
Figure 2. Share of Sectoral Employment in Total Employment (%)



Source: TURKSTAT

Figure 3 shows the sectoral productivity in the Turkish economy during the period from 2010 to 2020. The industrial sector had the highest productivity compared to other sectors. The average productivity during the studied interval was 11.42% in the industrial sector, 11% in the services sector, and 9.81% in the agriculture sector. Typically, even though the services sector's mien is higher compared to other sectors, the labor productivity is higher in the industrial sector.

Figure 3. Sectoral Productivity (in Natural Logarithm)



Source: TURKSTAT

There are two central bases of productivity evolution in the economy. The first one is the within-sector effect. In other words, the overall productivity might increase due to the rise in the productivity of a dominant sector. The reason for that may be dynamics such as the upsurge in the qualified labour force in that sector, the increase in capital investments, and technological accumulation. The second basis of productivity evolution is the structural change effect. That

is the shift of labour to more productive activities. Therefore, the significant bearing of the structural change effect indicates that resources are shifting in the right direction (Kaymaz, 2022, p. 97-98; McMillan & Rodrik, 2011, p. 13; Rodrik, 2010, p. 5; Altıok & Tuncer, 2013, p. 63; Doğruel & Doğruel, 2018, p. 269; Nas et al., 2023, p. 27-28). Moreover, the significant bearing of structural change designates that the economy is efficiently on the path of economic growth and development, as indicated by Kuznets (1973), Lewis (1954), and Kaldor (1967). Accordingly, Shift-Share Analysis was applied to scrutinize structural change and labour productivity evolution in 26 Turkish regions at the sectoral level. The data assembled by the Turkish Statistical Institute (TURKSTAT) is employed for the phase (2010-2020). Two principal variables from the database are utilized: Gross domestic product in chain-linked volume, index and percentage change (2009 = 100) and employment by kind of economic activity data of 26 Turkish regions at the sectoral level.

The results revealed that the within-sector effect comprised the bulk of the labour productivity evolution during the studied interval. Furthermore, the service sector's labour productivity evolution outpaced that of the other sectors of the economy. Furthermore, the leading ingredient of labour productivity evolution was the within-sector effect in all the Turkish regions. Higher labour productivity evolution was recorded for the industrial sector in TR21 (Tekirdağ, Edirne, Kırklareli), TR22 (Balıkesir, Çanakkale), TR31 (İzmir), TR33 (Manisa, Afyon, Kütahya, Uşak), TR41 (Bursa, Eskişehir, Bilecik), TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova), TR52 (Konya, Karaman), TR82 (Kastamonu, Çankırı, Sinop) and TRC1 (Gaziantep, Adıyaman, Kilis). In addition, higher labour productivity evolution was recorded for the agricultural sector in TRA2 (Ağrı, Kars, Iğdır, Ardahan). At large, the mien of the structural change effect is positive but low in accordance with the within-sector effect. There are few studies in the literature that use shift-share analysis. As seen in the literature section, the analyses conducted for the Turkish economy were generally conducted for the entire economy. There are limited up-to-date studies that decompose the accumulated labour productivity at both local and sectoral levels in the Turkish economy, as shown in the literature section. Considering these reasons, it is alleged that this study will confer to the literature on potential economic growth linked to structural change. This work is made up of five sections. The first section includes the introductory part in which the general features of the structural change are summarized. In the second section literature review is structured. The third section includes data and methodology. The fourth section is about appraising the consequences, and the fifth explains the conclusion.

2. LITERATURE REVIEW

The process of structural change can be defined as the transformation of production factors from the low productive economic activities to the high productive ones and vice versa. It can accelerate the economic growth if it occurs in the right direction meaning that if labours move from low value-added activities to higher value activities. In contrast, the process of structural change can decelerate the evolution of economy if labours move from high value economic activities to lower value-added activities. Fagerberg (2000) emphasizes that structural change is the key driver of economic evolution. Similarly, Swiecki (2017) states that structural change is one of the most important features of development and is an important dynamic for economic growth and development. According to Rodrik (2010), structural change affects not only economic growth velocity but also income distribution development. Therefore, economic growth is characterized by the incessant reallocation of resources to dynamic sectors in a certain way. Factors of production frequently move to industries that are expanding more quickly. This economic dynamic growth is classified as structural change (Timmer & Szirmai, 2000). With this respect, Diao, McMillan and Rodrik (2017), McCaig & Pavcnik (2016), McCaig, McMillan et al. (2016), Rodrik (2017) and Rodrik et al., (2016) emphasize that structure change is critical to the evolution of developing countries like East Asian, Latin American and Sub-Saharan African countries. Additionally, Rodrik et al., (2016) contend that structural change has reduced rates of poverty and significantly expanded the middle class in these countries. When evaluating the framework of these countries' development, it can be said that structural change is an imperative ingredient for sustainable and long-term growth in developing countries, as supported by Osei & Jedwab (2016). Therefore, sectoral structural transformation is one of the essential ingredients in terms of economic evolution. Measuring the contribution of the sectoral shift to economic growth is related to changes in productivity (Doğruel & Doğruel, 2018). McMillan & Rodrik (2011) argue that the total labour productivity and incomes will increase if labour and other resources of production shift to more productive activities. The aggregate labour productivity evolution could be decomposed into two components: the within-sector effect and the structural change effect (Doğruel & Doğruel, 2018). The within-sector effect refers to the involvement of intra-sector productivity evolution to aggregate labour productivity evolution; while the structural change effect refers to the involvement of changes in the employment shares of sectors to overall labour productivity evolution (Fagerberg, 2000; Osei & Jeqwab, 2016). The structural change effect matches the sum of two components: static-shift and dynamic-shift effects. While the static-shift effect referred to the segment of accumulated

labour productivity evolution descending from employment shares' changes in sectors with diverse productivity levels, the dynamic-shift effect referred to the segment of accumulated labour productivity evolution descending from the interaction between employment shares' changes and productivity gains (Doğruel & Doğruel, 2018).The accumulated labour productivity evolution had been decomposed by employing the shift-share method. According to Doğruel & Doğruel (2018), Fabricant (1942) was the first to establish the shift-share method, which was then used to analyze data on the US economy. Although some small additions have been made today, the basic structure of this method is still preserved. Following the works of Fagerber (2000), Timmer & Szirmai (2000) and McMillan & Rodirk (2011), the productivity evolution of various countries has been investigated. Limited studies in the literature have been conducted to decompose the overall labour productivity evolution employing the shift-share analysis. Fagerberg (2000), in his investigation of 39 nations, contends that the accumulated labour productivity evolution is principally attributed to the within-sector effect between 1973 and 1990. Analyzing a comparable period, similar results to Fagerberg (2000) were revealed by Timmer & Szirmai (2000). Timmer & Szirmai (2000) claim that the manufacturing industries' productivity evolution in India, Indonesia, South Korea, and Taiwan during 1963-1993 is predominantly attributed to the within-sector effect. Between the investigated countries, except for the Indian manufacturing industry, the structural change affected economic growth negatively. Timmer & de Vries (2009) revealed that the within-sector effect's involvement in accumulated labour productivity evolution outpaced that of structural change in the Asian and Latin American countries from 1950 to 2005. Moreover, they revealed that the services and manufacturing industries contributed the most to productivity evolution in these countries. In some developing countries, structural change positively affected productivity evolution during the 1980s and 1990s, but its contribution negatively affected productivity evolution after the 1990s. McMillan & Rodrik (2011) confirmed that in the post-1990s, structural changes in Africa and Latin America slowed growth. However, they contend that during the same period, the structural change process in Asian countries significantly positively affects growth. de Vries et al. (2012) also present evidence that, unlike Brazil, structural change in China, India, and Russia in the post-1980 period increased overall productivity. However, according to Valli & Saccone (2015), the economies of China and India experienced a different trend. They revealed that the labour productivity evolution's bedrock from 1987 to 2009 was the within growth effect, despite the significant structural change implemented in China and India. Moreover, labour productivity was concentrated in the industrial and services sector during the studied interval.

Timmer et al. (2014; 2015; 2016) argued that many developed countries made significant progress in the post-1950 period, especially in the 1960s and 1970s, thanks to manufacturing industry activities. The authors claimed that despite the high tariffs and active government policies that supported the growth, the structural change component was the focal dynamic of the economic growth during the studied interval. Because during this period, resources (especially the labour force) moved to more productive activities. The authors emphasized that while the static-shift effect increased after 1990, the dynamic-shift effect vanished, resulting in a negative structural change effect. Moreover, they claimed that the economic activities were concentrated in the services sector. Although the service sector's productivity is greater than that of other sectors, it is emphasized that there has been no significant increase in total productivity. According to Harchaoui & Üngür (2016), the real reason for the economic recovery in Sub-Saharan African countries between 1970 and 2010 was a service sector revival rather than structural change. Moreover, the manufacturing industry's productivity in these countries is steadily declining. Positive but modest productivity evolution between 1990 and 2010 had been estimated in Sub-Saharan African and Latin American countries by Timmer et al. (2016). During the studied interval, they revealed a greater positive mien of structural change on labour productivity. Moreover, they decomposed productivity evolution into negative within-sector and significant structural change effects in Asian countries during the same period. Rapid evolution, especially in labour productivity, has been experienced in the latest years in Botswana, Ghana, Nigeria, Zambia, India, Vietnam, and Brazil, as claimed by McMillan et al. (2017). Furthermore, they attributed the labour productivity surge to the structural change effect. Only in Botswana has there been evidence of a greater within-sector effect. The authors claimed that structural changes in African countries boosted growth after the 2000s. According to their reports, most of the productivity evolution in India is realized through the within-sector effect. Diao et al. (2017) contend that growth in some developing countries has accelerated in recent decades and that they have converged with developed countries. It is claimed that structural change is a key driver of this expansion. They provide evidence that Latin American, African, and South Asian growth rates are based on within-sector effects and structural change. According to Nguyen (2018), the bearing of structural change on productivity evolution in Vietnam remained low between 1990 and 2008, while the within-sector effect was more dynamic. However, Nguyen contends that structural change played a significant role between 2000 and 2007. It is emphasized that the bearing of structural change decreased again between 2007 and 2013. The findings revealed that labour productivity increased by approximately 4.5% in the Vietnamese economy between 1990 and 2013. It is

emphasized that structural change is the primary driver of this increase during this time period. Dobrzanski & Grabowski (2019) also emphasize that productivity increased in all economic sectors of Central and Eastern European (CEE) countries between 2004 and 2018, with the services sector experiencing the greatest increase. Likewise, the structural change and the within-sector effects have an increasingly positive bearing on labour productivity, but the bearing of structural change is dominant. In their analysis of the Brazilian Economy, Nassif et al. (2020) state that the effect of structural change reforms irregularly. Subsequently, labour productivity in Brazil increased by about 247 per cent between 1950 and 1979. The primary driver of this rise has been a structural change. However, it is claimed that deviations in this increase in labour productivity occurred after 1980. Labour productivity evolution decreased by -19.5 per cent between 1980 and 1994. Although the increase in labour productivity from 1995 to 2011 was positive, it is stated that it is very low when compared to the increase from 1950 to 1979, and the basic dynamic is the within-sector effect. Thus, the authors argue that while labour productivity played a dynamic role in growth in Brazil's first 30 years of industrialization (1950-1979), poor labour productivity performance from 1980 to 2011 slowed growth. According to Dieppe & Matsuoka (2021), productivity evolution in developed countries from 1975 to 2018 was almost entirely due to within-sector effects in the manufacturing, transportation, and finance sectors. The bearing of within-sector and structural change had slowed in the 2000s. It is emphasized that productivity evolution in emerging markets and developing countries (EMDEs) has been swayed by both within-sector and structural change. The within-sector effect is strong, particularly in agriculture, manufacturing, trade, transportation, and finance. Bilenko (2022) contends that productivity evolution's first impetus in all sectors is the within-sector effect from 1996 to 2019 in CEE countries. Following the 2008 financial crisis, the dynamic-shift effect on productivity evolution became negative. In most countries, the dynamic-shift effect is negative. This indicates that the labour force is shifting to low-productive industries.

There are also some empirical studies examine structural changes in total and sectoral Turkish labour productivity. With this regard, Akkemik (2006) found that the Turkish manufacturing industry's labour productivity evolution had been significantly brought by the within-sector effect between 1970 and 2000, while the structural change effect was negative. Productivity evolution was approximately 4.09 per cent during this period. Productivity evolution in the manufacturing industry was 1.63 per cent in 1970-1979, 5.46 per cent in 1980-1988, 7.16 per cent in 1989-1992, and 2.69 per cent in 1995-2000. The within-sector effect is the primary basis

of productivity evolution during all the studied sub-periods. In almost all periods, the bearing of structural change is negative. Furthermore, the study's authors emphasize that the bearing of structural change on productivity evolution has shifted in the period before and after 1980. In this regard, the static-shift effect is positive during import substitution policies (1970-1979) and negative during export-based and liberalization policies (1980-1994). Finally, the study emphasizes that total labour productivity had positively influenced by labour mobility during the period of import substitution but negatively after 1980. Similar findings can be found in Kılıçaslan & Taymaz's study (2006). As a result, the authors claim that structural change significantly affected the manufacturing industry's 3.4 percent productivity evolution from 1965 to 1999. It is also suggested that a significant portion of structural change's positive effect occurred before 1980. According to the authors, the bearing of structural change after 1980 became negative. Rodrik (2010) claimed that the policies implemented in the Turkish economy in the 1990s, such as free trade and capital mobility, increased growth. Rodrik claims that structural change's mien on labour productivity evolution was substantial during the periods of (1990-2005) and (1999-2008). The bearing of structural change on labour productivity evolution was 45 per cent (1990-2005) and 38 per cent (1990-2008). According to Altıok & Tuncer (2012), the increase in labour productivity in Turkey's manufacturing industry between 1981 and 2000 was 7.6 per cent. It is also considered that the within-sector effect was the productivity surge's foremost basis during this period, and the effect of structural change is negative. The Turkish manufacturing industry's labour productivity evolution was comparable to 9.31 per cent between 1981 and 1990 and 5.88 per cent between 1991 and 2000. It is emphasized that the focal foundation of productivity evolution in both periods is the within-sector effect, while the bearing of structural change is negative. The same study analysed the Mediterranean region, and comparable fallouts were presented. Subsequently, the Mediterranean region's manufacturing industry's labour productivity upsurge was comparable to 6.56 per cent in 1981-1990, 5.80 per cent in 1991-2002, and 6.18 per cent in 1981-2000. It is claimed that the within-sector effect is more dominant during the specified periods. Similar findings were presented in the authors' other study. According to Altıok & Tuncer (2013), the within-sector effect was the bedrock of the manufacturing industry's labour productivity from 1980 to 2008. Periodically, the manufacturing industry's labour productivity evolution was comparable to 55.41 per cent from 1980 to 1990, 45 per cent from 1991 to 2000, and 7.34 per cent from 2003 to 2008.The within-sector effect is stated to be the central foundation of labour productivity increase in all of the periods mentioned. The structural change has either a negligible or almost negative bearing. In the context of the study's findings, it is emphasized

that the structural transformation carried out with the stabilization and structural adjustment programs implemented between 1980 and 2008 did not contribute significantly to the increase in productivity of the Turkish manufacturing industry. However, similar findings to the Rodrik (2010) study are presented in two separate studies conducted by Atiyas & Bakis (2013;2015). As a result, Atiyas & Bakis (2013; 2015) contend that structural change in the 1990s contributed significantly to labour productivity. The authors also emphasize that structural change was responsible for almost all productivity evolution in the 1990s. In the 2000s, structural change was said to have a greater than 50% impact. The authors observe that in the post-2000 period, both the manufacturing and financial sectors contributed significantly to productivity evolution. In this period, the within-sector effect in the manufacturing industry is dominant, whereas, in the financial sector, the structural change effect is dominant. According to Yurtsızoğlu & Kılıçaslan (2017), labour productivity in the Turkish service sector fell by 13% between 2003 and 2008. They reported positive structural changes mein, but negative within-sector's one on this drop in labour productivity. Furthermore, they reported negative labour productivity in the service sector between 2009 and 2012. Labour productivity evolution was calculated to be -16.7 per cent between 2003 and 2012. During this period, the within-sector effect was calculated to be -17.5 per cent, and the structural change effect was calculated to be -17.5 per cent. As a result, according to the study's findings, the service sector could not benefit sufficiently from structural changes, and the decrease in productivity couldn't be prevented. Doğruel & Doğruel (2018) examined the manufacturing industry sector from 2003 to 2015. As a result, the manufacturing industry's increased labour productivity from 2003 to 2015 was 12.6 per cent. The within-sector effect is the primary basis of this productivity increase. According to the findings of the periodic analysis, labour productivity decreased by 17.69 per cent between 2003 and 2007 but increased by 24.95 per cent between 2010 and 2015. Despite this difference, the within-sector effect is the key determinant of productivity change in both sub-periods. The effect of structural change is said to be negligible. Tuncer & Moalla (2020a) examined the industry and services sectors from 2003 to 2017. Accordingly, productivity evolution in the 2003-2008 sub-period was negative (-18%), with the within-sector effect dominating. Productivity evolution (27 per cent) turned positive between 2010 and 2017, and the chief foundation of productivity evolution is said to be the within-sector effect. Structure change has a negative bearing. Productivity appears to have been quite low between 2003 and 2017. Labour productivity evolution was calculated to be 0.25 per cent during this period. Tuncer & Moalla (2020b) investigated the manufacturing industry during the same period. According to the

authors' research, the manufacturing industry's labour productivity evolution was comparable to 2.42 per cent from 2001 to 2008 and 5.87 per cent from 2010 to 2017. Labour productivity evolution was calculated to be 1.84 per cent between 2003 and 2017. During the analyzed periods, the labour productivity evolution's bedrock was the within-sector effect versus a negative structural change's mien on it. Finally, Kaymaz (2022) emphasizes that the within-sector and structural change effects contribute to increased productivity in the Turkish economy. However, it is suggested that the within-sector effect is the most important factor in the productivity change from 2009 to 2019. Although cross-sectoral labour transitions had a relatively large bearing on productivity in 2011, 2012, and 2014, this effect diminished in subsequent years. A literature review of studies implemented for both different countries and the Turkish economy was conducted in this section. It has been observed that structural change analyses are limited in the Turkish economy as well as in other countries around the world. Furthermore, aside from the Altıok & Tuncer (2012) study, almost no studies analysed regional productivity increases in the Turkish economy. However, in their study, Altıok & Tuncer (2012) examined only the Mediterranean region and Mersin province. The dynamics of structural change and labour productivity evolution in NUTS2 regions were investigated in this study. Therefore, the study is expected to make an important contribution to the literature.

3. DATA AND METHODOLOGY

The Turkish Statistical Institute's (TURKSTAT) database was applied in this study to analyse regional productivity and structural change in the Turkish economy. Two principal variables from the database are used: Gross domestic product by provinces in chain-linked volume, index and percentage change, by type of economic activity (2009 = 100) and employment by economic activities in 26 Turkish regions (NUTS2). The bearing of structural change in the agriculture, industry, and services sectors on sectoral productivity was examined using data from 26 regions (NUTS 2) during the phase (2010-2020). The Shift-Share Analysis structural decomposition method was utilized in this study to analyse the bases of productivity evolution. This analysis allows finding the bedrock of the labour productivity evolution by decomposing it into three components: within-sector effect, static-shift effect, and dynamic-shift effect. The terms "static-shift effect" and "dynamic effect" refer to the structural change effect. This entails structural changes across sectors. Accordingly, there could be two major reasons for a sector's productivity change. The first effect is the within-sector effect. This effect captures productivity evolution within industries. Specifically, the within-sector effect refers to the changes within the sectors. Factors such as economies of scale, technological progress, and learning by doing

may be responsible for the growth in the sector's productivity. The second effect is the structural change effect (static-shift and dynamic-shift effects). The structural change occurs in either a positive or negative direction if the share of the sub-sectors in the total changes. The decomposition method generally divides productivity change into the within-sector effect and structural change effect. Fabricant (1942) was the first to use the decomposition method in the literature to measure the contribution of labour allocation between sectors to total growth (de Vries et al., 2015, p. 679). However, preserving the method's basic structure, some minor changes were later made by Fagerberg (2000), Timmer & Szirmai (2000) and McMillan & Rodirk (2011). The analysis performed in this study was conducted based on the studies conducted by Fagerberg (2000), Timmer & Szirmai (2000), and McMillan & Rodirk (2011). The shift-share method is e employed to calculate the involvement of sectors on aggregate productivity from 2010 to 2020 using the equations below (Timmer & de Vries, 2009, p.168). In this context, labour productivity is calculated as shown in Equation 1 (Bilenko, 2022, p.18):

$$LP^t = \frac{VA^t}{L^t} \tag{1}$$

Where, LP^t denotes labour productivity, VA^t denotes real value-added, L^t denotes employment, and the subscript *t* denotes time. When applying Equation (1) to all sub-sectors, the total labour productivity in the economy could be obtained as Equation (2) (Bilenko, 2022, p. 19; Harchaoui & Üngör, 2016, p. 647; Tuncer & Moalla, 2020, p. 12):

$$LP^t = \frac{VA^t}{L^t} = \sum_{i=1}^{n} \frac{VA_i^t . L_i^t}{L_i^t . L^t} = \sum_{i=1}^{n} LP_i^t . S_i^t \tag{2}$$

Where *i* denotes sub-sectors, LP_i^t, the labour productivity of sector *i* in period *t*, S_i^t denotes the share of the labour force of sector *i* (agriculture, industry, services) in the total employment in period *t.* Equation (2) depicts sectors' total labour productivity when the labour productivity of each sub-sector is weighted by its employment share (Tuncer & Altıok, 2013, p. 61; Timmer & de Vries, 2009, p. 168).

If the first difference of Equation (2) is taken and divided each side by LP^b, Equation (3) is obtained. In Equations (3), *b* and *f* represent the base and final years, respectively (Altıok & Tuncer, 2012, p. 6; Tuncer & Moalla, 2020, p. 12; de Vries et al., 2015, p. 679-680):

$$\frac{LP^f - LB^b}{L^b} = \underbrace{\sum_{i=1}^{n} \frac{\left(LP_i^f - LP_i^b\right).S_i^b}{LP^b}}_{\textbf{(I)}} + \underbrace{\sum_{i=1}^{n} \frac{\left(S_i^f - S_i^b\right).LP_i^b}{LP^b}}_{\textbf{(II)}} + \underbrace{\sum_{i=1}^{n} \frac{\left(S_i^f - S_i^b\right).(LP_i^f - LP_i^b)}{LP^b}}_{\textbf{(III)}} \tag{3}$$

The left side of Equation (3) symbolizes the evolution of total labour productivity. The first term on the right side of Equation (3) refers to the within-sector effect (I), or the increase in productivity that occurs within the sector itself, the second term refers to the static-shift effect (II), and the third term refers to the dynamic-shift effect (III). The second and third terms to the right of the Equation (3) represent the overall effect of structural change effect (de Vries, Timmer & de Vries, 2015, p.680; Harchaoui & Üngür, 2016, p. 647). The within-sector effect was calculated by keeping the sector's employment share constant to determine how much of the sector's labour productivity is generated. Making a distinction between static-shift and dynamic-shift effects in the analysis is critical for analyzing both the effects of the shift of labour towards sectors with high productivity in the initial year and the effects of the shift to sectors with rapid growth performance (Altıok & Tuncer, 2012, p.7; Tuncer and Moalla, 2020, p. 12-13). The static-shift effect (II) refers to the contribution of variations in the distribution of labour across sectors to productivity evolution. The optimistic static-shift effect occurs if fast-growing sectors, concerning productivity, enlarge their segment of total employment. In this case, the structural change will boost the evolution of overall productivity. However, if the segment of total employment in high-productivity sectors falls, the static-shift effect will be negative. Contrarily, the dynamic-shift effect (III) measures productivity and labour distribution changes across sectors. Specifically, the common bearing of changes in employment and productivity levels explains the dynamic-shift effect. A positive dynamic-shift effect occurs if the high-productivity sectors' segment in aggregate employment grows faster than the share of low-productivity sectors. This indicates that a country's or region's economic resources have shifted to more productive activities (Bilenko, 2022, p. 19; de Vries et al., 2015, p. 680).

4. RESULTS

The shift-share decomposition method has scrutinised the structural change and labour productivity evolution in the Turkish economy and its 26 regions (NUTS 2) from 2010 to 2020. Two principal variables from the database are used: Gross domestic product by provinces in chain-linked volume, index and percentage change, by type of economic activity (2009 = 100) and employment by economic activities in 26 Turkish regions (NUTS2). The bearing of structural change in the agriculture, industry, and services sectors on sectoral productivity was investigated using data from 26 regions (NUTS 2) (2010-2020). The fallouts of the analysis are shown in Figure 4, Figure 5, Figure 6, and Appendix Table 1.

Figure 4. Determinants of Labour Productivity Evolution in the Agricultural Sector

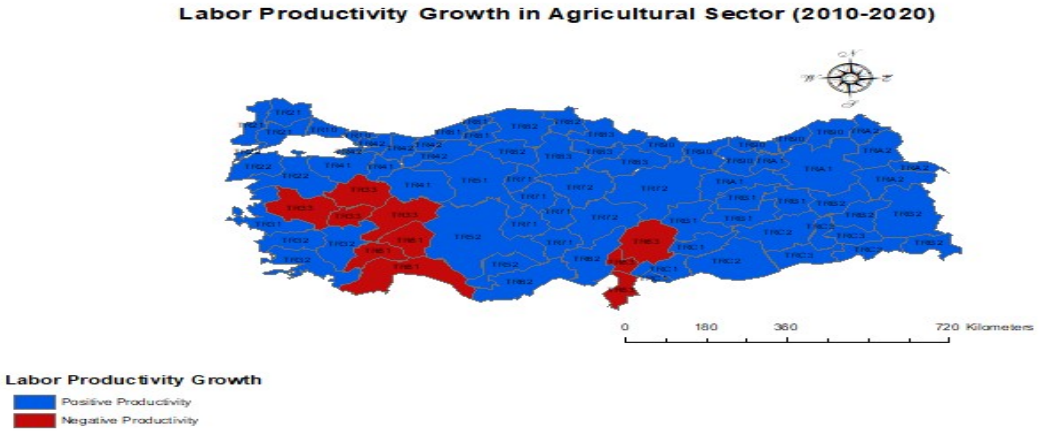


Figure 4-a

Figure 4-b

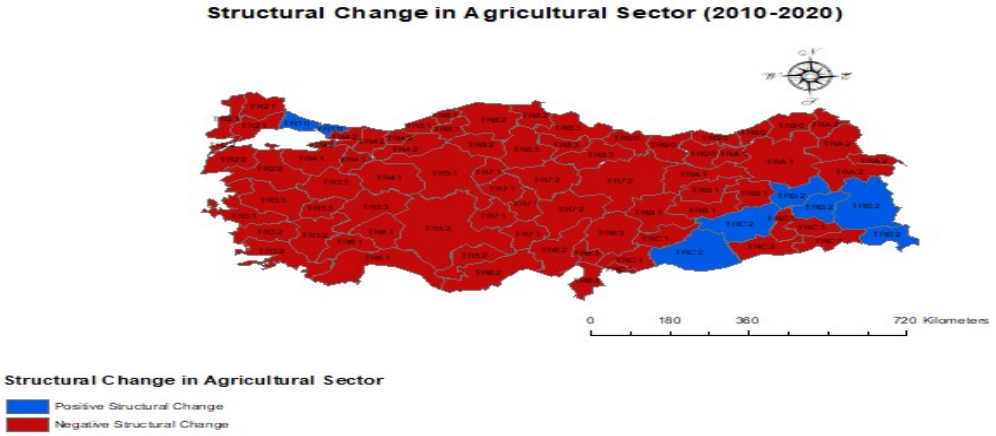


Figure 4-c

Figure 4 depicts agricultural productivity, within-sector effect, and structural change effect. The red colour denotes the negative effect, while the blue colour denotes the positive effect. Figure 4-a depicts the growth in agricultural labour productivity from 2010 to 2020. Labour productivity in the agricultural sector is negative in TR33 (Manisa, Afyon, Kütahya, Uşak), TR61 (Antalya, Isparta, Burdur), and TR63 (Hatay, Kahramanmaraş, Osmaniye) as shown in Figure 4-a. Labour productivity is positive in the remaining regions. The top three regions with the highest labour productivity in the agricultural sector are TRA2 (Ağrı, Kars, Iğdır, Ardahan), TRA1 (Erzurum, Erzincan, Bayburt) and TR52 (Konya, Karaman), respectively. Figure 4-b depicts the agricultural sector's within-sector effect. The TRC2 (Şanlıurfa, Diyarbakır) and TR10 (Istanbul) regions have a negative within-sector effect. Figure 4-c depicts the agricultural sector's structural change. Figure 4-c shows that structural change in the agricultural sector is negative in almost all regions. TRC2 (Şanlurfa, Diyarbakır), TRB2 (Van, Muş, Bitlis, Hakkari), and TR10 (Istanbul) are regions where agricultural structural change is positive.

Figure 5. Determinants of Labour Productivity Evolution in the Industrial Sector

Figure 5-a

Figure 5-b

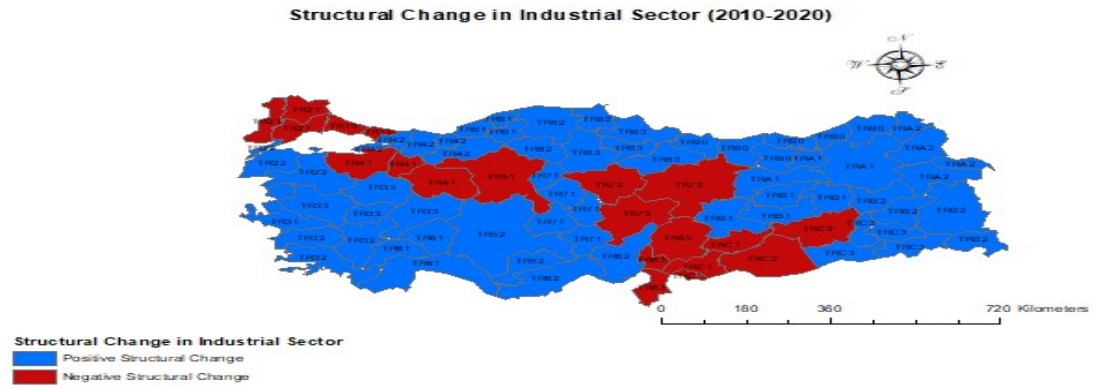


Figure 5-c

Figure 5 depicts the productivity, within-sector effect, and structural change effect in the industrial sector from 2010 to 2020. Figure 5-a shows that productivity is positive in the industrial sector of 26 regions. TRC1 (Gaziantep, Adyaman, Kilis) has the highest productivity in the industrial sector. In the TRC1 region, industrial productivity evolution is approximately 51% between 2010 and 2020. TRC2 (Şanlıurfa, Diyarbakır) has the lowest productivity evolution in the industrial sector. The TRC2 region's productivity evolution rate is approximately 2.88 per cent. The average productivity evolution in the Turkish industrial sector is around 18% between 2010 and 2020. Figure 5-b depicts the industrial sector's within-sector effect. TRB2 (Van, Muş, Bitlis, Hakkari) is the only region with a negative within-sector effect from 2010 to 2020, as shown in Figure 5-b. The within-sector effect is positive in all other regions. TRC1 (Gaziantep, Adıyaman, Kilis) has the greatest within-sector effect in the

industrial sector. The within-sector effect in the industrial sector in this region is approximately 56%. Figure 5-c depicts the industrial sector's structural change. Howbeit, structural change in the industrial sector produces more positive results. However, structural change has a negative bearing in some regions. The regions where the structural change in the industrial sector is negative are as follows: TR10 (Istanbul), TR41 (Bursa, Eskişehir, Bilecik), TRC1 (Gaziantep, Adıyaman, Kilis), TR21 (Tekirdağ, Edirne, Kırklareli), TRC2 (Şanlıurfa, Diyarbakır), TR72 (Kayseri, Sivas, Yozgat), TR63 (Hatay, Kahramanmaraş, Osmaniye) and TR51 (Ankara). TR71(Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir) has the greatest structural change effect in the industrial sector.

Figure 6. Determinants of Labour Productivity Evolution in the Service Sector

Figure 6-a

Figure 6-b

Figure 6-c

Figure 6 depicts the productivity, within-sector effect, and structural change effect in the services sector from 2010 to 2020. Figure 6-a depicts growth in the service sector's productivity. As in the industrial sector, labour productivity in the services sector is positive in all regions. The services sector's labour productivity increased by approximately 22% between 2010 and 2020. The services sector's labour productivity evolution has outpaced the agricultural and industrial sectors. During the same period, the agricultural sector's productivity increased by 1%, while the industrial sector increased by 18%. The TRC3 region (Mardin, Batman, Şırnak, Siirt) has the highest labour productivity in the services sector. The TRC3 region's labour productivity in the services sector has increased by 58%. TR41 (Bursa, Eskişehir, Bilecik) has the lowest rate of increase in labour productivity. This region's labour productivity has increased by 8%. The within-sector effect in the services sector is depicted in Figure 6-b. TR61 (Antalya, Isparta, Burdur) is the only region with a negative within-sector effect. TRB2 (Van, Muş, Bitlis, Hakkari) has the greatest within-sector effect. In 2010-2020, the within-sector effect on the Turkish economy's services sector was 12 per cent. The bearing of structural change in the services sector is depicted in Figure 6-c. The structural change effect in Turkey's services sector is 10% between 2010 and 2020. TRB2 (Van, Muş, Bitlis, Hakkari) and TRC2 (Şanlıurfa, Diyarbakır) have negative structural change effects. The bearing of structural change is positive in all remaining regions. The region with the highest structural change effect is TRA1 (Erzurum, Erzincan, Bayburt). Figure 7 depicts the labour productivity and structural change in three major sectors of the Turkish economy.

Figure 7. Sectoral Productivity Growth and Structural Change in the Turkish Economy, 2010-2020 (%)

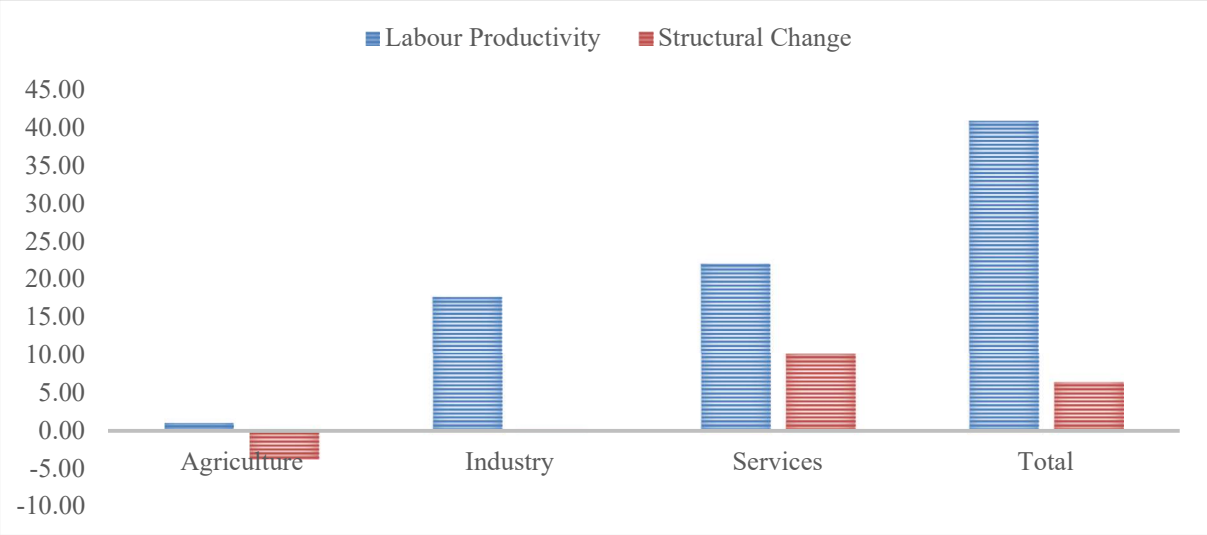


Figure 7 shows that the services sector in Turkey experienced the greatest rise in labour productivity. Services sector's labour productivity has increased by about 20%. The industrial sector's productivity evolution rate is around 18%. Labour productivity has increased by about 1% in the agricultural sector. The services sector has been hit the hardest by structural change. The bearing of structural change on the industrial sector is nearly nil, while it is negative in the agricultural sector. In general, the upsurge in labour productivity in the Turkish economy is approximately 41%, and the bearing of structural change is approximately 6%.

The findings of a shift-share analysis on the within-sector effect, static-shift effect, dynamic-shift effect, and labour productivity in the three key sectors of 26 regions from 2010 to 2020 are shown in Appendix Table 1. Corresponding to the data in Appendix Table 1, the total productivity increase in the Turkish economy between 2010 and 2020 is 40.88 per cent. Turkey's labour productivity increased by 1.11 per cent in the agricultural sector, 17.71 per cent in the industrial sector, and 22.06 per cent in the services sector during the same period. The TRC3 (Mardin, Batman, Şırnak, Siirt) region experienced the utmost upsurge in labour productivity between 2010 and 2020. This region's total labour productivity has increased by 84%. Labour productivity increased by 7.06 per cent in the agricultural sector, 18.74 per cent in the industrial sector, and 58.20 per cent in the services sector in the TRC3 region. The TR61 (Antalya, Isparta, Burdur) region has the lowest increase in labour productivity. The TR61 region has seen a 13.62 per cent enlargement in labour productivity. Labour productivity increased by -2.33 per cent in the agricultural sector, 7.87 per cent in the industrial sector, and 8.08 per cent in the services sector in the TR61 region. When comparing agriculture, industry,

and services, industrial labour productivity is higher in TR21 (Tekirdağ, Edirne, Kırklareli), TR22 (Balıkesir, Çanakkale), TR33 (Manisa, Afyon, Kütahya, Uşak), TR41 (Bursa, Eskişehir, Bilecik), TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova), TR52 (Konya, Karaman), TR82 (Kastamonu, Çankırı, Sinop), TRC1 (Gaziantep, Adıyaman, Kilis); however, in the remaining regions, labour productivity in the service sector is higher. However, in TR31 (İzmir), TR32 (Aydın, Denizli, Muğla), TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir), and TR72 (Kayseri, Sivas, Yozgat) labour productivity in the industrial and service sectors are nearly identical. When the bases of the upsurge in labour productivity (40.88 per cent) in the Turkish economy from 2010 to 2020 are examined, the within-sector effect is the most significant (34.48 per cent). The weight of structural change on labour productivity evolution is 6.40 per cent (the static-shift effect is 6.03 per cent, and the dynamic-shift effect is 0.37 per cent). When examined in a sectoral context, it is clear that the within-sector effect is the primary basis of the increase in labour productivity. Within-sector effect's mien on labour productivity is comparable to 4.93 per cent in agriculture, 17.67 per cent in industry, and 11.88 per cent in services. Structural change's mien (static-shift effect + dynamic-shift effect) on labour productivity was comparable to -3.82% in the agricultural sector (static-shift effect -2.33% and dynamic-shift effect -1.48%), in the industrial sector (static-shift effect -0.03% and dynamic-shift effect 0.01%), and in the service sector - 10.18% (static-shift effect 8.33% and dynamic-shift effect 1.85%). The reasons why the within-sector effect is higher and dominant in total labour productivity increase are the increase in investments, the training of qualified labour force (Kaymaz, 2022: 97-98), capital accumulation, technological change (McMillan & Rodrik, 2011: 13; Rodrik, 2010: 5), the increase in capital and energy density per capita (Altıok & Tuncer, 2013: 63). When examined regionally, the key basis of labour productivity evolution is once again the within-sector effect. However, the within-sector effect's mien on the labour productivity's upsurge in the agricultural sector of TR10 (Istanbul) and TRC2 (Şanlıurfa, Diyarbakır) regions, in the industrial sector in the TRB2 (Van, Muş, Bitlis, Hakkari) region, and in the services sector in the TR61 (Antalya, Isparta, Burdur) region is negative. When the regional findings are evaluated, it is perceived that the dynamics of labour productivity increase have changed in the sectoral context. In this regard, the bearing of structural change on labour productivity in the TRC2 (Şanlıurfa, Diyarbakır) region's agricultural sector is greater and more positive than the within-sector effect. In the industrial sectors of TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir) and TRA1 (Erzurum, Erzincan, Bayburt) regions, structural change contributes higher to the increase in labour productivity. TR10 (İstanbul), TR21 (Tekirdağ, Edirne, Kırklareli), TR22

(Balıkesir, Çanakkale), TR32 (Aydın, Denizli, Muğla), TR33 (Manisa, Afyon, Kütahya, Uşak), TR41 (Bursa, Eskişehir, Bilecik), TR61 (Antalya, Isparta, Burdur), TR63 (Hatay, Kahramanmaraş, Osmaniye), TR72 (Kayseri, Sivas, Yozgat), TR81 (Zonguldak, Karabük, Bartın), TR82 (Kastamonu, Çankırı, Sinop), TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane), TRA1 (Erzurum, Erzincan, Bayburt) and TRB1 (Malatya, Elazığ, Bingöl, Tunceli) regions' structural change in the service sectors have a higher bearing on labour productivity evolution. The static-shift effect has outpaced the dynamic-shift effect in sectors with a high structural change effect. The high and positive bearing of structural change in this regard indicates that the labour is transferring to more productive activities (Atiyas & Bakiş 2013: 7; Atiyas & Bakiş 2015: 1213-1214). Simultaneously, the positive bearing of structural change shows that the portion of total employment in the high-productivity sector has enlarged (Yurtsuzoğlu & Kılıçaslan, 2017: 218). Furthermore, structural change, in this case, will boost the overall productivity evolution across the Economy (Rodrik, 2010: 5). Figure 8 depicts the correlation between regional productivity and change in employment share in agricultural, industrial and service sectors from 2010 to 2020.

Figure 8. Correlation between Regional Productivity and Change in Employment Share

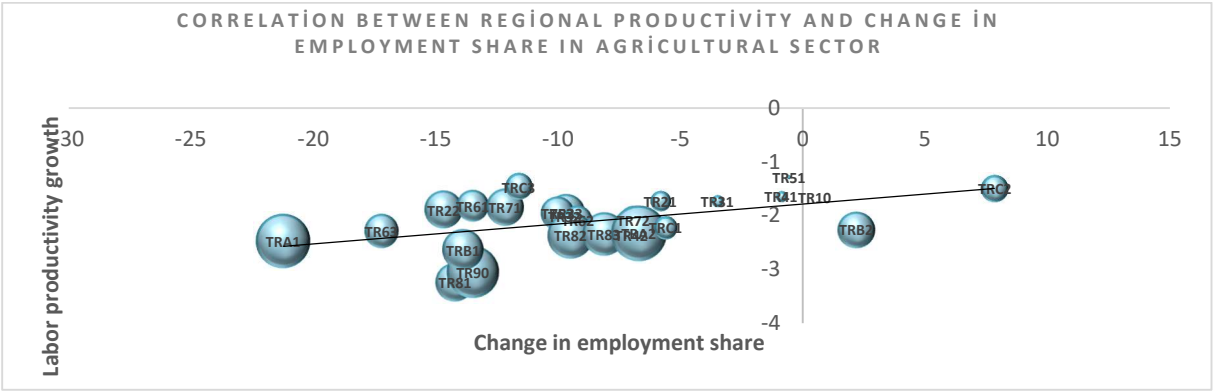


Figure 8-a

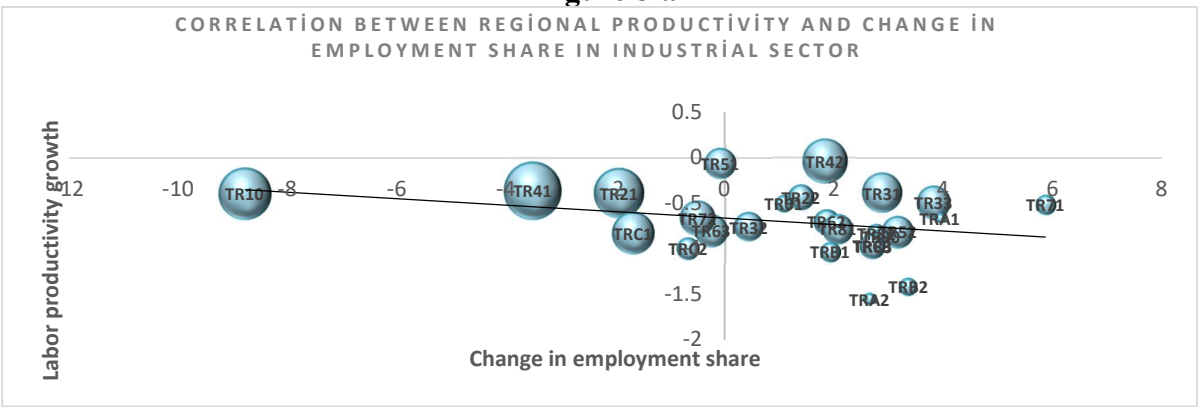


Figure 8-b

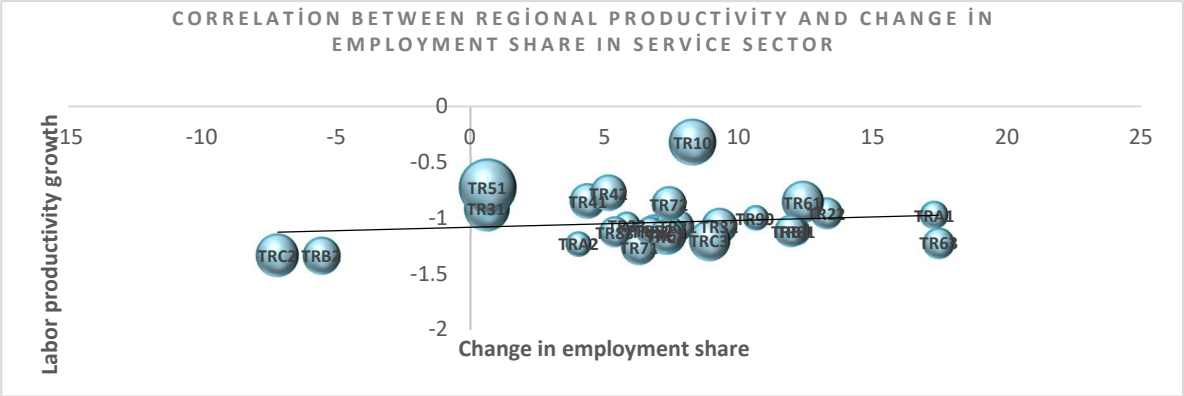


Figure 8-c

Note: Authors' calculations. Note: Circles' size denotes employment portions in the base year (2010). The line denotes fitted values of a linear regression of changes in sectoral productivity to aggregate productivity by changes in employment shares.

Figure 8-a portrays the association between (end year) relative sectoral productivity in log scale and employment portions' changes in the agricultural sector from 2010 to 2020. The employment share had increased only in TR10 (İstanbul), TRB2 (Van, Muş, Bitlis, Hakkâri) and TRC2 (Şanlıurfa, Diyarbakır). Contrastingly, the employment shares had decreased in the remaining regions during the studied interval. In general, a positive correlation exists between decreasing employment share and decreasing labour productivity in the agricultural sector. Figure 8-b portrays the correlation between (end year) relative sectoral productivity in log scale and employment shares' changes in the industrial sector from 2010 to 2020. The employment share had decreased in TR10 (İstanbul), TR21(Tekirdağ, Edirne, Kırklareli), TR41(Bursa, Eskişehir, Bilecik), TR51(Ankara), TR63 (Hatay, Kahramanmaraş, Osmaniye), TR72 (Kayseri, Sivas, Yozgat). On contrast, the employment shares had increased in the remaining regions during the studied interval. On the whole, a negative correlation indicates that evolution in employment descended from low-productivity industries during the studied interval. Figure 8-c portrays the correlation between (end year) relative sectoral productivity in log scale and employment shares' changes in the service sector from 2010 to 2020. The employment share had increased in all the studied regions except for TRB2 (Van, Muş, Bitlis, Hakkâri) and TRC2 (Şanlıurfa, Diyarbakır). In general, a positive relationship is found in the service sector.

5. CONCLUSION

Resources can constantly shift to more dynamic sectors during the process of economic development and growth. The reallocation of resources to more dynamic or efficient sectors indicates that economic growth is on the right path. Similarly, productivity increases can vary across sectors during the economic growth process, and production factors, in particular, tend

to shift to more efficient, faster-growing sectors. This economic change and transformation are defined as structural change in the works of Kuznets (1973), Lewis (1954), Kaldor (1967), Stiglitz (2017), Rodrik (2010) and McMillan and (Rodrik (2011). In this context, structural change is an imperative ingredient in the evolution process of a country. Structural change was especially important in developing countries during the golden age of growth (Chang, 2002; Chang and Grabel, 2016) from 1950 to 1975. Developing countries have experienced significant economic growth and productivity increase during this period. Although some developing countries experienced positive structural change after 1980, economic growth remained below 1950-1975 (Timmer, de Vries and de Vries, 2016; Rodrik, McMillan & Sepulveda, 2016). Productivity evolution is an essential economic evolution dynamic in the process of structural change. This study examined the sectoral productivity evolution in 26 regions of Turkey and the bases of this productivity increase. According to the study's findings, total labour productivity in the Turkish economy increased by approximately 41% between 2010 and 2020. Sectoral productivity evolution was 1% in agriculture, 18% in industry, and 22% in the services sector during the specified period. The within-sector effect has been the primary basis of productivity evolution in both the Turkish economy and sectors. The bearing of structural change is very low, with a negative bearing in the agricultural sector, a near-zero bearing in the industrial sector, and a positive bearing in the services sector. When the regional results were analyzed, it was determined that the labour productivity evolution's bedrock was the within-sector effect in 26 regions. However, structural change has a negative bearing in TR10 (İstanbul), TR21 (Tekirdağ, Edirne, Kırklareli), TR41 (Bursa, Eskişehir, Bilecik), TRB2 (Van, Muş, Bitlis, Hakkari) and TRC2 (Şanlıurfa, Diyarbakır). The structural change effect is positive in the remaining regions, but it is small in comparison to the within-sector effect. The within-sector effect's mien on productivity evolution in the agricultural sector of all regions had outpaced that, but the structural change effect which recorded a negative mien on productivity evolution. Moreover, in the industrial sector, the structural change effect outpaced the within-sector effect in the TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir), TRA1 (Erzurum, Erzincan, Bayburt), TRA2 (Ağrı, Kars, Iğdır, Ardahan) and TRB2 (Van, Muş, Bitlis, Hakkari) regions. However, in these regions, it was seen that the static-shift effect was stronger, and the dynamic-shift effect had a weaker bearing on the labour productivity evolution stemming from the structural change effect (static + dynamic). The bearing of structural change is either negligible or negative in the remaining regions. The structural change effect in the services sector was found to be more effective than in the agricultural and industrial sectors. Accordingly, the within-sector effect dominates productivity evolution in the services sector in

TR31 (İzmir), TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova), TR51 (Ankara), TR52 (Konya, Karaman), TR62 (Adana, Mersin), TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir), TRB2 (Van, Muş, Bitlis, Hakkari), TRC1 (Gaziantep, Adıyaman, Kilis), TRC2 (Şanlıurfa, Diyarbakır) and TRC3 (Mardin, Batman, Şırnak, Siirt) regions. In contrast, the structural change effect is stronger in other regions. Furthermore, with the exception of TRB2 (Van, Muş, Bitlis, Hakkâri) and TRC2 (Şanlıurfa, Diyarbakır), the structural change effect is positive in all remaining regions. In general, it was discovered that the within-sector effect's mien on productivity evolution was dominant in Turkey and its 26 regions between 2010 and 2020. Furthermore, when the sectoral evaluation was performed, it was discovered that the within-sector effect was dominant. In this context, the study's findings are consistent with those obtained in previous studies by Altıok and Tuncer (2013), Yurtsizolu and Kılıçaslan (2017), Tuncer and Moalla (2020), Altıok and Tuncer (2012), Kaymaz (2022), and Akkemik (2006). The findings, however, differ from those obtained by Atiyas and Bakis (2013; 2015) and Rodrik (2010). Based on the findings, policies should be implemented to accelerate structural change in the Turkish economy and its 26 regions. Because in order for productivity evolution to drag and stabilize growth, the structural change effect (static + dynamic) must increase. Accordingly, the economic structure will embark on a proper and effective growth path. Implementing selective industrial policies can maximize the bearing of structural change, improve labour quality, enable implementing appropriate industrial investments, ensure product diversity, accelerate production based on technology and knowledge, and encourage technological developments.

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Annex Table 1. Decomposition of Labour Productivity in Regions and Turkish Economy

Regions	Sectors	Within Growth	Static Shift	Dynamic Shift	Labour Productivity Growth (%)
TR (Türkiye)	Agriculture	4.93	-2.33	-1.48	1.11
	Industry	17.67	0.03	0.01	17.71
	Services	11.88	8.33	1.85	22.06
	Total	34.48	6.03	0.37	40.88
TR10 (İstanbul)	Agriculture	-0.07	0.16	-0.08	0.01
	Industry	18.45	-8.21	-4.05	6.18
	Services	9.42	8.68	1.31	19.42
	Total	27.81	0.63	-2.82	25.61
TR21 (Tekirdağ, Edirne, Kırklareli)	Agriculture	3.48	-2.40	-0.93	0.14
	Industry	37.49	-2.93	-1.90	32.67
	Services	4.09	6.38	0.79	11.26
	Total	45.06	1.05	-2.05	44.06
TR22 (Balıkesir, Çanakkale)	Agriculture	13.09	-6.58	-4.83	1.69
	Industry	18.55	2.53	1.32	22.39
	Services	1.73	15.26	0.57	17.55
	Total	33.37	11.21	-2.94	41.63
TR31 (İzmir)	Agriculture	3.49	-1.47	-1.04	0.98
	Industry	14.54	4.13	1.38	20.05
	Services	19.00	0.53	0.20	19.73
	Total	37.03	3.19	0.54	40.77
TR32 (Aydın, Denizli, Muğla)	Agriculture	9.81	-4.74	-2.91	2.15
	Industry	18.94	0.64	0.39	19.97
	Services	6.89	10.75	1.40	19.05
	Total	35.64	6.65	-1.12	41.17

TR33 (Manisa, Afyon, Kütahya, Uşak)	Agriculture	5.25	-4.79	-1.27	-0.81
	Industry	22.96	6.42	3.42	32.80
	Services	5.24	6.30	0.89	12.43
	Total	33.46	7.92	3.04	44.42
TR41 (Bursa, Eskişehir, Bilecik)	Agriculture	1.19	-0.36	-0.09	0.73
	Industry	21.57	-4.56	-1.72	15.30
	Services	3.66	3.73	0.36	7.75
	Total	26.42	-1.18	-1.46	23.78
TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova)	Agriculture	2.05	-1.32	-0.72	0.01
	Industry	19.83	3.12	1.07	24.01
	Services	8.18	4.32	0.92	13.42
	Total	30.06	6.12	1.26	37.44
TR51 (Ankara)	Agriculture	0.64	-0.31	-0.09	0.23
	Industry	12.43	-0.12	-0.04	12.26
	Services	20.12	0.54	0.18	20.84
	Total	33.19	0.10	0.04	33.33
TR52 (Konya, Karaman)	Agriculture	26.96	-4.58	-7.69	14.70
	Industry	28.47	4.66	3.67	36.80
	Services	11.79	8.11	2.00	21.91
	Total	67.22	8.20	-2.02	73.40
TR61 (Antalya, Isparta, Burdur)	Agriculture	7.08	-6.56	-2.85	-2.33
	Industry	5.71	1.70	0.47	7.87
	Services	-5.35	14.68	-1.25	8.08
	Total	7.44	9.81	-3.63	13.62
TR62 (Adana, Mersin)	Agriculture	9.62	-4.12	-2.92	2.57
	Industry	24.02	3.02	2.29	29.32
	Services	20.33	7.99	2.97	31.29
	Total	53.97	6.88	2.33	63.18
TR63 (Hatay, Kahramanmaraş, Osmaniye	Agriculture	12.13	-6.64	-5.89	-0.40
	Industry	17.41	-0.39	-0.17	16.85
	Services	5.87	20.26	2.58	28.71
	Total	35.41	13.23	-3.48	45.17
TR71 (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	Agriculture	23.69	-6.52	-7.35	9.82
	Industry	3.65	12.83	1.41	17.89
	Services	10.13	6.32	1.40	17.86
	Total	37.48	12.64	-4.55	45.57
TR72 (Kayseri, Sivas, Yozgat)	Agriculture	5.60	-2.95	-1.31	1.33
	Industry	16.17	-0.72	-0.30	15.16
	Services	6.26	8.18	1.06	15.50
	Total	28.03	4.52	-0.55	31.99
TR81 (Zonguldak, Karabük, Bartın)	Agriculture	10.09	-2.53	-3.53	4.03
	Industry	8.74	3.70	0.78	13.21
	Services	5.48	17.20	1.84	24.51
	Total	24.30	18.37	-0.91	41.76
TR82 (Kastamonu, Çankırı, Sinop)	Agriculture	13.26	-4.25	-2.59	6.42
	Industry	19.10	4.88	3.48	27.46
	Services	10.41	9.53	1.93	21.87
	Total	42.76	10.16	2.82	55.74
	Agriculture	7.73	-3.54	-1.37	2.82

TR83 (Samsun, Tokat, Çorum, Amasya)	Industry	7.86	4.65	1.41	13.92
	Services	11.47	7.45	1.58	20.50
	Total	27.06	8.56	1.62	37.23
TR90 (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	Agriculture	14.50	-3.37	-3.57	7.56
	Industry	16.48	6.12	3.73	26.32
	Services	8.47	19.30	2.76	30.53
	Total	39.45	22.04	2.92	64.41
TRA1 (Erzurum, Erzincan, Bayburt)	Agriculture	33.16	-6.83	-12.46	13.86
	Industry	4.49	10.99	2.24	17.72
	Services	1.93	29.05	0.94	31.91
	Total	39.58	33.21	-9.29	63.50
TRA2 (Ağrı, Kars, Iğdır, Ardahan)	Agriculture	31.10	-3.86	-3.58	23.66
	Industry	1.14	3.83	0.33	5.30
	Services	27.28	6.60	3.39	37.27
	Total	59.52	6.57	0.14	66.24
TRB1 (Malatya, Elazığ, Bingöl, Tunceli)	Agriculture	16.10	-3.92	-5.20	6.98
	Industry	14.35	3.25	1.77	19.37
	Services	5.52	17.77	1.60	24.88
	Total	35.97	17.10	-1.84	51.23
TRB2 (Van, Muş, Bitlis, Hakkari)	Agriculture	4.31	1.27	0.24	5.83
	Industry	-0.20	4.30	-0.05	4.05
	Services	42.52	-6.95	-4.90	30.66
	Total	46.63	-1.38	-4.71	40.53
TRC1 (Gaziantep, Adıyaman, Kilis)	Agriculture	4.59	-2.04	-1.05	1.50
	Industry	56.37	-2.39	-2.91	51.07
	Services	12.14	7.54	2.04	21.73
	Total	73.09	3.12	-1.92	74.29
TRC2 (Şanlıurfa, Diyarbakır)	Agriculture	-3.87	6.59	-1.09	1.63
	Industry	3.94	-0.91	-0.15	2.88
	Services	28.75	-6.93	-3.77	18.05
	Total	28.81	-1.25	-5.01	22.55
TRC3 (Mardin, Batman, Şırnak, Siirt)	Agriculture	23.47	-6.71	-9.70	7.06
	Industry	13.24	3.66	1.84	18.74
	Services	41.41	9.75	7.04	58.20
	Total	78.12	6.70	-0.82	84.00