STRUCTURAL CHANGE AND GROWTH PROSPECTS IN THE TURKISH ECONOMY: A DEMAND-SIDE DECOMPOSITION ANALYSIS

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Abstract: *Over the past four decades, Turkey has undertaken a wide range of reforms that aim at the liberalisation of foreign trade, relaxation of the tariff system, deregulation of the financial system, and foreign investment regulations. Significant structural change experienced in the Turkish economy pursues access to the global market. This paper presents an empirical investigation of the growth prospects in both the Turkish economy and manufacturing industry during the whole period from 1995 to 2015 and the sub-periods of 1995–2001, 2001–2008, 2008–2015 and 1995–2015. Since investigating the dynamics of economic growth from the supply-side has been well documented in the literature, this work contributes to the literature on the sources of economic growth by providing a more up-to-date analysis from a demand-side perspective in the case of the Turkish economy. We make use of Chenery's factor decomposition method that decomposes output growth into the growth of domestic demand, import-substitution, growth of export and intermediate demand. Conclusions revealed that the total output evolution of the whole economy and the manufacturing industry was mainly responsive to final domestic demand during the whole period of 1995–2015 and the sub-periods of 1995–2001, 2002–2008 and, 2008–2015. However, the nexus between the final domestic demand and the output evolution tended to weaken during the period from 2001 to 2008, but recovery took place again in the following periods. Moreover, the output growth that stemmed from export expansion was more prevailing in the manufacturing industry. To these ends, policies aimed at increasing income, demand, product diversity and reducing poverty should be applied to encourage the deepening of domestic demand. Furthermore, selective micro policies of industrial and technological upgrading and diversification should be applied to sustain output and export growth and, create a more resilient economy to external shocks.*

Keywords: *Growth, Chenery's factor decomposition, structural change, Turkish economy, manufacturing industry.*

JEL Classification: *C02, D57, O12.*

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Introduction

After the 24th of January 1980, the Turkish economy had undergone a significant transformation by which inward-oriented and protective import substitution policies had been replaced by outward-oriented and export-based industrialisation and growth strategies (Töngür & Taymaz, 2017). The main characteristics of

this transformation composed of liberalisation of the financial sector, opening to foreign markets and integration into international economy (Yeldan, 2016). The government engaged in contractionary fiscal and monetary policies to suppress domestic demand and real wages and kept their priority to increase exports by implementing various incentive and subsidy tools (Doğruel & Doğruel, 2017; Orhangazi, 2020; Soydan, 2018; Yeldan, 2016). As a result of the experienced transformation, Turkey suffered from economic instability and fragility in the post-1980 period (Soydan, 2018). The average annual growth rate decreased from 5.65% in the 1960s to 4.10% in the 1980s (Taymaz & Voyvoda, 2017; World Bank, 2021). The drastic growth fluctuations during the period from 1980 to 2001 were deduced as a sign of a poorly performing economy, especially in the 1990s (Töngür & Taymaz, 2017). In the early 2000s, a severe crisis recorded a negative growth rate of −5,75% in 2001 hit the Turkish economy (World Bank, 2021; Yeldan, 2017). Even the swiftly recovering from the 2001 crisis was hit by the 2008 crisis (Soydan, 2018). If numbers talk, the rate of economic growth had increased from −2.45% in 1980 to 9.49, 2.32 and 0.29% in 1987, 1988 and 1989 respectively. It had decreased from 9.27% in 1990 to −4.67% because of Turkey's 1994 crisis. The growth rates in 1998 and 1999 were respectively 2.40% and −3.26%. It dropped from 6.45% in 2000 to 5.75% in 2001 and from 0.82% in 2008 to −4.82% in 2009. The period after 2009 combined growth trends with relatively cyclical fluctuations (World Bank, 2021). Overall, the Turkish economy had experienced four significant crises, namely 1994, 1998/1999, 2001 and 2008/2009 during the studied interval (Boratav, 2019; Çolak, 2019; Yeldan, 2016).

Economic growth prospects and differences between countries can be explained both from a demand-side and a supply-side perspective (Tuncer et al., 2011). The industrial development report (UNIDO, 2017) stated that the growth literature has generally been focused on supply-side growth measures but usually ignores demand-side aspects. Smith (2012) and Tekgül and Cin (2013) argued that investigating the dynamics of economic growth from the supply-side perspective had been well documented, but the demand-side aspects had usually been neglected. Moreover, the neoclassical and endogenous growth models intended to strongly support the relevance of certain supply-side factor endowments (such as capital, labour, labour productivity) and their distribution in explaining growth and growth differences across countries (Magacho & Spinola, 2020; Oreiro et al., 2010). However, Keynesian and Post-Keynesian growth models emphasised the significance of demand as a crucial determinant of long-run economic growth (Magacho & Spinola, 2020). Those models of growth hold that growth in aggregate demand fundamentally determines the output growth and the rate of capital accumulation (Magacho & Spinola, 2020; Setterfield, 2003; Smith, 2012). With this respect, this research paper intended to analyse the sources of growth in the Turkish economy and the manufacturing industry during the period from 1995 to 2015 from a demand side perspective. It was carried out along with many other studies such as: Çalışkan and Aydoğuş (2011), Günçavdı and Küçükçiftçi (2002), Günçavdı and Küçükçiftçi (2011), Günçavdı and Küçükçiftçi (2012), Günlük-Şenesen (1994), Pamukçu and Boer (2000), Tunç (2004) and the recent work by Ayaş (2017) who analysed the Turkish economy during the period from 1996 to 2011. We make use of the structural decomposition method proposed by Chenery (1960) and Chenery et al. (1962). This decomposition method accounts for sectoral production changes, i.e., the growth of gross domestic product (GDP), from a demand-side perspective. It is worth pointing out that Celasun (1983) was the first who employed a demand-side decomposition technique to investigate the growth prospects in the Turkish economy. Unlike the previous studies, our study presents an empirical investigation of the growth prospects in both the Turkish economy and manufacturing industry during the whole period from 1995 to 2015 and the sub-periods of 1995–2001, 2001–2008, 2008–2015 and 1995–2015. This paper contributes to the related literature on economic growth by providing a more up-to-date analysis of the sources of Turkish economic growth from a demand side perspective. This work is made up of four sections. Firstly, the introductory part in which a representation of the post-1980 policies that led to a transformation in the Turkish economy is briefly introduced. In the first section, a literature review on assessing economic growth in Turkey and different countries is structured.

The second section includes the data and methodology. In this section, the data of the National Input-Output Tables (NIOT) taken from the Organisation for Economic Development and Economic Cooperation (OECD) database for the period from 1995 to 2015 had been applied to Chenery's factor decomposition method. The method decomposes the output growth of each sector into the growth of final domestic demand, exports, import substitution and technological change. The third section includes the research results. The obtained outcomes revealed that the whole economy's and manufacturing industry's total output growth was predominantly responsive to final domestic demand during the periods of 1995–2001, 2002–2008, 2008–2015 and 1995–2015. However, the nexus between the final domestic demand and the output growth tended to weaken during the period from 2001 to 2008 but recovery took place again in the following periods. Moreover, output growth that stemmed from export expansion was more prevailing in the manufacturing industry. The fourth section is about evaluating the results and conclusion.

1. Theoretical Background

The growth rate of any economy is closely related to changes in the sectoral composition. In the early stages of economic development, the primary sector is more dominant in terms of economic activities, but its weight decreases concurrently with the increase of the manufacturing industry's share at later stages of development. Likewise, at more advanced stages of the development process, the share of the manufacturing industry decreases concomitantly with the increase in the share of services. It is essential to understand the dynamics of structural change that take place during the economic growth process and analyse them at the sectoral level to reveal the driving forces behind economic growth of each sector (Aydoğuş, 2015). This paper, utilising the structural decomposition method, aimed to investigate the dynamics of changes at the sectoral level. Various versions of this method generally decompose sectoral economic growth into four components: the growth of the final domestic demand, the final foreign demand (exports), import substitution and technological change (Çalışkan & Aydoğuş, 2011). One of the studies that apply such method for the Turkish economy is Tunç (2004). Tunç (2004) stated that the change of a certain variable over time can be explained by the change of the components that make up that variable. Accordingly, detailed information related to the dynamics affecting the development of the sectors operating in any economy can be obtained (Tunç, 2004). Two pioneering studies utilised the structural decomposition method to identify the dynamics of sectoral growth from a demand-side perspective are Aydoğuş (2015) and Çalışkan and Aydoğuş (2011). The pioneer study was the work done in the 1960's by Hollis B. Chenery who inspected the manufacturing industry's growth dynamics in 38 countries during the period from 1950 to 1960 (Chenery, 1960). He disclosed that the industrial sector grew faster than the rest of the economy and attributed the industrial growth to three different dynamics: the import substitution of domestic production, the growth of the industrial production's final demand and the growth in the intermediate goods' demand stemmed from the first and second dynamics. The second important pioneering study was the one conducted by Chenery et al. (1962) on the Japanese economy covering two sub-periods: 1914–1935 and 1935–1954. Chenery et al. (1962) claim that the change in the output of each economic sector is determined by four principal dynamics which are: domestic demand, export volume, import volume, and technology. Their conclusions revealed that the import substitution impact was more dominant concerning increasing the industry's share in total production compared to the effective role of exports, domestic demand, and technological change. However, it was different for the Turkish economy as reported in 2004 by Tunç who utilised the I-O tables to analyse the Turkish sectoral production growth in two sub-periods, namely 1985–1990 and 1990–1996. His results revealed that during the period from 1985 to 1990, the exports' enlargement accounted for 122% of production was the fundamental factor promoting growth followed by the final domestic demand which contributed to almost 70% of the production growth. Tunç (2004) revealed that while the import substitution affected the production growth negatively (−38% for final and −61% for intermediate demand), a positive contribution equivalent to 7% accounted for the technological change. Moreover, he found that the final domestic demand accounted for 70% of production was the key dynamic of the output growth during the

period from 1990 to 1996, followed by the import substitution which was equivalent to 45% (intermediate) and 23% (final) of the production growth. Furthermore, the contribution of export expansion was negative equivalent to −40% of production growth.

Unlike Tunç (2004), Çalışkan and Aydoğuş (2011) indicated dominantly in final domestic demand. They utilised the Turkish I-O tables for the years of 1985, 1990 and 2002. They revealed that the contribution of the final domestic demand to the production growth during the period from 1985 to 1990 was higher than that during the period from 1990 to 2002. The study argued that the policies that were conducted in line with the 1980 stabilisation programme such as reducing domestic demand and increasing exports did not tackle short-term instability. During the period from 1990 to 2002, the opening-up policies led to a leap of exports' contribution to the production growth. At this period, the technology's contribution to the production growth was higher compared with that from 1985 to 1990. For both periods, the import substitution contributed negatively to the production growth. Generally, the opening-up policies created an effect on the Turkish economy in the long run but not in the short run. During the period from 1985 to 2002, the contributions of the final domestic demand, exports, import substitution and technological change were respectively equivalent to 70.34, 14.43, −7.43 and 22.64% of the production growth. Günçavdı and Küçükçiftçi (2012) also come up with similar conclusion especially for the 1985–1990 period. Günçavdı and Küçükçiftçi (2012) utilised the 1973, 1985, 1990 and 1998 I-O tables of the Turkish economy in decomposing sources economic growth from a demand side perspective. During the period from 1973 to 1985, the contributions of the final domestic demand, exports, import substitution of final products, import substitution of intermediate products and technological change were respectively equivalent to 76.1, 25.4, 3.0, −1.4 and −3.8% of the production growth. The public expenditures and investments were responsible for the expansion of the final demand. During the period from 1985 to 1990, the contributions of the final domestic demand, exports, import substitution of final products, import substitution of intermediate products and technological change were respectively 83.1, 3.2, −0.5, −4.3 and 18.5% of the production growth. The authors underlined that the openness and export-led policies applied during the period from 1985 to 1990 did not have the expected outcomes. During the period from 1990 to 1998, the contributions of the final domestic demand, exports, import substitution of final products, import substitution of intermediate products and technological change were respectively equivalent to 39.1, 64.2, 16.0, 18.3 and −1.0% of the output growth. Compared to the previous studies, this period was characterised by an increase in exports. Except for the period from 1990 to 1998, the final domestic demand was the key dynamic that promoted Turkish economic growth. Moreover, the export incentive policies implemented in the post-1980 period facilitated accelerating production growth. In another study, Ayaş (2017) calibrated a demand-side decomposition model based on the World Input-Output Database (WIOD) for the Turkish economy. The study argued that the output of all economic sectors had raised their output during the period from 1996 to 2011. The highest increase accounted for the wholesale and retail trade. The key dynamic that stimulated economic growth was the final domestic demand. The results revealed that the demand dynamics' contribution to the production growth varied among sub-sectors. In other words, the demand change in intermediate inputs was responsible for 50% or more of the production growth respectively in the sectors of the other minerals, mining, and chemistry. Moreover, the change in the final domestic demand was responsible for 50% or more of the production growth respectively in finance, tourism, woodworking, public services, food, communication, trade, media, and transportation. However, there was an unbalanced impact of the expansion of the exports on the different economic sectors. The expansion of the exports was responsible for 100% or more of the production growth in the sectors of metal, wood, machinery, finance, and other minerals. The contribution of import substitution was generally negative.

Indeed, the key determinants of economic growth seems to be different among countries too. For example, the Indian economy had been analysed by Kumari (2005). The sources of industrial growth were analysed for two periods: the first one is from 1983–1984 to 1989–1990 and the second one is from 1989–1990 to 1997–1998. In other words, he analysed the

prospects of the Indian industrial growth before and after the implementation of the liberalisation policies. The study revealed that during the two analysed periods, the expansion in the final domestic demand was the key component that enhanced the manufacturing industry's production growth followed by the expansion of exports. He argued that the expansion in both exports and domestic demand became more dominant in terms of expanding the production in the post-liberalisation period. Moreover, the contributions of both import substitution and the demand for intermediate inputs were positive in the pre-liberalisation period but negative in the post-one. The Iranian economy had been analysed in 2007 by Mohammadi and Bazzazan (2007) utilising the I-O tables of 1988, 1993 and 1999 to investigate the dynamics that were effective in output growth. They revealed that the expansion of the exports was responsible for 66.4% of the total output growth in the manufacturing industry during the period from 1988 to 1993. At the same period, the import substitution and the domestic demand for intermediate and final products were respectively responsible for 1.8, 3.3 and 28.3% of total output growth in the manufacturing industry. During the period from 1993 to 1999, the final domestic demand played a dominant role in increasing the manufacturing industry's production to about 142.6% of its output growth. The shares of the exports' expansion, intermediate inputs and import substitution were respectively equivalent to 20.5, −64.4 and 1.24% of the output growth. In sum, during the period from 1988 to 1993, the most essential dynamics in increasing production were the raise in export demand firstly and the final domestic demand secondly. During the period from 1993 to 1999, which was a period in which the Iranian policymakers sought to achieve economic development by an export-led growth strategy, a dominant image had been drawn by the final domestic demand and the demand for intermediate products. The Malaysian economic growth had been analysed by Rohana et al. (2008) utilising the I-O tables to determine the dynamics fostering economic growth for two separate sub-periods: 1978–1991 and 1991–2000. During the sub-period from 1978 to 1991, the contributions of the exports' expansion and final domestic demand were respectively equivalent to 33.33% and 63.35% of the production growth. During the period from 1978 to 2000, the contribution of the exports' expansion increased to 45.73%, but that of the final domestic demand decreased to 48.11% of the production growth. At the same period, it was argued that the domestic demand's contribution, 81.53% of the production growth, was the most important dynamic in the growth process. The contributions of export expansion, import substitution of final products, import substitution of intermediate products and technological change were respectively: 60.59, 1.79, −18.61 and −21.72% of the Malaysian production growth. Tregenna (2012) utilised the South African I-O tables for the period from 1970 to 2007 to analyse the economic growth prospects. The results revealed that the domestic demand was the dominant dynamic that increased production during all the studied sub-periods. The raise in total production stemming from the final domestic demand was equivalent to 74.7% during the period from 1995 to 1980, 52.2% during the period from 1980 to 1990, 61.5% during the period from 1990 to 1995 and 29% during the period from 1995 to 2000. The increase in production stemmed from final domestic demand decreased over time. However, it started to increase after 2000. Its contribution reached 84.3% of the production growth during the period from 2000 to 2007. The contribution of the import substitution to output growth was positive but it became negative in the aftermath of the 2000's. The contribution of the exports' expansion to growth of production was equivalent to 7.7% during the period from 1970 to 1980, 14.3% during the period of 1980–1990, 72.6% during the period of 1990–1995, 22.2% during the period of 1995–2000 and 18.7% during the period of 2000–2007. The growth of production stemmed from the technological change was −1% from 1970 to 1980, 24.3% during the period of 1980–1990, 36.3% during the period of 1990–1995, 38.7% during the period of 1995–2000 and 15.3% during the period of 2000–2007. The production growth stemmed from the technological change was more dominant in the heavy manufacturing industry compared to the light industry since the heavy industry produced intermediate products while the light industry produced final consumer goods. The Brazilian economic growth prospects had been analysed by Magacho and Rocha (2019) employing a structural decomposition method during the periods of 2010–2013 and 2013–2016. The results revealed that the final

demand was the key factor that stated economic growth during the period from 2010 to 2013. At the same period, the contributions of technological change, final demand and import substitution were equivalent to 3.58, 10.19 and −4.35% of the production growth respectively. The economic output decreased during the period from 2013 to 2016 for the reason that the effectiveness of the growth dynamics was lower during this period compared to the previous periods. The contributions of the technological change, the final demand and the import substitution were respectively equivalent to 1.78, −12.61 and 1.42% of the Brazilian output growth.

It is important to figure out that the literature shows a significant contribution of some leading sectors to economic evolution such as studies conducted by Rohman and Bohlin (2014) and Xu et al. (2021). Rohman and Bohlin (2014) claimed that the Indonesian telecommunications industry had recently stimulated economic growth and achieved a higher growth rate compared to other sectors. They employed Indonesia's I-O tables for the period from 1975 to 2008 to examine the production growth that stemmed from the telecommunications sector. The results revealed that the key dynamic that stimulated the economic growth in the telecommunications sector was the final domestic demand. Its contribution to the economic growth was between 70% to 80% during the period from 1975 to 2008. During the periods of 1975–1980, 1980–1985 and 1985–1990, the dynamics that affected the economic growth dominantly were firstly the final domestic demand and secondly the technological change. However, the expansion of exports affected the growth of production increased during the periods of 1990–1995 and 1995–2008. The contribution of the final domestic demand was equivalent to about 80%, the contribution of export change was below 20% and the contribution of the technological change decreased during the period from 1995 to 2008. Xu et al. (2021) argued that the freight transport sector was one of the essential sectors that increased global oil consumption after 2000. They applied a structural decomposition method to the Chinese I-O tables during the period from 1997 to 2012. At this period, the largest freight transport demand by urban and rural households was in favour of consumable goods and other services. In contrast, the primary springs of freight transport demand for capital formation were construction and machinery. In 1997, freight transport demand by export flourished for wholesale products. Likewise, the freight transport export demand was dominant for machinery in 2002, 2007 and 2012. One of the study's objectives is to investigate the structure of aggregate final demand of the economy. The results revealed that in 1997, the shares of total embodied freight movement were 20% for rural household consumption demand, 20% for urban household consumption demand, 10% for government expenditure, 32% for capital formation and 18% for export demand. Most of the literature show that the domestic demand as the dominant force stimulating economic growth.

2. Research Methodology

The national Input-Output Tables harmonised by the OECD had been utilised to investigate the dynamics of Turkish economic growth from a demand-side perspective. The OECD database offers two different release of the I-O tables: the 2015 release classified the data according to International Standard Industrial Classification revision 3 (ISIC Rev. 3) and the 2018 release classified them according to International Standard Industrial Classification revision 4 (ISIC Rev. 4). The 2015 release is disaggregated into 34 sub-sectors for the period 1995–2011. The release of 2018 is disaggregated into 36 sub-sectors for the period 2005–2015. In this paper, the national I-O tables for the years 1995, 2001 arranged by ISIC Rev. 3, and 2008, 2015 arranged according to ISIC Rev. 4 had been utilised. To better fit the purpose of conducting the structural decomposition analysis as far as practically possible, a correspondence between the two classifications had been made by aggregating the I-O tables into 20 sectors (Tab. 1) since it was not possible to establish a one-to-one correspondence between tables of the two release. This correspondence implies the following cases: the sub-sectors 29, 30T33X and 31 following the ISIC Rev. 3 and the sub-sectors: 26, 27 and 28 following the ISIC Rev. 4 are combined under the industry section. Likewise, the sub-sectors within the services sector (following the ISIC Rev. 3 and ISIC Rev. 4) had been combined under two main groups: market services and non-market services. The sectors that had been obtained from the correspondence process are the

sector of agriculture, the industry sector, the mining sector, the sector of manufacturing industry (includes 14 sub-sectors), the sector of electricity, gas and water supply, the sector of construction and the services sector (divided into two groups: market services and non-market ones). 20 × 20 matrices had been constructed based on input-output tables of 20 economic sectors. The input-output tables enable, by utilising the matrix algebra, determining the level of gross output required to produce a specific final demand. I-O tables show the flows of goods and services as well as the interrelationship and interconnection between sectors (Leontief, 1986). Three key components are existed in the input-output tables: the total final demand which contains the domestic and the foreign final demand, the flow of domestic and imported intermediate input between sectors and the value added or primary inputs (Miller & Blair, 2009; OECD, 2021; Thirlwall, 1983). In an economy with n = 20 sub-sectors, let x_i denotes the total output of sector i, f_i denotes the aggregate final demand and z_{ij} denotes the inter-sectoral flow of goods. The basic I-O equation that indicates the relationship between the final demand and the total output in a sector i is as follows (Miller & Blair, 2009):

$$x_i = z_{i1} + ... + z_{ij} + ... + z_{in} + f_i = \sum_{i=1}^{n} z_{ij} + f_{ij} \quad (1)$$

Where: x denotes production, z denotes intermediate input demand and f denotes the final demand.

By rearranging Equation (1) for $n = 20$ sub-sectors, Equation (2) can be demonstrated as:

$$\begin{aligned} x_1 &= z_{11} + ... + z_{1j} + ... + z_{1n} + f_1 \\ &\vdots \\ x_i &= z_{i1} + ... + z_{ij} + ... + z_{1n} + f_i \\ &\vdots \\ x_n &= z_{n1} + ... + z_{nj} + ... + z_{nn} + f_n \end{aligned} \quad (2)$$

In Equation (2):

$$X = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}, Z = \begin{bmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & \ddots & \vdots \\ z_{n1} & \cdots & z_{nn} \end{bmatrix} \text{ and } F = \begin{bmatrix} f_1 \\ \vdots \\ f_n \end{bmatrix}$$

Where: x and f are n × 1 vectors, and Z is a n × n matrix.

The nexus between output and final demand is summarized in matrix notation as follows:

$$X = Z\mu + F \quad (3)$$

To analyse the I-O models, the matrix of technical coefficients should be obtained. The technical coefficients matrix measures the units of intermediate inputs used per unit of output for each industry. Technical coefficients matrix of a sector is calculated as follows (Aydoğuş, 2015; Leontief, 1986):

$$a_{ij} = z_{ij}/x_j \quad (4)$$

After calculating the technical coefficients for each sector, the technical coefficients matrix (A) is arranged as follows: $A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}$. It is also called the domestic technical coefficients matrix. It has been shown in the literature as A_d.

Where: a_{ij} coefficient denotes the minimum amount of good i required to produce one unit of good j under the current production technique (Aydoğuş, 2015). Usually, it is obtained in the form of $A = Z.\hat{X}^{-1}$; $A_d = \sum a_{ij}^d$ (Leontief,1986).

We reconstructed the input-output tables with constant prices in order to eliminate the artificial effects of the increase in prices (Aydoğuş, 2015; Celasun, 1983; Tunç, 2004). For this purpose, following the other studies, namely Celasun (1983), Çalışkan and Aydoğuş (2011), Pamukçu and Boer (2000) and Tunç (2004); the agriculture, industry, services, final domestic demand, export and import deflators (2015 = 100) had been utilised. Of what is next, a demand-side decomposition analysis had been employed to investigate the dynamics of growth in the Turkish economy for the periods of 1995–2001, 2001–2008 and 2008–2015. Chenery (1960) was the first to estimate the growth dynamics from a demand-side perspective then the estimation was developed by Chenery et al. (1962). This methodology decomposed the demand growth dynamics into four effects: final domestic demand, export demand, import substitution, and technological change effect. The following equation represents the decomposition of economic growth at the sectoral level (Aydoğuş, 2015; Chenery, 1960; Chenery et al., 1962; Kubo et al.,1986):

Tab. 1: Sectoral aggregation and sectoral codes

		ISIC Rev. 3 (1995, 2001)	ISIC Rev. 4 (2008, 2015)
Agriculture	Agriculture	A, B (01–05)	A (01–03)
Industry	Manufacturing industry	D (15–37)	C (10–33)
	Construction	F (45)	F (41–43)
	Mining and quarrying, electricity, gas and water supply	C (10–14) E (40–41)	B (05–09) D (35) E (36–39)
Services	Market services (trade, transport, accommodation and food, business and administration services)	G (50–52) H (55) I (60–64) J (65–67) K (70–74)	G (45–47) H (49–53) I (55–56) J (58–63) K (64–66) L (68) M (69–75) N (77–82)
	Non-market services (public administration, community, social and other services, and activities)	L (75) M (80) N (85) O (90–93) P (95) Q (99)	O (84) P (85) Q (86–88) R (90–93) S (94–96) T (97–98) U (99)

Source: UNSTAT; ILOSTAT

$$\begin{bmatrix} x_1 \\ \cdot \\ \cdot \\ \dot{x_n} \end{bmatrix} = \begin{bmatrix} v_1 \\ \cdot \\ \cdot \\ v_n \end{bmatrix} + \begin{bmatrix} y_1 \\ \cdot \\ \cdot \\ \dot{y} \end{bmatrix} + \begin{bmatrix} e_1 \\ \cdot \\ \cdot \\ e_n \end{bmatrix} + \begin{bmatrix} m_1 \\ \cdot \\ \cdot \\ \dot{m}_n \end{bmatrix} \quad (5)$$

A summary notation for Equation (5) is:

$$X_i = V_i + Y_i + E_i - M_i \quad (6)$$

Where: X_i, V_i, Y_i, E_i and M_i in Equation (5) are column vectors of order *n*. Those arrays are respectively defined as domestic production, intermediate input demand, final domestic demand, exports, and imports. In Equation (6), V_i is obtained by multiplying the matrix of technical coefficients (*A*) by the vector of domestic production (*X*) (Tregenna, 2012):

$$\begin{bmatrix} v_1 \\ \cdot \\ \vdots \\ v_n \end{bmatrix} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \times \begin{bmatrix} x_1 \\ \vdots \\ \cdot \\ x_n \end{bmatrix}; V_i = A \cdot X_i \quad (7)$$

Based on Equation (6), set supply equal to demand (Ayaş, 2017; Aydoğuş, 2015):

$$X_i + M_i = Y_i + V_i + E_i \quad (8)$$

The right side of Equation (8) shows the aggregate demand, and the left one shows the aggregate supply. Moreover, (*M*) symbolises the imports of both intermediate and final goods together:

$$M_i = m_i (V_i + Y_i); m_i = M_i/(V_i + Y_i) \text{ and } p_i = (1 - m_i) \quad (9)$$

Where: *m* symbolises the matrix of imports' coefficients and *p* symbolises the matrix of domestic supply coefficients (Ayaş, 2017; Kubo et al., 1986; Tregenna, 2012).

Rearranging Equation (8) based on Equation (9):

$$p_i = (X_i - E_i)/(V_i + Y_i) \quad (10)$$

Where: $(V_i + Y_i)$ represents the total domestic demand for the output of sector *i* and $(X_i - E_i)$ represents the domestic demand for domestic output. The coefficient measures the final and intermediate domestic products' import substitution effects. According to Equation (9), the increase in the import of sector *i* will reduce the p_i coefficient that sometimes can be interpreted as the domestic supply coefficient (Aydoğuş, 2015). The p_i coefficient symbolises the rate of the domestic products used in the production process. In other words, it presents the intermediate goods entailed for one unit of production. The p_i coefficient, which positively influences sectoral production, increases in proportion to the positive substitution and decreases in proportion to the negative one (Ayaş, 2017; Aydoğuş, 2015). By rearranging Equation (10) based on the basic assumptions of Leontief's model (Tregenna, 2012), then Equation (11) can be obtained as follows:

$$X = (I - PA)^{-1}(PY + E) \tag{11}$$

In Equation (11): if $P = (X - E)/(V + Y)$, $P \cdot V + P \cdot Y = X - E$; $P \cdot V + P \cdot Y + E = X$ and if $V = A \cdot X$, $P \cdot AX + P \cdot Y + E = X$; $X - P \cdot AX = P \cdot Y + E$; $X(I - PA) = PY + E$ then $X = (I - PA)^{-1}(PY + E)$.

Where: $L = (I - PA)^{-1}$ denotes the Leontief inverse, *P* = diagonal(*p*), *I* = identity matrix and *A* is a matrix of the input or the technical coefficients. Once the technical coefficients matrix has been formed, the Leontief inverse matrix may be obtained (Thirlwall, 1983). The technical coefficients matrix is obtained as in Equation (4). The Leontief inverse matrix captures the total (direct and indirect) effects arising from interaction among sectors to meet the final demand (Aydoğuş, 2015; Leontief, 1986). To obtain the Leontief inverse matrix, the following steps should be taken into consideration (Leontief, 1986; Miler & Blair, 2009; Thirlwall, 1983):

1-) The identity matrix (I) is obtained as follows:

$$\text{Identity matrix } (I) = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{bmatrix} \tag{12}$$

2-) When the technical coefficients matrix is subtracted from an identity matrix, it yields the Leontief matrix $(I - A)$ as follows:

$$\text{Leontief matrix } (I - A) = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \tag{13}$$

Consequently, the *n* × *n* matrix is obtained as follows:

$$(I - A) = \begin{bmatrix} 1 - a_{11} & \cdots & -a_{1n} \\ \vdots & \ddots & \vdots \\ -a_{n1} & \cdots & 1 - a_{nn} \end{bmatrix} \tag{14}$$

Leontief matrix is required to satisfy the conditions of 1- a_{11}, ..., $1 - a_{nn} > 0$, $(I - A) > 0$ and $A > 0$ (Leontief, 1986).

3-) If the inverse of the matrix $(I - A)$ exists, then the Leontief inverse matrix can be obtained as follows:

$$(1 - A)^{-1} = \lim_{n \to +\infty} (I + \sum_n A^n) = 1 + A + A^2 + A^3 + \ldots \tag{15}$$

This implies that to satisfy a unit increase in the final demand, all sectors need to increase their production by 1 unit as a first stage. In other words, one-unit increase in production in the first stage will increase all sectors' demand for additional intermediate inputs to the rate of their technical coefficients. Then, all sectors will again increase their output to accommodate the demand for additional intermediate inputs. This constitutes the second stage and the term *A* in the equation represents this stage. The terms A^2 and A^3 show that the increase in additional production occurring at each stage repeatedly raises the demand for intermediate inputs between sectors, leading again to additional production. Thus, sectoral interactions will continue as a chain reaction (Aydoğuş, 2015; Miller & Blair, 2009).

The change in gross production between the two periods (t, t_{t+1}) can be obtained as follows when the first difference of the equation is taken (Kubo et al., 1986; Tregenna, 2012):

$$\Delta X = L_t P_t \cdot \Delta Y + L_t \cdot \Delta E + L_t \cdot \Delta P \cdot (V_{t+1} + Y_{t+1}) + L_t P_t \cdot \Delta A \cdot X_t \tag{16}$$

The obtained equation is defined as the basic structural decomposition equation. The first term on the right side of the equation ($L_t P_t \cdot \Delta Y$) symbolises the contribution of the domestic final demand expansion; the second term ($L_t \cdot \Delta E$) represents the contribution of exports expansion; the term $L_t \cdot \Delta P \cdot (V_{t+1} + Y_{t+1})$ represents the effects of import substitution and $L_t P_t \cdot \Delta A \cdot X_t$ represents the Leontief technological change effect.

3. Research Results

The decomposition of output growth of the Turkish economy from a demand-side perspective by sub sectors is implemented for the periods of 1995–2001, 2001–2008, 2008–2015 and 1995–2015. Tab. 2 shows these demand dynamics for the period from 1995 to 2001. The major source of economic evolution during this period stemmed from the final domestic demand (87.86% of output growth). The export expansion was another major contributor to economic growth (14.34%). The contributions of import substitution (0.25%) was very weak and the effect of technological change (−2.44%) to output growth was negative. The Turkish economy switched to an export-led economic growth and development strategy in 1980. Turkey embarked upon structural adjustment policies (SAP) to transform the economy into an outward-oriented free market economy (Çolak, 2019; Orhangazi, 2019). In 1989, Turkey undertook a financial liberalisation phase that removing controls on and freeing circulation of international capital. In the aftermath of these economic liberalisation policies, the Turkish economy has become more integrated with the international markets. In 1990, the Turkish economy turned into a completely open one (Yeldan, 2016). Policies focused on promoting exports through subsidies and subsidized export credits, real devaluations, liberalisation of the import regime and contraction of domestic demand (Çalışkan & Aydoğuş, 2011). The results for the period of 1995–2001 are summarised in Tab. 2. The structural adjustments policies that implemented in the aftermath of 1980 leads to some unintended outcomes. For example, the main driver of the sectoral growth was domestic final demand rather than the export expansion especially after the crises (1994) experienced in the Turkish economy. Turkey has gone through three of these crises, the first one was in 1994 (Çolak, 2019) followed by the 1998/1999 and 2001 crises. As a result of the structural adjustment policies the Turkish economy became more sensitive to international capital in and out flows (Boratav, 2019, 2021). The crises led to adverse effects on exports and interruptions in foreign capital inflows. As a result, the domestic final demand was the key determinant of the Turkish sectoral growth during the period of 1995–2001. The Asian crises experienced in 1997 also negatively affected the Turkish economy. The severe devaluation of the Asian currency has negatively affected exports by reducing Turkey's competitiveness in the third markets with these countries (Kazgan, 2021a).

The results revealed that during the period from 1995 to 2001, the major source of economic growth of the sectors of agriculture, industry and services was the final domestic demand equivalent to 107.34, 83.81 and 88.21% respectively. The export expansion accounted for 7.30% of agricultural, 15.12% of industrial and 14.95% of services growth. However, the technological change effect contributed to about −14.64% of agricultural, 0.63% of industrial and −3.26% of services growth. The contribution of the import substitution was below 1%. During the same period the contributions of final domestic demand, exports, import substitution and technological change were respectively: 81.30, 17.73, 0.52 and 0.46% of the manufacturing industries' growth. The exports expanded faster in the manufacturing industries compared to services and agricultural exports. The sub-sector of rubber and plastics products especially demonstrated the highest rate of final domestic demand equivalent to 152.12%. However, the lowest rate (55.74%) had been demonstrated by the sub-sector of woods and wood products and cork. While the sub-sector of basic metals demonstrated the highest exports rate (30.05%), that of motor vehicles, trailers and semi-trailers demonstrated the lowest rate (10%). In general, all the manufacturing sub-sectors exhibited a low rate of import substitution varying between 0 and 5%. The sub-sector of wood and wood products and cork exhibited the highest rate of technological change effect (32.08%), while that of rubber and plastics products demonstrated the lowest rate (−85.94%). Tab. 3 shows the contribution of the final demand to economic growth during the period from 2001 to 2008. When comparing the results revealed for this period and those of the period from 1995 to 2001, a decreasing

Tab. 2: **Demand-side dynamics of sectoral growth during the period from 1995 to 2001 (%)**

Sectors	Final demand effect	Export effect	Import substitution effect	Technological change effect
Total	87.86	14.34	0.25	−2.44
Agriculture	107.34	7.30	0.00	−14.64
Industry	83.81	15.12	0.44	0.63
Services	88.21	14.95	0.09	−3.26
Manufacturing industries	81.30	17.73	0.52	0.46
Food, beverage, and tobacco manufactures (15T16)	82.68	11.17	−0.01	6.15
Manufacture of textiles, textile products, clothing, and footwear (17T19)	68.22	28.17	0.17	3.44
Manufacture of wood and products of wood and cork (20)	55.74	11.77	0.41	32.08
Manufacture of paper, pulp products, printing, and publishing (21T22)	75.83	10.47	0.36	13.34
Manufacture of coke, refined petroleum products and nuclear fuel (23)	83.51	12.80	0.50	3.19
Manufacture of chemicals and chemical products (24)	95.94	16.86	0.32	−13.12
Manufacture of rubber and plastics products (25)	152.12	29.10	4.72	−85.94
Manufacture of other non-metallic mineral products (26)	83.11	11.44	0.09	5.36
Manufacture of basic metals (27)	64.19	30.05	1.13	4.62
Manufacture of fabricated metal products (28)	89.90	17.70	0.80	−8.40
Machinery and equipment n.e.c; manufacture of computer, electronic and optical equipment (29T33)	89.20	12.60	0.92	−2.73
Manufacture of motor vehicles, trailers, and semi-trailers (34)	92.15	10.00	0.68	−2.83
Manufacture of other transportation vehicles (35)	76.82	21.20	3.22	−1.23
Manufacturing n.e.c, recycling (36T37)	65.00	29.62	2.03	3.35

Source: own (based on input-output data)

trend of the final domestic demand and the import substitution can be noticed a parallel with an increasing one of the exports and technological change effect. However, the major source of the evolution during this period was the final domestic demand (66.54%). The contributions of exports, import substitution and technological change effect were respectively: 17.42, −1.97 and 18.01%. Following the 1994 economic crisis, in 2001 Turkey faced the biggest economic crisis it had ever experienced (Çolak, 2019; Kazgan, 2021a). In response, Turkey cooperated with IMF to implement the programme of "Transition to a Strong Economy". The implementation of the programme facilitated a serious flow of funds into the banking system. Thanks to the fund inflows, Turkey has achieved serious economic growth.

Tab. 3: Demand-side dynamics of sectoral growth during the period from 2001 to 2008 (%)

Sectors	Final demand effect	Export effect	Import substitution effect	Technological change effect
Total	66.54	17.42	−1.97	18.01
Agriculture	102.84	11.03	−19.95	6.08
Industry	60.21	22.99	0.26	16.54
Services	73.87	7.91	−3.94	22.16
Manufacturing industries	54.02	33.53	0.87	11.57
Food, beverage, and tobacco manufactures (15t16)	40.52	5.77	−2.80	56.50
Manufacture of textiles, textile products, clothing, and footwear (17T19)	75.98	14.76	−9.27	18.54
Manufacture of wood and products of wood and cork (20)	46.28	14.49	11.65	27.58
Manufacture of paper, pulp products, printing, and publishing (21T22)	57.46	15.92	18.90	7.72
Manufacture of coke, refined petroleum products and nuclear fuel (23)	−212.76	−130.59	342.13	101.22
Manufacture of chemicals and chemical products (24)	238.16	146.43	−454.98	170.39
Manufacture of rubber and plastics products (25)	19.30	24.49	56.47	−0.25
Manufacture of other non-metallic mineral products (26)	62.73	20.51	−0.40	17.16
Manufacture of basic metals (27)	33.45	77.20	−20.00	9.36
Manufacture of fabricated metal products (28)	60.82	24.51	16.30	−1.63
Machinery and equipment n.e.c; manufacture of computer, electronic and optical equipment (29T33)	86.36	32.60	−4.80	−14.17
Manufacture of motor vehicles, trailers, and semi-trailers (34)	55.73	68.03	−17.84	−5.92
Manufacture of other transportation vehicles (35)	−73.08	−13.72	181.60	5.20
Manufacturing n.e.c, recycling (36T37)	15.20	2.13	79.26	3.41

Source: own (based on input-output data)

In the post-2001 era , it had been expected that increasing exports and tourism revenues could provide an important cushion for economic development (Kazgan, 2021b). As a result of these applied policies, the Turkish economy grew by 7% on average during the period from 2002 to 2007 (Bahçe & Köse, 2019). Compared to the 1995–2001 period, the exports policies strengthen exports' impact on sectoral growth in the post-2001 period in industry and especially in the manufacturing industry as shown in Tab. 3. The impact of technological change on sectoral growth also increased in the post-2001 period. However, the domestic final demand was continuing to be the major contributor of sectoral growth.

The contributions of the final domestic demand to the evolution of agriculture, industry and services were respectively: 102.84, 60.21 and 73.87% during the period from 2001

to 2008. Likewise, the contributions of the exports' expansion to the growth of the mentioned sectors were respectively: 11.03, 22.99 and 7.91%; those of the import substitution were: −19.95, 0.26 and −3.94%; and those of technological change effect were: 6.08, 16.54, and 22.16%. Except for the final domestic demand, the demand dynamics grew faster during the period from 2001 to 2008 compared with that from 1995 to 2001. The contributions of the final domestic demand, exports, import substitution and technological change effect were equivalent to 54.06, 33.53, 0.87 and 11.57% of the manufacturing industries' growth during the studied interval. Significant changes took place in the manufacturing sub-industries during the period of 2001–2008 compared with the previous period. The positive contribution of coke, refined petroleum products and nuclear fuel manufacturing and the manufacture of other vehicles turned out to be negative respectively −212,76% and −73.08% during this period. Likewise, the positive contributions of the exports' expansion also turned negative respectively equivalent to −130.59% and −13.72% of the mentioned two sub-sectors evolution. Moreover, the import substitution negatively influenced the growth of the sub-sectors of food, beverage, and tobacco products (−2.80%), textiles, textile products, clothing, and footwear (−9.27%), chemicals and chemical products (−454.98%), other non-metallic mineral products (−0.40%), basic metals (−20.00%), motor vehicles, trailers and semi-trailers (−17.84%). The sub-sector of chemicals and chemical products demonstrated the highest rate of technological change effect (170.39%), while that of motor vehicles, trailers and semi-trailers exhibited the lowest one (−5.92%). Tab. 4 shows the demand-side dynamics of economic growth during the period from 2008 to 2015. The results revealed that the final domestic demand gained recovery during the period from 2008 to 2015 after the shrinking that had been mirrored during the period from 2001 to 2008. Furthermore, lower growth rates of import substitution and technological change effect had been recorded during this period compared with the earlier one (2001–2008). The contributions of the final domestic demand, exports, import substitution and technological change effect were account for 83.56, 21.83, −5.50 and 0.11% respectively of output growth during the period from 2008 to 2015. After the 2001 crisis, the implementation of the structural adjustments policies in line with the reforms besides the integration with global markets and the positive international environment played an important role in the Turkish economic growth process. However, the 2008–2009 crisis put an end to this period of relatively strong economic growth. The negative impacts of the 2008–2009 crisis on economic growth are thought to be attributed to the strict credit policies, the sudden decreases in investment expenditures and household consumption. In addition, the impact of external demand on economic growth was negative in 2009. The decline in foreign demand adversely affected the export-oriented industries in the last period of 2008 (Aytaç, 2018). Many sectors, especially the manufacturing industry, had been adversely affected by the general shortening of credit, the decrease in demand, and the increase in domestic costs (Kazgan, 2021a). Since 2010, the economy returned to its long-run path and started to recover after the crisis (Bahçe & Köse, 2019). During this period, the domestic final demand continued to increase strongly (Aytaç, 2018). The average economic growth rate was 6% during the period from 2010 to 2015. The rate of economic growth reached a tremendous rate of 11.20% in 2011. This rate was the highest economic growth rate Turkey had achieved in the post-1980 period. Like the period of 2002–2007 in 2010 to 2015, the main sources of economic growth were the inflows of external funds, the low-interest rates, and government incentives (Kazgan, 2021a). Although the impact of the exports on sectoral growth increased during the period from 2008 to 2015, the main source of Turkish growth was domestic final demand as shown in Tab. 4. In addition, the impact of technological change on sectoral growth decreased in the same period.

Final domestic demand and exports expansion were the major sources of economic growth in the main sectors of the economy namely agriculture, industry, and services in the period between 2008 and 2015. In magnitude, the former contributed 96.00, 75.04, and 73.56% and the latter contributed 6.29, 29.27, and 16.15% of the main sectors' evolution respectively. The effect of import substitution was negative in industry and services but positive in agriculture. Furthermore, the technological change effect contributed positively to the growth of the industry but negatively to those of agriculture and services. Generally, the exports' expansion contributed more significantly to

Tab. 4: Demand-side dynamics of sectoral growth during the period from 2008 to 2015 (%)

Sectors	Final demand effect	Export effect	Import substitution effect	Technological change effect
Total	83.56	21.83	−5.50	0.11
Agriculture	96.00	6.29	0.36	−2.65
Industry	75.04	29.27	−8.44	4.14
Services	90.80	16.25	−3.24	−3.81
Manufacturing industries	73.56	38.49	−8.48	−3.56
Food, beverage, and tobacco manufactures (15t16)	92.55	5.44	1.49	0.52
Manufacture of textiles, textile products, clothing, and footwear (17T19)	72.45	36.68	2.14	−11.28
Manufacture of wood and products of wood and cork (20)	80.33	12.65	2.55	4.47
Manufacture of paper, pulp products, printing, and publishing (21T22)	80.94	9.59	−1.49	10.95
Manufacture of coke, refined petroleum products and nuclear fuel (23)	71.59	55.35	−44.44	17.49
Manufacture of chemicals and chemical products (24)	89.11	30.44	−12.30	−7.25
Manufacture of rubber and plastics products (25)	63.28	28.79	4.21	3.72
Manufacture of other non-metallic mineral products (26)	67.36	30.69	0.00	1.94
Manufacture of basic metals (27)	35.74	105.87	−57.77	16.16
Manufacture of fabricated metal products (28)	101.23	29.49	−1.35	−29.38
Machinery and equipment n.e.c; manufacture of computer, electronic and optical equipment (29T33)	77.37	39.68	−0.20	−16.85
Manufacture of motor vehicles, trailers, and semi-trailers (34)	33.23	85.50	−5.92	−12.81
Manufacture of other transportation vehicles (35)	15.66	80.85	18.33	−14.83
Manufacturing n.e.c, recycling (36T37)	102.90	8.26	1.19	−12.35

Source: own (based OECD input-output data)

the manufacturing industries' evolution during the period of 2008–2015 compared to those of 1995–2001 and 2001–2008. Relatively, the contributions of exports' expansion, final domestic demand, import substitution and technological change effect were respectively: 38.49, 73.56, −8.48 and −3.56% during the period from 2008 to 2015. The sub-sector of manufacturing n.e.c, recycling especially recorded the highest final domestic demand (102.90%), while that of other transportation vehicles recorded the lowest rate equivalent to 15.66% of the evolution. Likewise, the basic metals industry demonstrated the most exports enlargement (105.87%) on contrary to the sub-sector of food, beverage and tobacco products manufacturing which recorded the lowest rate equivalent to 5.44%. Furthermore, the contributions

of the sub-sectors of coke, refined petroleum products and nuclear fuel manufacturing and paper, pulp products, printing and publishing were negative during the period from 2008 to 2015 but positive during the previous one. With this respect, the rate of import substitution was equivalent to −44.44% of the coke, refined petroleum products and nuclear fuel manufacturing growth and −1.49% of the growth of paper, pulp products, printing, and publishing. While the basic metal industry demonstrated the highest rate of technological change effect equivalent to 16.16%, the fabricated metal products manufacturing demonstrated the lowest one equivalent to −29.38% of growth during the studied interval. Tab. 5 shows the sources of sectoral growth in the Turkish economy in the whole period 1995–2015. The main source of the sectoral growth was the domestic final demand during this period. Consequently, it can be

Tab. 5: Demand-side dynamics of sectoral growth during the period from 1995 to 2015 (%)

Sectors	Final demand effect	Export effect	Import substitution effect	Technological change effect
Total	102.44	16.69	0.41	−19.54
Agriculture	107.19	7.25	0.16	−14.60
Industry	100.51	18.04	0.68	−19.24
Services	103.32	17.58	0.17	−21.08
Manufacturing industries	94.37	20.41	0.85	−15.63
Food, beverage, and tobacco manufactures (15T16)	118.95	15.89	0.10	−34.93
Manufacture of textiles, textile products, clothing, and footwear (17T19)	81.95	34.41	0.55	−16.91
Manufacture of wood and products of wood and cork (20)	172.88	36.14	0.94	−109.95
Manufacture of paper, pulp products, printing, and publishing (21T22)	84.11	11.37	0.21	4.31
Manufacture of coke, refined petroleum products and nuclear fuel (23)	75.98	11.57	0.86	11.58
Manufacture of chemicals and chemical products (24)	120.14	20.66	1.74	−42.54
Manufacture of rubber and plastics products (25)	153.33	27.54	1.64	−82.51
Manufacture of other non-metallic mineral products (26)	108.02	15.25	0.26	−23.53
Manufacture of basic metals (27)	72.55	33.37	1.58	−7.49
Manufacture of fabricated metal products (28)	100.92	18.35	0.56	−19.83
Machinery and equipment n.e.c; manufacture of computer, electronic and optical equipment (29T33)	80.74	11.33	1.26	6.66
Manufacture of motor vehicles, trailers, and semi-trailers (34)	88.44	8.60	1.96	1.00
Manufacture of other transportation vehicles (35)	77.02	24.13	0.04	−1.19
Manufacturing n.e.c, recycling (36T37)	−73.69	−38.46	7.30	204.84

Source: own

concluded that the followed structural adjustment and export-led policies seems to far from providing the intended outcomes. In the aftermath of 1980's, the Turkish economy became fragile and excessively dependent on external financing (Boratav, 2019, 2021; Orhangazi, 2020; Kazgan, 2021a, 2021b) and as a result, the Turkish economy suffered significantly from the economic and financial crises of 1994, 1998/1999, 2001 and 2008. The external trade structure, trade and current account deficits should be no surprise because the economy was becoming more dependent on foreign financing over time. The Turkish economy has been able to attract significant foreign direct investment since the 2000s. However, most of these foreign investments were directed towards the construction and non-tradable services such as finance and communication; the matter that reduced the potential to generate income from exports. On the other side, Turkey has a medium-level technological structure of exports. The transition from medium to high technological level in the structure of exports is evolving very slowly. The technological and industrial upgrading towards the production of high-tech goods and services (especially in manufacturing) is very crucial in stabilising the internal and external equilibrium and sustaining economic growth in the Turkish economy (Aytaç, 2018; Kazgan, 2021a, 2021b). Tab. 5 shows the demand-side dynamics of Turkish economic evolution during the whole period from 1995 to 2015. The contribution of those dynamics to the aggregate economic growth was 102.44% for final domestic demand, 16.69% for exports, 0.41% for import substitution and −19.54% for technological change effect. The final domestic demand contributed 107.19, 100.51 and 103.32% to the growth of agriculture, industry, and services respectively. Moreover, the export expansion contributed 7.25, 18.04 and 17.58% to the growth of agriculture, industry, and services respectively. However, the contribution of the import substitution to the main sector's growth is trivial (below 1%). The contribution of the technological change effect was negative in majority of the sub-industries.

The demand-side dynamics of manufacturing industries' growth were respectively: final domestic demand (94.37%), exports (20.41%), import substitution (0.85%) and technological change effect (−15.63%). In general, exports grew more efficiently in the manufacturing industries compared with other sectors. The evolution of the sub-sector of wood, wood and cork products especially recorded the highest domestic and export demand during the period from 1995 to 2015 equivalent to 172.88% and 36.14% respectively. However, in the subsector of manufacturing n.e.c, recycling recorded the lowest rates equivalent to −73.69% for the former and −38.46% for the latter. The contribution of import substitution is around 7.3% of the sectoral evolution during the same period. Whereas the recycling sub industry recorded a remarkable rate of technological change effect (204.84%), the sub-manufacturing industry of wood, wood and cork products recorded the lowest one (−109.95%).

Conclusions

The Turkish economy witnessed two different periods of structural changes: pre- and post 1980 (Orhangazi, 2020). In the pre-1980 period, Turkey was mired in import-substitution industrialisation policies. Under those applied policies, the imported durable consumer and capital goods were replaced by domestic production; leading to the revival of domestic demand and the transformation of the Turkish economy from agrarian to the industrial one (Doğruel & Doğruel, 2017; Taymaz & Voyvoda, 2017; Yeldan, 2016). In the post-1980 period, the Turkish economy went through a process of tremendous sea change once again. Turkey passed from an inward-oriented and import-substituting structure to an outward- and export-oriented one. This transformation started in line with the structural adjustment policies recommended by the International Monetary Fund (IMF) and the World Bank (WB). The Turkish economy opened to foreign markets and liberalised its trade regime at the beginning of the 1980s. In 1989/1990, removing the obstacles to financial inflows was a key element in promoting financial liberalisation. Thus, the liberalisation process of the Turkish economy had completed in the 1990s. During this period, domestic demand was being suppressed and the policies of subsidies and incentives had been implemented to attract external demand. Simultaneously, the high-interest policy had been pursued to encourage capital inflows and stabilize the exchange rates. As a consequence of these policies, the structure of the Turkish economy has shifted towards services and become much more dependant on foreign capital inflows.

Furthermore, the value-added of the services sector (% of GDP) increased rapidly during this period (Altıok & Tuncer, 2013; Aytaç, 2018; Bakır et al., 2017; Doğruel & Doğruel, 2018; Soydan, 2018; Wigley et al., 2018). However, the Turkish economy had become vulnerable to crises. The Turkish economy experienced the effects of five different crises, namely 1994, 1998/1999, 2001 and 2008 and negative growth occurred. These economic fluctuations left the Turkish economy constantly unstable (Boratav, 2019; Kazgan, 2021a, 2021b; Orhangazi, 2020; Pamuk, 2015; Yeldan, 2016, 2019).

In this paper, economic evolution in the Turkish economy and the manufacturing industries during the periods of 1995–2001, 2001–2008, 2008–2015 and 1995–2015 are questioned from a demand-side perspective taking into consideration the mentioned economic crises. The structural decomposition model proposed by Chenery (1960) and developed, by Chenery et al. (1962) was applied to decompose the growth in the Turkish economy and sectoral production increase during certain periods. The results revealed that the final domestic demand was the main dynamic stimulating economic evolution during the periods of 1995–2001, 2001–2008 and 2008–2015. However, it demonstrated the most important decline during the period from 2001 to 2008. The second important factor that significantly contributed to economic evolution was export expansion. Unlike other main sectors of the Turkish economy, the growth of the manufacturing industries stemming from the demand dynamics varies greatly. For example, the manufacturing industries' exports were more efficient than the other sectors. As well as the other sectors, the final domestic demand of the manufacturing industries demonstrated the most important decline during the period from 2001 to 2008 but it was the main dynamic stimulating economic evolution during the rest periods. The exports were more effective in leading to growth in the manufacturing industry. The exports grew more efficiently in the manufacturing industries sector compared with other sectors. The enlargement of technological change negatively affects long-run production growth.

We concluded that the intermediate and final domestic demand was the key dynamic provoking economic evolution. In this context, although the outward-oriented and the export-led industrialisation policies implemented in the post-1980 were effective in the short term (especially during the period of 2001–2008), they seemed to be non-effective in the long term. Rather, they put the internal and external macroeconomic balance in jeopardy and opened the door to economic crisis had been faced at that period. The findings revealed in this study are similar to those reported in previous studies. For instance, the works of Celasun (1983) for the periods of 1953–1963, 1963–1968 and 1968–1973; Pamuk and Boer 2000 for the periods of 1968–1979, 1979–1990 and 1968–1990; Tunç (2004) for the period of 1990–1996; Çalışkan and Aydoğuş (2011) for the period of 1990–2002; Günçavdı and Küçükçifçi (2001, 2011, 2012) for the periods of 1973–1985, 1985–1990, 1990–1996 and 1973–1996 and Ayaş (2017) for the period of 1996–2011. Since that there are limited studies in the literature that examine the sources of sectoral growth utilising the structural decomposition technique; it is expected that the conclusions of this study will contribute to the literature in providing an up-to-date scale to measure the growth prospects in the Turkish economy from a demand-side perspective. Finally, long-run and short-run economic evolution in Turkey can be triggered by final domestic demand's growth. To these ends, policies aimed at increasing income, demand, product diversity and reducing poverty should be applied to encourage the deepening of domestic demand. Moreover, since that the adopted export-led policies, which worked successfully in other economies such as the far Eastern countries, did not achieve the intended outcomes such as reducing domestic demand and rising export demand; microeconomic policies should be applied for industrial and technological upgrading, reducing the harmful effects of external shocks and help creating more resilient macroeconomic structure.

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