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Structural transformation and sources of growth in Turkey

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Abstract: This paper provides a comprehensive analysis of the supply and demand side of structural transformation in Turkey. Using the GGDC/UNU-WIDER Economic Transformation Database, we find that labour productivity improvements explain more than half of economic growth in the period 1980–2021. This is mainly thanks to within-sector productivity improvements, while the contribution of structural change declines over time. Time-series regression analysis shows that structural change is driven by per capita income growth and financial openness but is halted by trade integration. Furthermore, decomposition analysis from input–output tables demonstrates that domestic final demand has been the main source of output growth since 1980 and the contribution of export expansion has increased over time, but import dependency has persisted. The intermediate goods industry stands out as the locomotive sector in the economy throughout the entire period according to forward and backward linkage analysis.

Key words: labour productivity, structural transformation, economic growth, input–output, forward linkage, backward linkage

JEL classification: C67, O11, O47, J24

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1 Introduction

After a long period of an inward-looking development strategy based on import substitution, Turkey shifted its policies towards an outward-oriented market economy from 1980. This shift was facilitated by the establishment of a customs union with the European Union (EU), structural adjustment programmes in response to economic crises, and Turkey's EU accession negotiations, which all contributed to its integration into global value chains. Turkey succeeded in reorienting its production structure and export composition from agriculture to the industry and services sectors, leading to improved international competitiveness for domestic firms and attracting significant foreign investment. As a result, trade and financial openness rose substantially and Turkey achieved a 4.6 per cent average annual growth rate between 1980 and 2021, outpacing many of its peer countries. However, this growth strategy has had unintended consequences, such as increased financialization, greater external vulnerabilities, and increased exposure to global financial risks (Akat and Yazgan 2013; Guncavdi and Bayar 2020; Orhangazi 2019).

Although higher growth is desirable, its quality is equally important to ensure that all segments of society reap its full benefits. In this regard, decomposition analyses are useful in revealing the sources of economic growth. Typically, the literature focuses on either the supply or the demand side of aggregate output to examine the sources of growth. From the supply-side perspective, economic growth is divided into employment growth and labour productivity growth, which measures output per worker.[1] While the former relates to the involvement of more resources in economic activity, the latter is linked to improving wages, reducing poverty, expanding the middle class, and raising living standards. Labour productivity dynamics can be further broken down into sector-specific productivity improvements, which can result from capital accumulation, technological advancements within sectors, or structural change such as labour reallocation between sectors (McMillan et al. 2014). The sources of output growth can also be analysed from the demand side of the economy with the help of input–output (I–-O) tables. This strand of the literature breaks down total demand into final domestic demand, export expansion, import substitution, and technological advancements, and calculates the relative contributions of these factors to total output growth. In addition, this type of analysis allows us to identify the key sectors with strong forward and backward linkages in the economy.

This study aims to provide a comprehensive analysis of the sources of growth and structural change in the Turkish economy by merging the two strands of the literature. Our first focus is on the supply side of the economy, specifically examining the dynamics of labour productivity for different sub-periods between 1960 and 2021. Prior studies show that sector-specific productivity improvements mainly drive labour productivity in Turkey, with some contribution from structural change (Atiyas and Bakis 2015, 2020; Rodrik 2010; Tuncer and Moalla 2020). To contribute to the literature, we extend sectoral value-added and employment data to cover the entire period and analyse a wider timespan by combining the GGDC/UNU-WIDER Economic Transformation Database (ETD) with less detailed value-added and employment data from the Turkish Statistical Institute (TURKSTAT). Additionally, we examine the drivers of structural change by regressing it to several possible covariates, which is a novel contribution to the literature on Turkey.

[1] Another branch of the supply-side growth accounting literature decomposes economic growth into labour, capital, and total factor productivity components (Atiyas and Bakis 2020). Because our focus is on labour productivity and structural change, such an analysis is beyond the scope of this paper.

Our results reveal that more than half of Turkey's economic growth in the post-1980 period is attributable to labour productivity growth, which was mainly propelled by improvements within industry and trade services. Moreover, we demonstrate that, although structural change has continued to contribute to growth, its role has diminished over time. Furthermore, time-series regression results indicate that trade integration has reduced the contribution of structural change, in contrast to several Middle Eastern countries (Mouelhi and Ghazali 2020; Moussir and Chatri 2020), whereas higher per capita income and more open financial institutions have facilitated the structural transformation of the economy.

Next, we turn our attention to exploring the demand side of the economy. Celasun's (1983) comprehensive analysis of growth sources during the inward-looking development era from the 1950s to the late 1970s was followed by numerous studies (Caliskan and Aydogus 2011; Guncavdi and Kucukcifci 2004; Voyvoda 2008) that highlighted the role of domestic final demand and export expansion in driving output growth, while import substitution had a negative impact. Altan et al. (2015), Ersungur et al. (2011), and Pehlivanoğlu and İnce (2020) extended these findings, identifying the manufacturing and utilities sectors as critical for different sub-periods. Our analysis builds on these earlier studies, using I–O tables for 1973, 1979, 1990, 2002, and 2012 from the TURKSTAT database and for 2021 prepared by Tasci (2023). Our findings confirm that domestic demand has been the primary driver of output growth, although its influence has gradually decreased and been replaced by export expansion. However, the shift towards outward-oriented policies has led to an increase in import dependence. Additionally, we observe that intermediate goods industries have consistently played a critical role in the economy since the 1980s.

The paper is structured as follows. Section 2 presents an overview of the Turkish economy and major policy shifts since 1980. Section 3 analyses its productivity dynamics and structural changes. Section 4 investigates the sources of output growth from the demand side, and the Section 5 concludes.

2 A brief history of the Turkish economy and major policy shifts after 1980

Turkey pursued an import-substitution development strategy based on high import tariffs and state-led industrialization from the 1960s to the end of the 1970s. Rapid industrialization efforts during the 1960s led to a substantial rise in the trade deficit through rapid import growth in capital and intermediate goods. The stability programme consisting of devaluation and export subsidies introduced in 1970 increased exports and workers' remittances but was not sustainable due to oil price shocks, domestic and regional political instabilities, and stagflation in major export partners. All these shocks culminated in significant balance of payments problems, high inflation, and large budget deficits, and Turkey went into a deep recession at the end of 1970s.

The action plan announced by the government in 1980, known as the '24 January Decisions', aimed to control inflation, meet external financing needs, reduce the size of the public sector, and transform the economy into an outward-oriented market economy (Uygur 1997). In addition to a large currency devaluation, the government implemented several policies to integrate markets into the global economy such as export incentives, the establishment of free trade areas and export credit banks, the introduction of export insurance, and a significant reduction in import protection (Olgun and Togan 1991; Onis and Webb 1992). Trade liberalization efforts were reinforced by the second wave of the liberalization programme in 1989, which lifted exchange rate controls, reduced capital controls, and deregulated interest rates. All these policies significantly transformed the economy into a more outward-oriented one and increased Turkey's participation in global value chains. Between 1980 and 1987, Turkish exports grew by an average of 17.1 per cent annually,

surpassing its long-term average and ranking the economy among the world's top 120 (World Bank 1989). Exchange rate depreciation, export incentives, and capital investments are seen as driving this performance, along with increases in global trade and external demand in Turkey's main trading partners (Barlow and Senses 1995; Uygur 1997).

Despite facing challenges from macroeconomic crises and political instabilities, Turkey continued its structural reform process in the 1990s, in line with its export-oriented growth strategy. The establishment of a customs union with the EU in 1995 and becoming an official EU candidate in 1999 were key milestones in this regard. These developments pushed Turkey to align its industrial and competition policies with the EU, standardize technical legislation, and establish independent regulatory authorities to supervise product and financial markets. However, the Turkish economy experienced three major economic crises during the 1990s due to several factors, including unsustainable public debt, a fragile financial system, and political instability. These crises led to the 1990s being called the 'lost decade' for the Turkish economy (Taymaz and Voyvoda 2012). Then, with the support of the International Monetary Fund (IMF), the government launched the 'Transition to a Strong Economy' programme in 2001, focusing on restructuring the financial sector, increasing transparency and efficiency, strengthening public finance, and increasing competition and efficiency (Undersecretariat of Treasury 2001).

The new programme, which aimed at improving competition and productivity, was structured around three main pillars: monetary policy, fiscal policy, and the banking system. In terms of monetary policy, Turkey shifted to a floating exchange rate regime, adopted the inflation targeting system, provided instrumental independence to the Central Bank, and prohibited short-term advances and loans to the Treasury (CBRT 2002). Regarding public finance, austerity policies were implemented to cut expenditures, new taxes were introduced, and the share of indirect taxes in tax revenues was increased. The banking system also underwent restructuring and political pressure on economic management was reduced through the establishment of independent administrative authorities and supreme boards (BRSA 2010). The reforms were supported by the Justice and Development Party (AKP), which came to power in 2002, and leveraged by the EU accession negotiations in 2005. Establishing close links with the EU raised trade and investment opportunities for Turkish companies owing to the elimination of customs duties on industrial goods. It also triggered significant improvements in export sophistication and product quality through the adoption of EU standards and knowledge transfer. Accordingly, Turkey's production and export structure was transformed from low value-added sectors such as textiles and clothing to medium value-added industries such as automobiles and auto parts (World Bank 2014).

Domestic political stability, prioritization of a private sector-led market economy, a foreign investor-friendly business environment, untapped investment opportunities, and favourable global financial conditions then allowed Turkey to attract huge capital inflows, paving the way for an uninterrupted reform and transformation process until the global financial crisis in 2008–09 (Akat and Yazgan 2013). These reforms led to significant improvements in macroeconomic indicators, such as a decline in chronic inflation, a substantial increase in trade and financial openness, control of budget deficit and public debt, reduced risk perception and borrowing costs, and an increase in GDP growth and per capita income (Table 1). Welfare outcomes also improved, including declines in poverty indicators, eradication of extreme poverty, and advances in education and health services (Acemoglu and Ucer 2015; Meyersson 2017). However, during this period of economic reform, Turkey also experienced some challenges, such as a rise in financialization (Orhangazi 2019), import dependency of industrial products, a surge in current account deficit, external vulnerabilities, and more volatile economic growth (Akat and Yazgan 2013).

Table 1: Key economic indicators

	1980–90	1991–2001	2002–12	2013–21**
GDP per capita* (USD)	3,738	3,083	11,638	9,528
Real GDP growth (y-o-y, %)	4.7	2.9	5.8	5.2
Unemployment rate (%)	7.7	7.2	9.9	11.2
Consumer inflation (%)	52.1	74.6	13.3	11.8
Trade openness* (% of GDP)	30.9	49.9	52.8	71.2
Private financial openness* (% of GDP)	21.3	78.1	79.6	88.9
Foreign direct investments (% of GDP)	0.2	0.5	1.7	1.5
Current account deficit (% of GDP)	-1.2	-0.5	-4.4	-3.3
Budget deficit (% of GDP)	-1.7	-5.7	-3.7	-2.9
External debt stock* (% of GNI)	33.4	57.4	38.8	61.3
Domestic savings (% of GDP)	21.0	21.6	22.9	26.2

Note: *end-of-period figures; **latest available data.

Source: IMF WEO; World Bank; Ministry of Treasury and Finance; Saadma and Steiner (2016).

Although Turkey quickly recovered from the global financial crisis with the help of abundant global liquidity and credit-driven growth policies, macroeconomic imbalances have escalated and the quality of growth has declined since 2008. Acemoglu and Ucer (2015) associate the decline in the quality of growth with the stalling reform process, particularly due to the collapse of the EU accession negotiations, a reversal from rule-based policies to discretionary policies, and intensified government control over economic decision-making. The failure to introduce fiscal rules and an independent tax authority, the neglect of second-generation institutional and economic reforms, and a gradual erosion of the independence of key economic institutions have also been identified as major factors contributing to the loss of economic momentum (Atiyas and Bakis 2020).

In recent years, the Turkish economy has faced several internal and external shocks, including terrorist attacks, a failed coup attempt, the transition to a presidential system, the COVID-19 pandemic, and a war between Russia and Ukraine, Turkey's two largest trade partners, which have led to significant imbalances in the economy. Rising state control over financial markets, a move away from economic orthodoxy, loss of central bank independence, and the prioritization of growth with cheap credit over stable inflation and balanced growth have caused massive capital outflows, severe depreciation of the lira, uncontrolled inflation, loss of purchasing power, widening current account deficit, and growing external financing needs.

Despite these challenges, Turkey's integration into the global economy has persisted. Between 1980 and 2022, Turkey underwent a significant economic transformation, shifting from a closed, agriculture-based economy to an export-oriented one, so that a substantial portion of its economy is now composed of industry and service sectors.

3 Labour productivity growth and structural change

As mentioned earlier, Turkey's economic growth has surpassed that of most of its peers since 1980, with over half of this performance attributable to improvements in labour productivity. Labour productivity can be divided into two components: structural change and within-sector productivity growth, which provide further insights into productivity dynamics. Structural change refers to the reallocation of the labour force between sectors, which can lead to reduced productivity gaps between developing and developed countries, upgraded industries, and access to new markets (Mouelhi and Ghazali 2020). However, labour does not always shift from lower to higher productivity sectors, as in the case of African and Latin American countries, where

structural change has been productivity-reducing (McMillan et al. 2014). Productivity-enhancing structural change can lead to static gains from increased productivity in high-productivity sectors and dynamic gains from improved skills, better technology access, and capacity accumulation (Moussir and Chatri 2020).

The second component of labour productivity growth is within-sector productivity, which captures productivity improvements within individual sectors. McMillan et al. (2017) link this component to improved fundamentals such as skill accumulation and institutional capabilities, which can generate sustainable productivity growth in all sectors. As structural change has its limits, improvements in fundamentals become crucial for sustainable productivity growth in middle-income economies. This section will shed light on which component has been more crucial for the Turkish economy, which has moved from lower-middle to upper-middle income status in recent decades. Before discussing the results in more detail, we present the methodology and data.

3.1 Productivity growth decomposition

First, we express total output as a function of the number of employed people and output per worker: $Y_t = E_t * {}^{Y_t}/_{E_t}$. We can then rewrite this equation as the growth rates of each component.

$$\frac{\Delta Y_t}{Y_{t-k}} = \frac{\Delta E_t}{E_{t-k}} + \frac{\Delta LP_t}{LP_{t-k}} \tag{1}$$

where Y is gross value added at constant prices, E is employment, and LP stands for economy-wide labour productivity. The Δ operator denotes the change in relevant figures from $t-k$ to time t, with k being the length of time period. In order to decompose labour factor productivity into its two main components, we employ a shift-share decomposition technique following McMillan et al. (2014, 2017):

$$\frac{\Delta LP_t}{LP_{t-k}} = \frac{\sum_{i=1}^{N} S_{i,t-k}(p_{i,t}-p_{i,t-k})}{LP_{t-k}} + \frac{\sum_{i=1}^{N} p_{i,t}(S_{i,t}-S_{i,t-k})}{LP_{t-k}} \tag{2}$$

where $S_{i,t}$ is the share of employment in sector i at time t, $p_{i,t}$ refers to sectoral productivity level at that time, and N is the number of sectors considered. The first part of the right-hand side of Equation (2) captures the within-sector productivity component, as the weighted sum of productivity growth in each individual sector. The second part shows the structural change component, i.e. the productivity gains/losses due to the labour reallocation between different sectors. Like Alexandre et al. (2022), we express labour productivity as the growth rate from $t-k$ to time t and relate both components to the contribution of the economy-wide productivity growth. Some studies, such as de Vries et al. (2015) and Mensah et al. (2022), further divide structural change into static and dynamic reallocation effects. Although we find this additional distinction useful, we follow the standard shift-share approach suggested by Chenery et al. (1986).

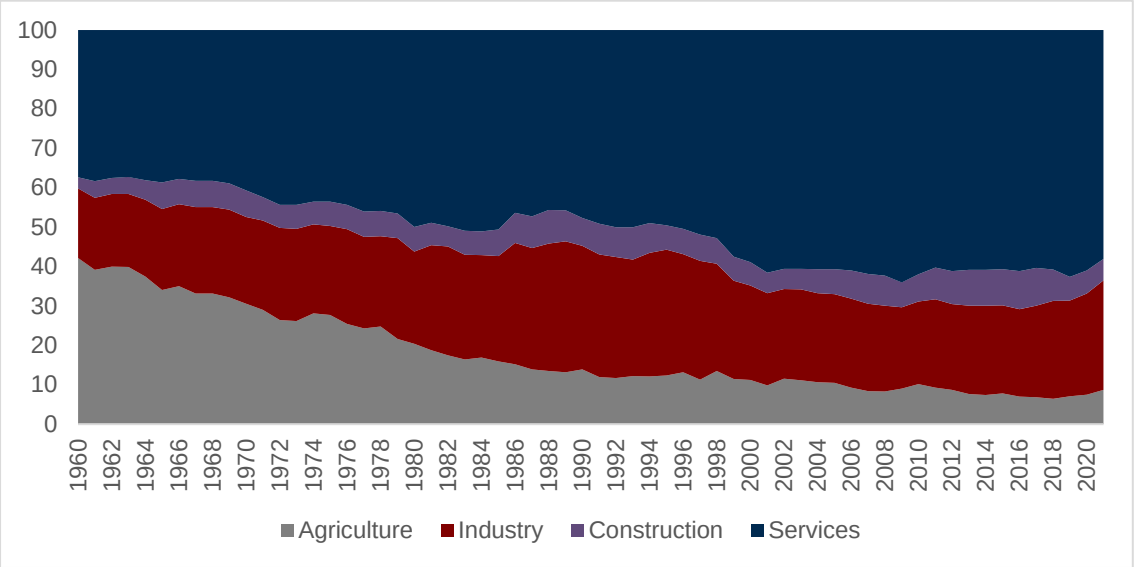
3.2 Data

Our sample covers the period between 1960 and 2021. The main data source is the GGDC/UNU-WIDER ETD, which provides time series of employment and value added by 12 sectors for the period 1990–2018.[2] Using data from official sources and the extrapolation method outlined in de Vries et al. (2021), we extended the dataset to cover the period between 1960 and 2021. TURKSTAT and the Presidency of Strategy and Budget provide nominal and real value-added series for 10 sectors based on different base year prices. We linked these to the ETD data for the period 1960–90 by rearranging the base year to 2015 using nominal value-added figures and price deflators. We used Bulutay's (1995) estimations to extrapolate sectoral employment data backwards, covering nine sectors from 1923 to 1987. We assumed the business services (J+M+N) sector to have grown at the same rate as transportation and business services in the old series, and the real estate (L) sector to have moved together with financial services (K). Other services (R+S+T+U), not included in Bulutay (1995), were estimated using the growth rate of community, social, and personal services. The real estate services sector was excluded from the analysis, as in Erumban and de Vries (2021), because a significant portion of its output consists of imputations for owner-occupied dwellings, which do not have a corresponding employment component. Therefore, the decomposition analysis is performed with 11-sector detail.

Figures 1 and 2 present the historical trends in sectoral gross value-added and employment. While the shares of industry and construction in value added and employment remained relatively unchanged over time, the share of the services sectors expanded substantially at the expense of agriculture. From 1960 to 2021, the share of agriculture in value added declined from 42.2 per cent to 8.7 per cent. In the same period, the share of the services sectors in value added rose from 37.4 per cent to 58.1 per cent. Similarly, the share of agriculture in employment shrank from 65.3 per cent in 1960 to 17.2 per cent in 2021, while the share of the services sectors jumped from 19.9 per cent to 55.3 per cent in the same period. Figure 1 highlights fluctuations in the industry's share of gross value added. After increasing steadily in the 1980s and remaining at around 30 per cent in the first half of the 1990s, it dropped to a low of 20.9 per cent in 2009. This process of 'de-industrialization' was the unintentional outcome of the government's economic preferences in favour of sectors such as construction, trade, and banking, which provided high and inclusive economic growth to large segments of society after 2003—in turn allowing the AKP to expand its public approval (Guncavdi and Bayar 2020)—but, at the same time, increased Turkey's dependence on imports of manufactured goods. However, the share of industry started to increase in 2016, particularly driven by the manufacturing sector, reaching 27.8 per cent in 2021. This 're-industrialization' is in line with trends in the developing world (Kruse et al. 2022) and can be seen as the result of the industrial demand shift from advanced economies to Turkey during the COVID-19 pandemic and the government's unusually low interest rate policy, although the causal effect warrants further research.

[2] See Kruse et al. (2022) for an overview of the database and the main industrialization trends in developing countries. The sectors (and the International Standard Industrial Classification, ISIC rev. 4 codes) are agriculture (A), mining (B), manufacturing (C), electricity, gas, and water (utilities, D+E), construction (F), trade (G+I), transport (H), business services (J+M+N), finance (K), real estate (L), government services (O+P+Q), and other services (R+S+T+U).

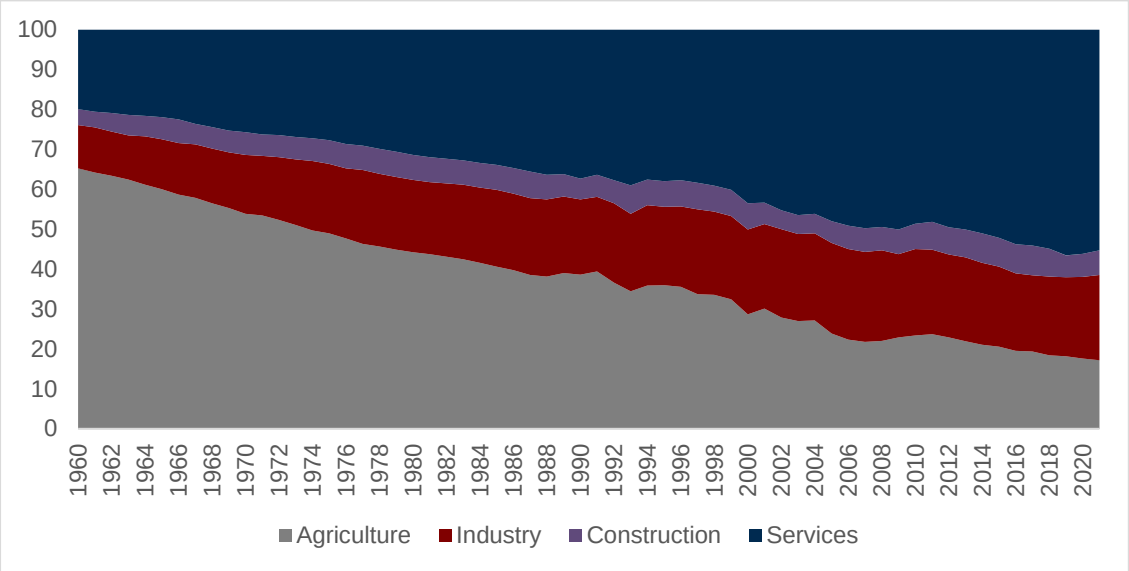
Figure 1: Sectoral (nominal) value-added shares (%)



Note: industry consists of the mining and quarrying (B), manufacturing (C), and utilities (D+E) sectors. For the purpose of illustration, the real estate services (L) sector is included in services in these figures.

Source: authors' calculations based on GGDC/UNU-WIDER ETD.

Figure 2: Sectoral employment shares (%)



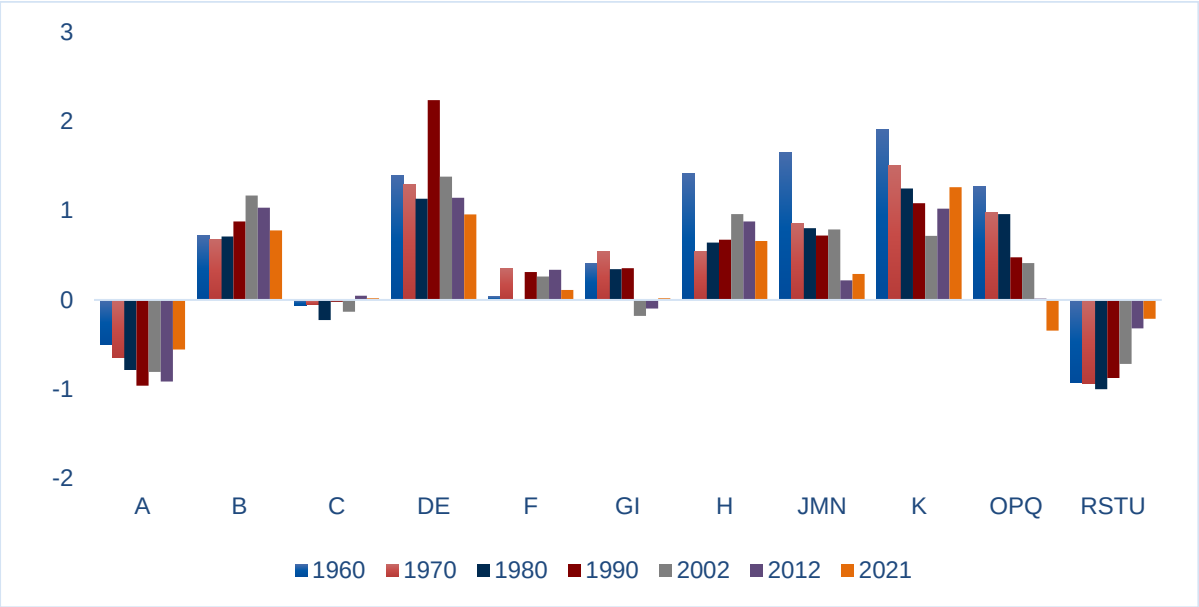
Note: industry consists of the mining and quarrying (B), manufacturing (C), and utilities (D+E) sectors. For the purpose of illustration, the real estate services (L) sector is included in services in these figures.

Source: authors' calculations based on GGDC/UNU-WIDER ETD.

Figure 3 presents the relative labour productivity of sectors, which is defined as the natural logarithm of the ratio of sectoral to overall productivity, by different years. Three observations stand out. First, as of 2021, financial services are the most productive sector, followed by the highly capital-intensive utilities and mining sectors. The agriculture and government services sectors are the least productive due to disguised employment and overstaffing. Second, the productivity of the manufacturing sector closely follows aggregate productivity for the entire period. Financial sector productivity declined until 2002 but rose after reforms following the 2001 crisis and large foreign capital inflows. In fact, almost half of the foreign direct investment inflows have since then been concentrated in the financial services sector, which might have spurred labour productivity

in these sectors. Third, productivity gaps have diminished over time, with the agriculture and other services sectors closing the gap to some extent. Conversely, the relative productivity of the mining and utilities sectors has regressed to aggregate productivity levels over time. However, the coefficient of variation remains high, indicating potential productivity gains with labour reallocation.

Figure 3: Relative labour productivity



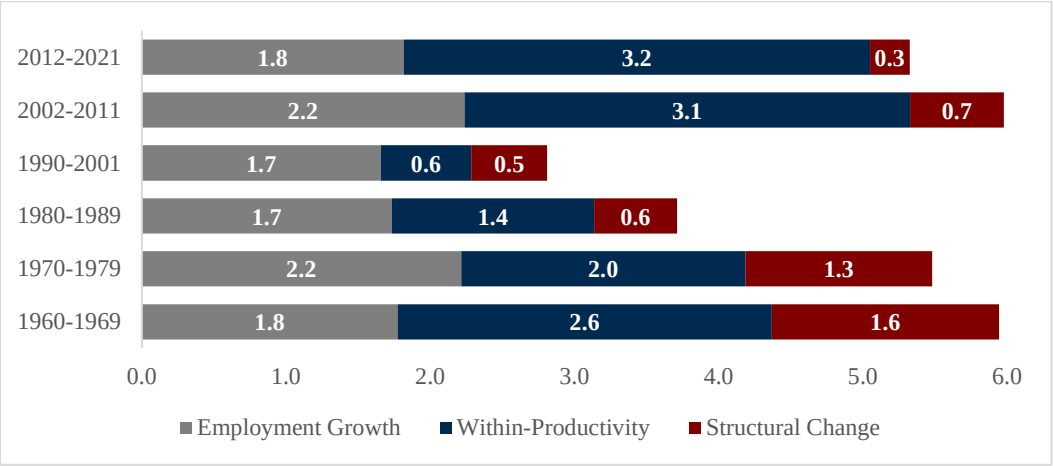
Note: relative labour productivity is calculated as the natural logarithm of sectoral productivity divided by overall productivity. Positive (negative) values correspond to higher (lower) productivity relative to overall productivity.

Source: authors' calculations based on GGDC/UNU-WIDER ETD.

3.3 Trends in labour productivity components

We break down the overall economic growth into employment growth and labour factor productivity growth using Equation (1) and further divide labour productivity growth into within-sector and structural change components using Equation (2). As shown in Figure 4, we observe a significant variation among economic growth rates and component contributions in different sub-periods. The period between 1960 and 1969 showed the best economic performance, with an average growth rate of 6.2 per cent. Labour productivity growth made the largest contribution of 4.2 percentage points, while employment growth contributed 1.8 pp. Within-productivity growth and structural change contributed 2.6 pp and 1.6 pp, respectively. The 1970–79 period also showed strong growth performance, with an average growth rate of 5.5 per cent and a 3.3 pp contribution of labour productivity. However, economic growth and structural change slowed down over the two decades following the 24 January Decisions in 1980. In both the 1980–89 and 1990–2001 periods, the main contributions came from employment growth, with 1.7 pp in both, followed by within-productivity, with 1.4 pp and 0.6 pp on average, respectively. The contribution of structural change was only 0.6 pp and 0.5 pp, respectively, in these periods.

Figure 4: Decomposition of economic growth into employment growth, within-sector and structural change components (%)



Source: authors' calculations based on GGDC/UNU-WIDER ETD.

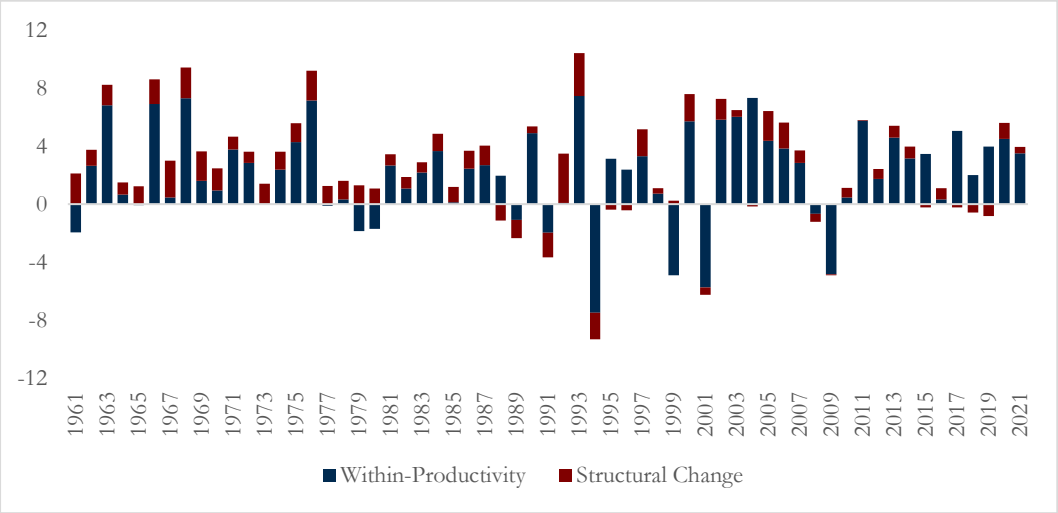
Following the 2001 economic crisis, both economic growth and the contribution of labour productivity picked up. Between 2002 and 2011, economic growth averaged 6.1 per cent, with 3.1 pp coming from within-productivity growth, 2.2 pp from employment growth, and 0.7 pp from structural change. Since 2012, the contribution of within-productivity growth has further risen to 3.2 pp, while the employment growth and structural change contributions have slowed to 1.8 and 0.3 pp, respectively. Overall, the average economic growth in the post-1980 era was 4.4 per cent,[3] of which more than half came from labour productivity increases. Within-productivity growth was the main contributor, with an average of 2 pp, followed by employment growth, with 1.9 pp, and structural change, with 0.5 pp.[4]

The time series shown in Figure 5 reveals three main trends in the contributions of the labour productivity components. First, both economic growth and the within-productivity component exhibit high volatility, particularly during the 1990s. Second, the within-productivity component drops sharply during crises and quickly rebounds afterwards, while the structural change component slowly adjusts, implying rigidities in the labour market and labour hoarding. Finally, the role of structural change has diminished over time. The contribution of structural change to labour productivity growth was even negative (productivity-reducing) in the period 2017–19. McMillan et al. (2014) argue that, as income level increases, the contribution of structural change to productivity growth declines because of sectoral specialization. However, the high share of agriculture in employment and productivity gaps among different sectors depicted in Figure 3 implies that there is still room for the structural change component to be exploited in Turkey. Therefore, we relate this productivity-reducing structural change to changing economic structure and government policies in recent years, as discussed in the previous section.

[3] This growth rate differs from the average annual growth rate of 4.6 per cent mentioned above because of the omission of the real estate sector from the decomposition analysis.

[4] Regional data on value added and employment from 2004 to 2020 suggest that the findings are mostly uniform across regions, except for Istanbul, where structural change impeded growth. Results for Istanbul are not included here due to space constraints but can be provided upon request.

Figure 5: Evolution of within-productivity and structural change components (%)



Source: authors' calculations based on GGDC/UNU-WIDER ETD.

These findings are broadly consistent with recent assessments of Turkish productivity dynamics by Atiyas and Bakis (2020) and Tuncer and Moalla (2020), with some differences in the magnitudes of the contributions. These studies also found that within-productivity was the main driver of labour productivity growth, except in the period 1990–2002, and that the contribution of structural change has declined over time. However, there are some quantitative differences in terms of the relative contributions of structural change and within-productivity, despite the similarity of labour productivity calculations for different periods. This is mainly because our dataset covers more disaggregated data (12 sectors) than the nine sectors covered in Atiyas and Bakis (2020), which provides more variation during the disaggregation process. It also allows us to exclude the real estate sector from the overall productivity computations. Productivity in the real estate sector has shown a substantial decline since 1980 according to our dataset, which may have led to underestimation of the contribution of the within-sector component.

Although our results are comparable with the above-mentioned studies using macro-level data, they contradict the findings of Dincer et al. (2022), who use firm-level data to analyse the productivity dynamics in Turkish manufacturing and services industries. In contrast to our findings, they suggest that labour productivity growth was negative between 2003 and 2015, mainly because of the impact of the government's sectoral policies on the expansion of low-productivity employment in the services sector. Although we find their approach a useful contribution, we think that the striking differences between their findings and ours are mainly due to their exclusion from their analysis of the agriculture sector and small-sized firms. In fact, we also find that employment growth in the low-productivity sectors (especially in non-market services, O~U) picked up considerably in the 2000s and that relative productivity is lower in these services than in economy-wide productivity. However, productivity levels in these sectors are still above agricultural sector productivity (see Figure 3); therefore, this approach neglects the impact of the shift between these sectors on overall productivity. Additionally, although larger firms are typically more productive, aggregate productivity growth is often driven by new small firms with more intensive usage of information and communication technologies (ICT) and innovation, as noted by the OECD (2021).

Table 2 presents the sectoral contributions to the within-productivity and structural change components in detail for each period. To make interpretation easier, the 11 sectors are aggregated into 6 sectors. The industry sector includes mining and quarrying, manufacturing, and utilities,

while the services sector is divided into three categories: trade and transportation, business and finance, and non-market services.

Table 2: Real GDP growth decomposition (%)

	1960–1969	1970–1979	1980–1989	1990–2001	2002–2011	2012–2021	1980–2021
Real GDP growth	6.24	5.55	3.74	2.73	6.06	5.38	4.39
of which							
Employment growth	1.77	2.21	1.73	1.66	2.24	1.82	1.85
Labour productivity growth	4.17	3.27	1.98	1.15	3.74	3.51	2.53
of which							
Within-productivity	*2.59*	*1.97*	*1.40*	*0.63*	*3.09*	*3.23*	*2.02*
of which							
Agriculture	*0.87*	*0.42*	*0.07*	*0.27*	*0.44*	*0.63*	*0.35*
Industry (B~E)	*0.72*	*0.22*	*0.93*	*0.39*	*1.00*	*0.75*	*0.75*
Construction (F)	*0.43*	*-0.05*	*0.41*	*-0.10*	*0.45*	*0.23*	*0.23*
Trade and transport services (G~I)	*0.35*	*0.59*	*0.28*	*-0.14*	*1.04*	*1.04*	*0.52*
Business and financial services (J~K)	*-0.16*	*0.14*	*0.05*	*0.08*	*0.09*	*0.57*	*0.19*
Non-market services (O~U)	*0.39*	*0.64*	*-0.34*	*0.12*	*0.07*	*0.02*	*-0.03*
Structural change	*1.58*	*1.29*	*0.58*	*0.53*	*0.65*	*0.28*	*0.51*
of which							
Agriculture	*-0.60*	*-0.51*	*-0.26*	*-0.33*	*-0.31*	*-0.28*	*-0.30*
Industry (B~E)	*0.29*	*0.47*	*-0.16*	*0.05*	*0.04*	*0.05*	*0.00*
Construction (F)	*0.15*	*0.11*	*-0.09*	*0.00*	*0.23*	*-0.15*	*0.00*
Trade and transport services (G~I)	*0.67*	*0.45*	*0.49*	*0.67*	*0.05*	*0.05*	*0.33*
Business and financial services (J~K)	*0.48*	*0.26*	*0.09*	*0.11*	*0.48*	*0.14*	*0.20*
Non-market services (O~U)	*0.60*	*0.51*	*0.50*	*0.03*	*0.16*	*0.46*	*0.28*

Note: the 11 sectors in the decomposition analysis are aggregated into 6 broad sectors for ease of interpretation. Numbers may not add up due to rounding.

Source: authors' calculations based on GGDC/UNU-WIDER ETD.

From 1980 to 2021, the industrial sectors, particularly manufacturing, made the largest contribution to average within-productivity growth, with 0.75 pp. Except in the 1970s and 'the lost decade' of the 1990s, the industrial sectors had strong within-productivity growth in all sub-periods. Trade and transportation services had the second-largest contribution to within-productivity growth in the post-1980 period, with 0.52 pp. In addition, trade and transportation services had the highest within-productivity growth among all sectors in the post-2002 period. While agriculture, construction, and business services have improved within-productivity since 1980, non-market services have experienced a productivity slowdown.

The table also shows that structural change was mainly driven by the services sector, especially trade and transportation services. As expected, the agriculture sector made a negative contribution to structural change, while the contributions of industry and construction were negligible. The trend in the construction sector is particularly interesting. Despite several studies highlighting Turkey's excessive reliance on construction (Atiyas and Bakis 2020; Guncavdi and Bayar 2020; Orhangazi 2019), our results indicate that the construction sector's contribution to structural change was negative in the 2012–21 period, mainly due to a sharp decline in construction employment after 2018.

In Table 3 we compare our labour productivity decompositions of Turkey with those of other developing countries using Erumban and de Vries (2021) for the same sub-periods. Productivity

growth in Turkey outpaced that of other developing countries[5] but was below the level in developing Asia in all sub-periods. For all regions, the contributions of structural change and within-productivity were relatively similar between 1990 and 2020. However, the contribution of structural change has declined over time in all regions and even turned negative after 2010 in other developing countries. On the contrary, overall productivity growth and within-productivity contributions have improved in all regions. Overall, productivity trends in Turkey follow the pattern in the developing world.

Table 3: Comparison with developing world

	Developing Asia	Other developing	Turkey
Productivity growth			
1990–2000	3.42	1.08	1.47
2000–10	4.10	1.72	2.54
2010–18	4.31	1.60	3.52
Structural change			
1990–2000	1.47	0.35	0.64
2000–10	1.28	0.47	0.60
2010–18	1.13	-0.02	0.26
Within-productivity			
1990–2000	1.96	0.73	0.84
2000–10	2.82	1.25	1.94
2010–18	3.18	1.63	3.26

Source: Erumban and de Vries (2021) and authors' calculations.

3.4 Drivers of structural change

Structural change is often associated with changes in real income, relative price developments, economic and financial globalization, foreign investment, sophistication in production structure, industrial policies, and labour market conditions.[6] In the case of Turkey, Atiyas and Bakis (2015) link the significant contribution of structural change to aggregate productivity with the change in export composition from traditional products to medium-tech products. They also show some positive impact of R&D incentives on regional employment but argue that structural change was not a direct result of industrial policies due to the lack of sectoral selectivity in the incentive system. However, to the best of our knowledge, there is no empirical study that formally investigates the drivers of structural change in Turkey. To fill this gap, we estimate the following model similar to de Vries et al. (2015), Martins (2019), Mouelhi and Ghazali (2021), and Moussir and Chatri (2020):

$$SC_t = \alpha_t + \sum_{k=1}^{p} \beta_k X_t + u_t \quad (3)$$

where SC is the structural change contribution to annual labour productivity growth in time t, α is the intercept, u is the error term, and X is a vector of selected possible determinants of the structural change based on the literature.[7]

Table 4 presents the results of different regression models based on Equation (3). The first column shows that per capita GDP growth significantly increases the structural change component of

[5] 'Other developing countries' covers nine Latin American countries, Egypt, Morocco, Tunisia, and Turkey.

[6] For a comprehensive survey of the literature, see van Neuss (2019).

[7] Lists of all explanatory variables and data sources are provided in Table A1 in the Appendix.

productivity growth. This is in line with the presumption that, as per capita income rises, the demand structure changes towards more sophisticated products and services, inducing the reallocation of resources in the production structure (van Neuss 2019).[8]

Table 4: Drivers of structural transformation

	(I)	(II)	(III)	(IV)	(V)	(VI)
GDP per capita growth (%)	14.068***	14.329***	14.091***	13.954***	14.282***	14.610***
	(3.203)	(3.263)	(3.280)	(3.360)	(3.292)	(4.564)
Trade openness (%)	-0.066***	-0.067***	-0.066***	-0.066***	-0.060**	-0.073*
	(0.018)	(0.019)	(0.019)	(0.020)	(0.029)	(0.039)
Private financial openness (%)	0.022**	0.025**	0.022*	0.021**	0.023	0.032
	(0.010)	(0.011)	(0.012)	(0.010)	(0.014)	(0.020)
FDI to GDP (%)		-0.118				
		(0.218)				
Credit to GDP (%)			-0.000			
			(0.011)			
Polity score				0.015		
				(0.029)		
Years of schooling					-0.092	
					(0.348)	
R&D expenditures to GDP (%)						-1.039
						(1.565)
Observations	52	52	52	49	50	31
R-squared	0.376	0.380	0.376	0.378	0.397	0.328

Note: dependent variable is structural change contribution to annual labour productivity growth between 1960 and 2021. Standard errors are in parentheses. Breusch-Pagan and Breusch-Godfrey tests reject the presence of heteroskedasticity and autocorrelation, respectively. * p<0.10, ** p<0.05, *** p<0.01.

Source: authors' calculations.

Surprisingly, though, increasing trade integration into global value chains reduces the contribution of structural change to productivity growth, as evidenced by the negative coefficient estimate for trade openness. This finding contradicts the results of the studies by Moussir and Chatri (2020) and Mouelhi and Ghazali (2021) for Middle Eastern countries. We believe that, since the bulk of Turkey's manufacturing exports are concentrated in low- and medium-tech products, the increase in exports has not promoted structural change from medium- to high-productivity sectors. In other words, the over-reliance on medium-tech exports has left Turkey stuck in medium-productivity sectors.

On the other hand, private financial openness fosters structural change, implying that structural change in Turkey is still related to its global integration. In fact, as we discussed previously, Turkey experienced substantial capital inflows during the period of analysis—particularly between 2004 and 2008 and after the global financial crisis—which may have financed the structural transformation. We do not find a significant relationship between structural change and other possible covariates that are found relevant to structural transformation in different countries and samples. On the financial side, our finding is that foreign direct inflows and private sector credits have no significant impact on structural transformation, which conforms to Martins (2019) and Moussir and Chatri (2020) but is opposed to Mouelhi and Ghazali (2021). Mean years of schooling,

[8] We checked for reverse causality using consumption growth instead of per capita income growth and found no significant difference. However, we think that per capita income growth is more suitable, as it better captures changes in consumption patterns towards more sophisticated products.

a proxy for the skill level of the labour supply, and research and development expenditures, which is thought to ignite the transformation process, are found to be insignificant in our model. Finally, we do not find evidence of the relationship between the degree of democratic institutions and structural change claimed by Alexandre et al. (2022).[9]

4 Sources of output growth

The previous section examined the labour productivity dynamics of Turkish economic growth with a focus on the supply side of the economy. It found that labour productivity has been driven by within-productivity growth in the post-1980 period, though structural change has also played its part. This section will shift the focus to the demand side of the economy and deconstruct Turkey's long-term economic growth into various demand-side sources. We use Syrquin's (1976) Decomposition Method, which makes use of I–O tables to break down total production into four sources: domestic final demand expansion, export expansion, import substitution, and technological change (i.e. changes in input coefficients). The following section will elaborate on the model.

4.1 Model

There are two versions of the Syrquin (1976) Decomposition Method: the total shares method and the deviation method. The former decomposes the changes in sectoral production into their relative shares within a given period, accounting for the first-order differences of variables. In contrast, the deviation method highlights how much sectoral growth deviates from the economy's balanced growth path. For this study, we will be utilizing the method of total shares based on first-order differences. This method starts with the equilibrium production equations of the basic Leontief (1951) I–O model for an open economy. The equilibrium production equation for sector i is

$$X_i = d_i(V_i + Y_i) + E_i \tag{4}$$

where X_i is the domestic production, V_i is the intermediate demand, Y_i is the domestic final demand and E_i is export demand for sector i. The d_i coefficient measures the import substitution effect, which can be expressed as

$$d_i = (X_i - E_i)/(V_i + Y_i) \qquad i = 1 \ldots \ldots N \tag{5}$$

In Equation (5), the denominator represents the total domestic demand for good i, whilst the numerator denotes the domestic demand for domestic production. Thus, an increase in imports of good i will increase the denominator, thereby decreasing the coefficient d_i. Accordingly, the coefficient increases with positive import substitution and vice versa. Therefore, d_i can be interpreted as a domestic supply coefficient. If we rewrite Equation (4) in matrix notation and solve for the domestic production vector (X_i), the equilibrium equation becomes

$$X = (I - DA)^{-1}(DY + E) \tag{6}$$

[9] We also find no evidence of the impacts of labour market rigidity or the share of high-tech exports, number of patents, and economic freedom index on structural change in Turkey. The results of these regressions are not shown to save space but are available upon request.

where D is a diagonal matrix whose elements on the main diagonal are composed of d_i coefficients. By taking first differences, we obtain yjr following equation:

$$\Delta X = R_t D_t \Delta Y + R_t \Delta E + R_t \Delta D[Y_{t+1} + V_{t+1}] + R_t D_t \Delta A X_{t+1} \quad (7)$$

where the symbol Δ indicates the change in the relevant variable between the t and ($t+1$) periods and R denotes the inverse Leontief matrix, which is equal to $(I - DA)^{-1}$. Equation (7) decomposes the changes in sectoral production levels in a given period into contributions of the changes in domestic final demand *(*Δ*Y)*, exports *(*Δ*E)*, domestic supply coefficients *(*Δ*D)*, and the input coefficients *(*Δ*A)*.

The method showing direct effects of the first-order differences in Equation (7) is calculated by the Laspeyres weighting method, i.e. using the initial period structural parameters as a basis. Another option is to utilize Paasche weightings, which are based on end-period parameters, as shown below:

$$\Delta X = R_{t+1} D_{t+1} \Delta Y + R_{t+1} \Delta E + R_{t+1} \Delta D[Y_t + V_t] + R_{t+1} D_{t+1} \Delta A X_t \quad (8)$$

As the different weightings based on Laspeyres and Paasche yield different outcomes, we take the arithmetic average of the values calculated by the two methods, like Celasun (1983).

The method applied in this study has some weaknesses that should be taken into consideration. First, the decomposition Equations (7) and (8) are comparatively static, as they compare only the equilibrium states of the economy in two different periods. This may limit the analysis and provide an incomplete understanding of the dynamics of the economy over time. Second, the contributions of the import substitution and technological change components are oversimplified, as they are expressed only by the changes in the domestic demand coefficients and the input coefficients, respectively. This may overlook the complexity and dynamic nature of the technological change (Caliskan and Aydogus 2011). Therefore, it is important to interpret the findings of this study with caution.

4.2 Data

We use I–O tables for 1973, 1979, 1990, 2002, and 2012 produced by TURKSTAT. The tables for 1973, 1979, 1990, and 2012 consist of 64 sectors, whereas the 2002 table comprises 59 sectors. As the I–O tables include different numbers of sectors, we aggregate them into 10 broad sectors using the EUROSTAT conversion tables and considering the margins of error in the matching process. Like Caliskan and Aydogus (2011), we combine the manufacturing and services sectors into three product groups. Additionally, we use the 2021 I–O table with 10 sectors prepared by Tasci (2023) using TURKSTAT's 2012 I–O table and Entrepreneur Information System. Because the sectoral aggregations in Tasci (2023) for 2021 and in our study for 2012 I–O tables differ and there is no way to directly compare them, we aggregate them into four sectors to examine the contributions of the different sources to economic growth between these years. Finally, since the focus of our decomposition analysis is real output growth, we convert the original tables at current prices into 1987 constant prices using agriculture, mining, manufacturing, utilities, construction, trade, transportation, other services, and overall economy price deflators derived from the TURKSTAT (2022) database. We present the details of the sectoral aggregation in Table 5.

Table 5: Sectoral aggregation key (10 sectors)

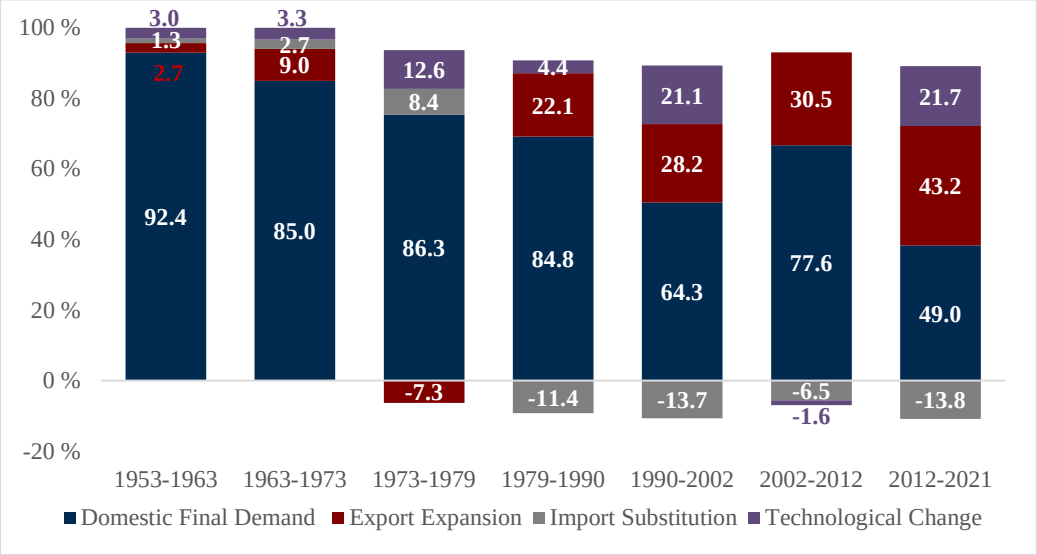
Sector name	1973, 1979, and 1990 codes	2002 codes	2012 codes
Agriculture	1–4	1–3	1–3
Mining	5–10	4–8	4
Consumer goods	11–26	9–14, 30	5–7, 22
Intermediate goods	27–40	15–21	8–15
Investment goods	41–49	22–29, 31	16–23
Electricity, gas, and water	50–51	32–33	24–25
Construction	52–53	34	27
Trade	54	35–37	28–30
Transportation	56–59	39–41	31–33
Other services	55, 60–64	38,42–59	26, 34–64

Source: authors' calculations based on I–O tables.

4.3 Decomposition of output growth

Figure 6 summarizes the calculations of sources of economic growth for the sub-periods between 1953 and 2021.

Figure 6: Sources of growth decomposition (%)



Source: Celasun (1983) for 1953–73 and authors' calculations based on I–O tables for 1973–2021.

According to estimations by Celasun (1983), domestic final demand was the prominent source of economic growth from 1953 to 1973, contributing 92.4 per cent and 85 per cent to overall growth in the subsequent two decades, respectively. Technological change played a minor role in overall growth, with 3 per cent in the 1953–63 period and 3.3 per cent in the 1963–73 period. Trade effects (import substitution and export expansion) also contributed positively to economic growth to varying degrees between 1953 and 1973. While the relative contributions of import substitution were higher than those of export expansion in 1953–63, the reverse was the case in the 1963–73 period. These results reflect shifts in trade policies. Turkey's exports surged at the end of the 1960s and in the early 1970s, resulting in a significant export expansion contribution to growth (9 per cent). However, the trade regime remained mostly restrictive because of the government's import-substitution development strategy in the first half of the 1960s and the combination of the oil price shock and regional political tensions in 1974. The neglect of corrective measures to improve the balance of payments, the lack of trade incentives, and the impact of sanctions against Turkey due

to the Cyprus operation led to a significantly negative contribution of export expansion between 1973 and 1979, while the relative importance of import substitution once again strengthened.

After 1979, the switch from an import substitution to an export-oriented strategy in the Turkish economy became more visible. Although domestic final demand expansion remains the most important contributor to output growth, export expansion gradually increased from 1979 to 2021. This indicates that export-oriented growth policies have contributed to output growth since 1980. However, negative contributions from import substitution indicate that these policies have also made the economy more dependent on imports. The reduction of customs tariffs, increase of trade quotas, and abolition of permit-required imports during 1980s and 1990s resulted in substantial import growth and decreased the domestic competitiveness of these products. These findings are confirmed by the gradual increase in imported inputs in Turkey's exports from 13.9 per cent in 1995 to 15.1 per cent in 1998 and further to 22.3 per cent in 2002, according to the OECD's Trade in Value Added (TiVA) database.[10] Technological change made strong contributions to output growth in the periods 1990–2002 and 2012–21, but its contributions were negligible in other periods. This is somewhat surprising given that the period 1990–2002 is often referred to as the 'lost decade' in terms of economic performance. In the following sections, we will examine the sources of growth in 10 broad sectors for different sub-periods.

1979–90

Table 6 presents the decomposition of output growth during the period 1979–90 by main sectors. The results indicate that domestic final demand expansion was the largest contributor, accounting for 84.8 per cent of the growth, followed by export expansion, which had a 22.1 per cent share. Import substitution, on the other hand, had a negative contribution of -11.4 per cent, while technological expansion increased at an insignificant rate of 4.4 per cent. At the sectoral level, the mining, investment goods, and construction sectors had the highest contributions to their output growth through domestic final demand. Additionally, the mining, consumer goods, and transport sectors contributed a significant share of export expansion. The sectors with the highest shares of the technological change component are the consumer goods and other services sectors. However, the mining, transport, and trade sectors had negative contributions to technological expansion. Another notable feature of Table 6 is that the mining and investment goods sectors had negative contributions to import substitution.

Table 6: Sources of sectoral output growth: 1979–90 (component shares, %)

	Domestic final demand	Export expansion	Import substitution	Technological change
Agriculture	87.1	18.2	-11.6	6.4
Mining	207.2	52.5	-87.6	-72.1
Consumer goods	53.6	45.4	-18.8	19.8
Intermediate goods	86.7	25.3	-16.8	4.8
Investment goods	111.2	13.2	-28.1	3.7
Electricity, gas, and water	61.7	16.6	-5.3	27.1
Construction	100.0	0.0	0.0	0.0
Trade	88.7	18.9	-4.5	-3.2
Transportation	83.4	35.7	-6.1	-13.0
Other services	72.7	14.9	-4.2	16.7
TOTAL	84.8	22.1	-11.4	4.4

Source: authors' calculations based on I–O tables.

[10] https://stats.oecd.org/Index.aspx?DataSetCode=STAN_IO_M_X (accessed 15 January 2023).

These results demonstrate that, while the implementation of export-oriented policies at the outset of the examined period augmented the contribution of export expansion, it was still domestic final demand that remained the most significant source of output growth. Furthermore, the negative contributions of import substitution indicate that the economy's import dependence had increased since the periods previously covered by studies of growth sources (see Celasun 1983). Yeldan (2001) and Karsiyakali (2008) argue that, since the increase in the contribution of export expansion was accompanied by a decrease in import substitution, growth was achieved by utilizing existing capacity rather than by creating new investment and employment opportunities.

1990–2002

Table 7 presents the sources of sectoral output growth between 1990 and 2002. It shows that the largest contribution to economic growth came from expansion of domestic final demand (64.3 per cent) due to the consumer goods, other services, and trade services sectors. However, compared with the 1979–90 period, the share of domestic final demand decreased significantly, primarily because of the 1994 financial crisis and the subsequent implementation of the stability programme.

Table 7: Sources of sectoral output growth: 1990–2002 (component shares, %)

	Domestic final demand	Export expansion	Import substitution	Technological change
Agriculture	90.6	47.8	-12.1	-26.3
Mining	82.9	79.8	-155.1	92.3
Consumer goods	69.1	24.1	-0.7	7.5
Intermediate goods	40.6	59.4	-58.1	58.1
Investment goods	42.5	67.3	-44.1	34.3
Electricity, gas, and water	61.2	16.0	-11.4	34.2
Construction	39.3	23.6	-0.4	37.5
Trade	50.3	24.3	-5.0	30.5
Transportation	87.9	18.7	-20.7	14.0
Other services	79.1	5.6	-2.3	17.6
TOTAL	64.3	28.2	-13.7	21.1

Source: authors' calculations based on I–O tables.

Karsiyakali (2008) argues that the real wage losses resulting from the 1994 stabilization package kept final demand under pressure in the 1990s. The contribution of export expansion increased in this period (to 28.2 per cent), possibly due to the establishment of the customs union with the EU in 1995. We also observe a significant increase in the contribution of technological change compared with the previous period, with a share of 21.1 per cent. The contribution of import substitution remained at -13.6 per cent, as in the previous period.

When examining the sectoral details, it becomes apparent that the shares of domestic final demand expansion were greater in the agriculture, transport services, mining, and consumer goods sectors than in the overall economy. The sectors with the highest shares in the contribution of export expansion were mining, investment goods, and intermediate goods industries. However, these sectors also recorded the largest negative contributions in the import substitution component, indicating that the increase in exports of these sectors also heightened the dependency on imported inputs. Notably, the sectors with the highest shares of the technological change component also had the greatest contributions of export expansion. We believe that this is due to the technology and knowledge transfer resulting from the increase in exports.

2002–12

Table 8 displays the sources of sectoral output growth between 2002 and 2012. Once again, domestic final demand expansion became the primary contributor to output growth, led by construction and trade services, followed by export expansion. The contribution of export expansion increased in this period, highlighting the growing significance of global value chains in the Turkish economy. While the contribution of import substitution remained negative, particularly in the intermediate and consumer goods sectors, the contribution of technological change also became negative. Among the main sectors, mining, trade, and agriculture had the highest relative contributions of domestic final demand expansion. Mining, intermediate goods, and investment goods had the greatest shares in the contributions of export expansion and the lowest shares in the contributions of import substitution, as in the previous period, demonstrating that domestic intermediate goods were replaced by imported intermediate goods. Finally, the relative contributions of technological development were negative in many sectors between 2002 and 2012.

Table 8: Sources of sectoral output growth: 2002–12 (component shares, %)

	Domestic final demand	Export expansion	Import substitution	Technological change
Agriculture	112.3	35.2	-18.1	-29.4
Mining	170.4	154.3	-85.8	-138.8
Consumer goods	70.9	41.1	-9.8	-2.2
Intermediate goods	51.0	62.5	-16.9	3.4
Investment goods	55.1	53.5	-2.5	-6.1
Electricity, gas, and water	70.7	14.1	-2.6	17.8
Construction	82.8	0.0	-0.3	17.5
Trade	113.5	8.8	-3.0	-19.3
Transportation	67.4	27.4	4.9	0.4
Other services	105.3	9.8	-6.1	-9.0
TOTAL	77.6	30.5	-6.5	-1.6

Source: Authors' calculations based on I–O tables

2012–21

In addition to previous periods for which TURKSTAT provides comprehensive I–O tables, we analysed the sources of growth between 2012 and 2021 using the I–O table with 10 sectors provided by Tasci (2023). Because of the compositional differences in the broad sectors, we aggregated the 2012 and 2021 I–O tables into four main sectors, namely agriculture, industry, construction, and services.[11] Table 9 present the results of the decomposition analysis based on these main sectors.

Our findings indicate that, once again, the expansion of domestic final demand played the most significant role in output growth, accounting for 49 per cent of total growth. The expansion of exports also contributed significantly, with a share of 43.2 per cent, especially thanks to the industrial sectors. In this period, Turkey experienced huge internal and external shocks, leading to significant exchange rate depreciation, which may have spurred exports by increasing Turkish companies' international competitiveness. Despite these substantial exchange rate shocks, imports remained robust, leading to the continuation of negative contributions from the import

[11] The sectoral aggregation key is shown in Table A4 in the Appendix.

substitution component. Finally, we see that the share of technological expansion picked up, with a 21.7 per cent share, especially thanks to the construction and agriculture sectors.

Table 9: Sources of sectoral output growth: 2012–21 (component shares, %)

	Domestic final demand	Export expansion	Import substitution	Technological change
Agriculture	39.7	28.1	-15.9	48.1
Industry	30.3	95.4	-29.1	3.3
Construction	-30.8	3.5	-1.0	128.2
Services	100.0	27.1	-8.1	-19.0
TOTAL	49.0	43.2	-13.8	21.7

Source: authors' calculations based on I–O tables.

4.4 Key sector analysis

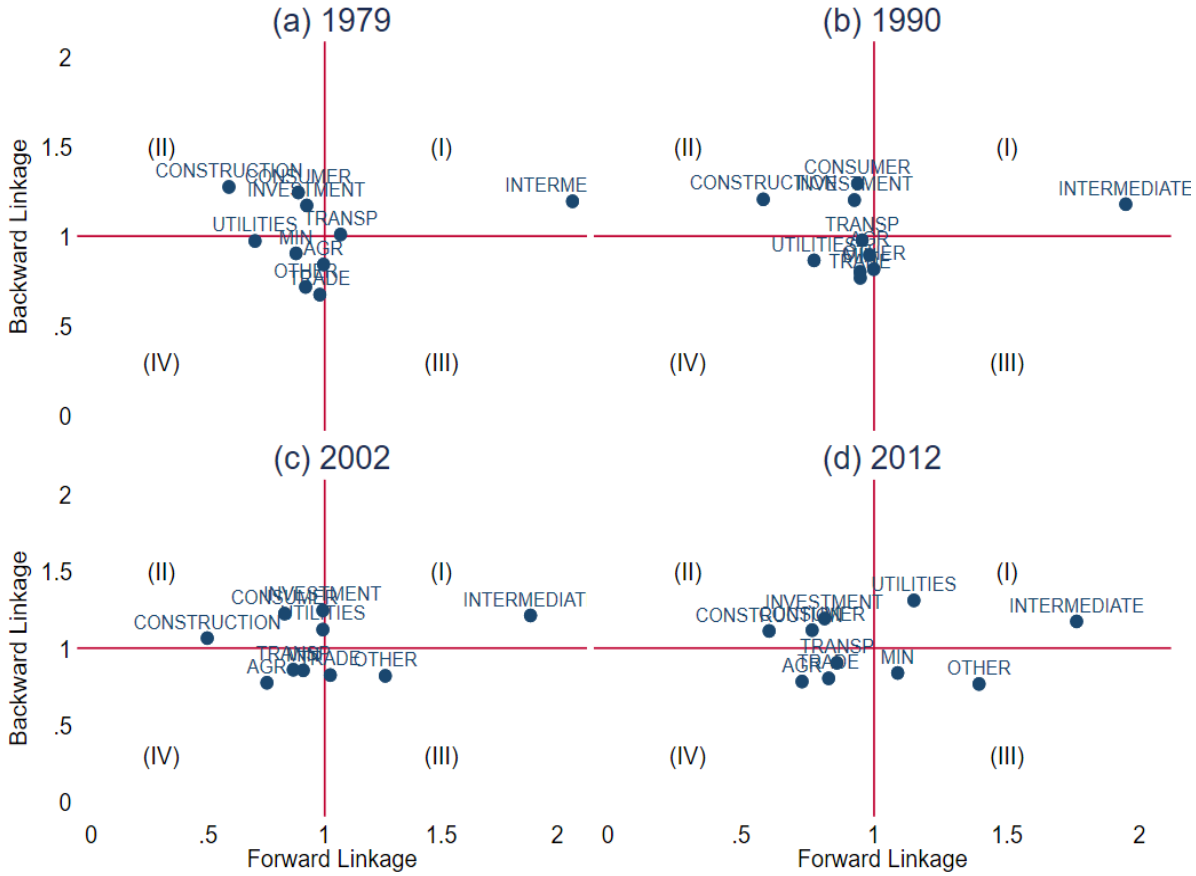
I–O tables also provide an opportunity to analyse forward and backward linkages between different sectors and identify key sectors in the economy during a given period. Key sector analysis allows us to determine the sectors with high multiplier effects, which can enable decision-makers to specify investment priorities (Muniz et al. 2006). Forward linkage shows the degree of usage of the output of a specific sector as an intermediary for other sectors, while backward linkage demonstrates to what extent the output of a specific sector stimulates the production of others through the demand for intermediate goods. Using Hirschman's (1958) sectoral classification based on forward and backward linkage indices,[12] we visualize key sectors in different periods in Figure 7.[13]

The intermediate goods sector stands out as the key sector in the Turkish economy during all periods. This is not surprising given the historically high share of intermediate exports and imports in Turkey's total trade basket. The transportation sector was the key sector in 1979 but lost this position in 1990, despite the forward and backward linkage indices being close to one. Moreover, the forward and backward linkages of utilities increased over time, making it the key sector in 2012. We also observe a general decline in the connections between sectors, except for the investment goods, transportation, and utilities sectors in 2002 due to the impact of the 2001 economic crisis. Despite having significantly low forward linkage, the construction sector has one of the highest backward linkages in all periods. Additionally, it has low dispersion in backward linkage, revealing the sector's importance in supporting production in different sectors. Another key finding is the declining trend in the forward and backward linkages of the agricultural sector throughout the analysis period, indicating a transition in the production structure from agriculture to industry and services.

[12] A sector with high linkage is not necessarily important for the whole economy, as it may be linked only with a few sectors. Therefore, we use the dispersion indices of the total backward and forward linkage effects that show to what extent the effects of the different sectors are evenly distributed within the economy (Tables A2 and A3 in the Appendix). A sector is considered to be a key sector if backward and forward linkage indices are greater than one and dispersion indices are less than one (Valadkhani 2003).

[13] For the methodology of forward and backward linkage indices and Hirschman (1958) sector classification, see Moussir and Chatri (2020).

Figure 7: Key sector analysis



Source: authors' calculations.

5 Conclusion

Since 1980, the Turkish economy has undergone significant transformation through a series of reforms that have integrated the economy with global markets. Consequently, the country's economic strategy has shifted from inward-looking to outward-oriented. This shift is reflected in the declining shares of agriculture in gross value-added and employment, which have been replaced by rising shares in industry and services. Furthermore, trade and financial openness have increased, and Turkey's importance in global value chains has grown. Although average economic growth during this period has exceeded that of many peer countries, the quality of this growth is still a topic of debate among scholars. Evaluating the quality of growth requires an investment in both the supply and demand sides of economic output.

In this study, we analysed the sources of growth and productivity dynamics in Turkey after 1980, when the country's integration in global value chains began to accelerate. Unlike previous studies, ours focused on both the supply and demand sides of the economy. First, we broke down overall economic growth into employment growth and the within- and between-sector components of labour productivity growth between 1960 and 2021. We also analysed the sources of the between-sector (structural change) component of productivity growth by relating it to possible covariates, as proposed in the literature. Then we focused on the demand side of the economy and decomposed output growth into four sources—domestic final demand, export expansion, import

substitution, and technological change—for the periods 1973–79, 1979–90, 1990–2002, 2002–12, and 2012–21, using I–O tables and compared the post-1980 and pre-1980 periods in terms of sources of growth. Finally, we identified key sectors by calculating backward and forward linkage indices and using Hirschman's (1958) sectoral classification.

Our findings demonstrate that labour productivity growth accounted for more than half of the economic growth observed between 1980 and 2021. Within-productivity growth was the primary driver of labour productivity improvements, while the contribution of structural change decreased over time. Our time-series regression analysis showed that structural change was influenced by changes in the demand structure resulting from per capita income growth and strong private capital inflows. However, our results suggest that trade openness hindered structural change in the economy, implying that export growth was mainly driven by low-productivity products. In fact, while the share of medium-tech exports increased until 2006, it has remained stagnant since then. The proportion of high-tech exports has also stagnated, the bulk of manufacturing exports consisting of low and low-to-medium products such as textiles, clothing, metals, rubber, and plastic materials.

The findings of our demand-side analysis suggest that output growth in Turkey between 1979 and 2021 was primarily driven by an increase in domestic final demand, as previous studies have also indicated (Caliskan and Aydogus 2011; Guncavdi and Kucukcifci 2004; Voyvoda 2008). However, the relative importance of domestic final demand has decreased over time, despite being the main source of output growth with a high share in all sub-periods. In contrast, the government's outward-oriented policies have led to an increase in the output contribution of export expansion over time. Nevertheless, this positive impact of trade liberalization was offset by a significantly negative contribution of import substitution. Our analysis highlights the reversal of the contribution of import substitution and the gradual increase in the contribution of export expansion to output growth in the post-1980 period compared with the pre-1980s. Moreover, we observe that the role of technological change in output growth was unstable over the period. Our sectoral output decomposition analysis reveals that the contributions of technological change and export expansion were closely linked in various industries, particularly in manufacturing. This suggests that these industries were able to acquire technology and know-how from their export markets, indicating that exposure to international competitiveness indirectly led to an increase in productivity. From these findings we can conclude that the transfer of technology from export markets played a crucial role in improving productivity in the manufacturing sector.

Finally, we identified key sectors in the economy by calculating forward and backward linkage indices for these sub-periods. According to our findings, the industries producing intermediate goods have been the key sector of the Turkish economy in all sub-periods, indicating a high priority for investment (Altan et al. 2015; Ersungur et al. 2011; Pehlivanoğlu and İnce 2020). Given the high energy import dependency of the manufacturing sector, investments in intermediate goods can also reduce the import component of exports, decrease current account pressures, and increase the import-substitution component of output growth. We also showed that the relative importance of the transportation sector was replaced by utilities over time, and utilities became one of the key sectors in 2012. Additionally, forward and backward linkages of the agriculture sector declined, indicating a reduction in its importance in the economy.

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Appendix

Table A1: Variable descriptions

Variable	Description	Source
GDP per capita growth (%)	The growth rate of real GDP per capita in local currency	World Bank
Consumption growth (%)	The growth rate of real household consumption expenditures in local currency. Pre-1970 values are backward extrapolated using real GDP growth.	UN National Accounts Database
Trade openness (%)	Trade of goods and services as a percentage of GDP	World Bank
Private financial openness (%)	Foreign assets and liabilities as a percentage of GDP, excluding official flows like development aid and central banks' reserve assets	Saadma and Steiner (2016)
FDI to GDP (%)	Foreign direct investment inflows as a percentage of GDP	World Bank
Credit to GDP (%)	Net domestic credit to GDP ratio	World Bank
Polity score	An index measuring the characteristic of political regimes scale ranging from +10 (strongly democratic) to -10 (strongly autocratic)	The Integrated Network for Societal Conflict Research
Years of schooling	The average number of completed years of education of a population aged 15–64. Missing years are linearly interpolated.	Barro and Lee (2013), TURKSTAT
R&D expenditures to GDP (%)	Total expenditure on R&D by all companies, universities and government as a percentage of GDP	OECD
Labour market rigidity	Employment protection legislation index, measuring the procedures for hiring and dismissing workers	OECD
High-tech exports	The share of high-tech exports in total exports, constructed using the OECD technology classification of products	TURKSTAT
Number of patents	Total number of patents granted to locals and foreign citizens in Turkey	World Intellectual Property Organization
Economic freedom	A comprehensive index measuring the degree of economic liberalism based on five categories: size of government, legal structure, sound money, international trade, and regulation. Missing years are linearly interpolated.	Fraser Institute

Source: authors' construction.

Table A2: Forward–backward linkage indices of sectors

	1979		1990		2002		2012	
	TFI	TBI	TFI	TBI	TFI	TBI	TFI	TBI
Agriculture	0.995	0.842	0.983	0.895	0.752	0.774	0.729	0.782
Mining	0.877	0.904	0.947	0.801	0.908	0.855	1.089	0.838
Consumer goods	0.887	1.243	0.938	1.293	0.828	1.225	0.767	1.117
Intermediate goods	2.063	1.194	1.947	1.178	1.883	1.213	1.762	1.174
Investment goods	0.923	1.171	0.926	1.201	0.992	1.246	0.814	1.193
Electricity, gas, and water	0.701	0.973	0.774	0.865	0.992	1.121	1.150	1.311
Construction	0.589	1.274	0.583	1.205	0.496	1.065	0.605	1.112
Trade	0.979	0.674	0.948	0.768	1.024	0.824	0.829	0.803
Transportation	1.068	1.009	0.955	0.977	0.865	0.859	0.860	0.904
Other services	0.918	0.717	0.999	0.816	1.260	0.819	1.395	0.766

Source: authors' calculations based on I–O tables.

Table A3: Sectoral dispersion indices

	1979		1990		2002		2012	
	DFI	**DBI**	**DFI**	**DBI**	**DFI**	**DBI**	**DFI**	**DBI**
Agriculture	0.986	1.172	1.026	1.142	1.184	1.188	1.216	1.106
Mining	0.961	0.959	0.876	1.088	0.856	0.959	0.729	0.941
Consumer goods	1.154	0.847	1.203	0.879	1.272	0.875	1.265	0.835
Intermediate goods	0.535	1.022	0.585	1.052	0.594	1.035	0.567	0.916
Investment goods	1.107	0.912	1.091	0.885	0.985	0.860	1.157	0.797
Electricity, gas, and water	1.258	0.927	1.138	1.042	1.210	1.123	1.192	1.054
Construction	1.447	0.667	1.456	0.704	1.569	0.739	1.445	0.760
Trade	0.821	1.303	0.864	1.145	0.732	1.021	0.867	0.930
Transportation	0.822	0.939	0.899	0.937	0.934	1.021	0.992	0.966
Other services	0.908	1.252	0.861	1.127	0.663	1.179	0.569	1.696

Source: authors' calculations based on I–O tables.

Table A4: Sectoral aggregation key (4 sectors)

	2012 codes	**2021 codes**
Agriculture	1–3	1
Industry	4–26	2
Construction	27	3
Services	28–64	4–11

Source: authors' construction.