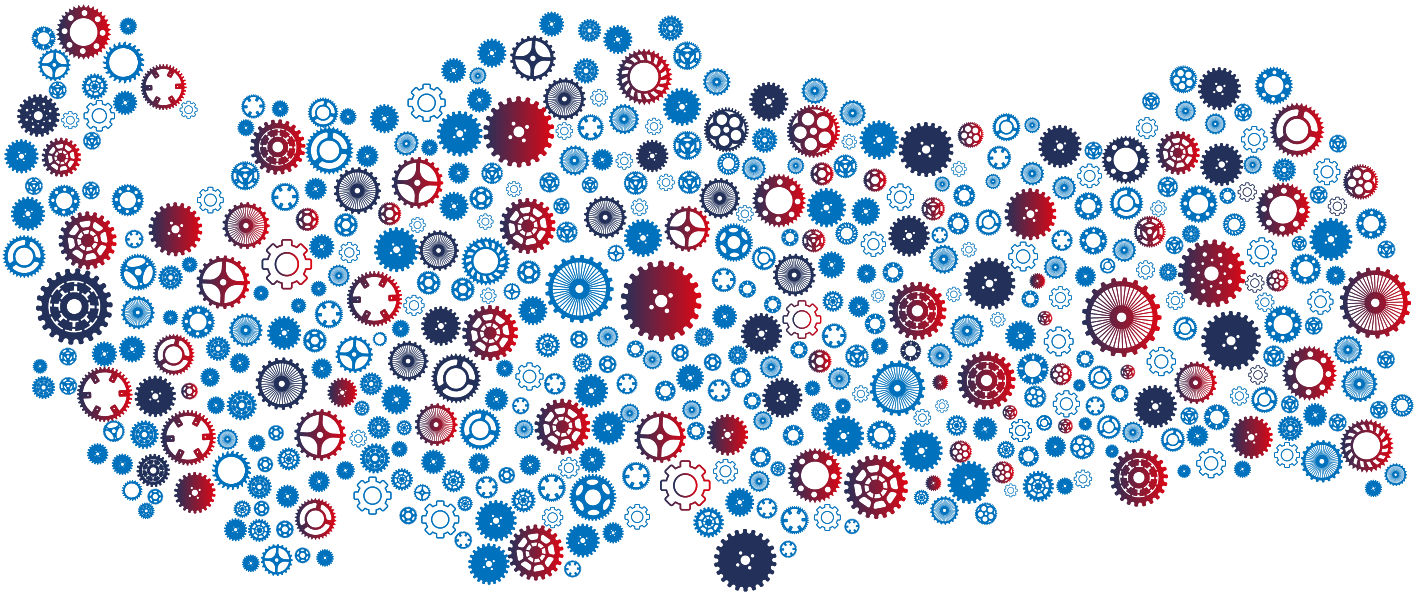
TURKEY

Productivity Report 2019

FIRM PRODUCTIVITY AND ECONOMIC GROWTH IN TURKEY



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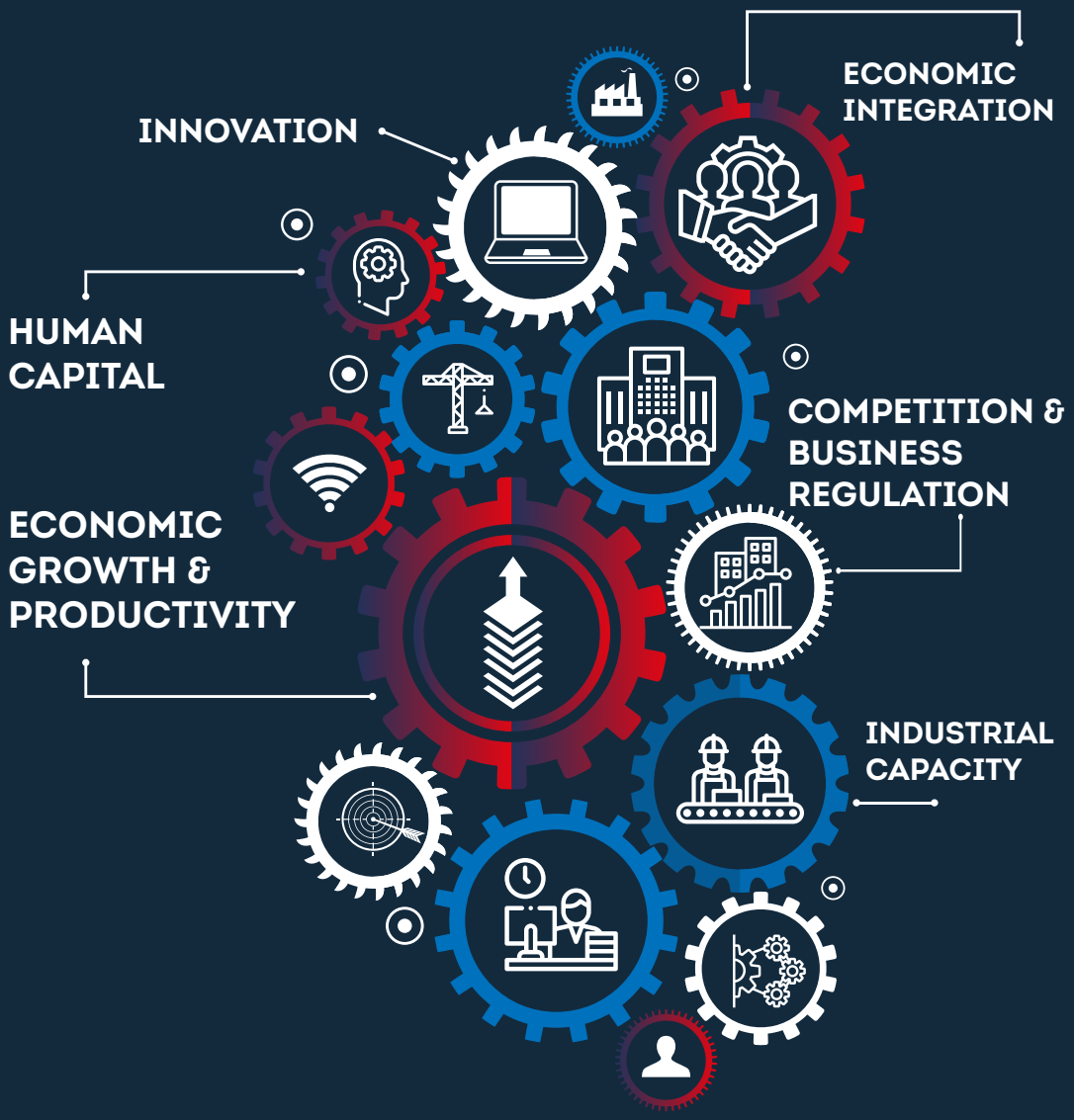

COUNTRY ECONOMIC MEMORANDUM: FIRM PRODUCTIVITY AND ECONOMIC GROWTH IN TURKEY

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3Cs	Competitiveness, Capability and Connectedness
ACF	Ackerberg, Caves and Frazer
ALMP	Active Labor Market Policies
ARG	Argentina
B40	Bottom 40
BRA	Brazil
C/I	Consumption-to-investment ratio
CAGR	Compound annual growth rate
CBRT	The Central Bank of the Republic of Turkey
CEM	Country Economic Memorandum
CET	Central European Time
CHL	Chile
CR20	Concentration of top twenty
CR4	Concentration of top four
CU	Customs Union
CZE	Czech Republic
DB	Doing Business
DEC	Development Economics Vice Presidency
EFI	Equitable Growth, Finance and Institutions
EFTA	European Free Trade Association
EIS	Entrepreneur Information System
ENR	Engineering News Record
EPO	European Patent Office
EU	European Union
FCI	Finance, Competitiveness and Innovation
FDI	Foreign direct investment
FTA	Free trade agreement
FX	Foreign exchange
GATS	General Agreement on Trade in Services
GCI	Global Competitiveness Index
GCR	Global Competitiveness Report
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GP	Global Practice
GVCs	Global Value Chains
HD	Human Development
HHI	Herfindahl-Hirshchman Index
HIC	High Income Countries
HP	Hodrick-Prescott
HUN	Hungary

ICT	Information and Communication Technologies
IMF	International Monetary Fund
IO	Input-Output
IPR	Intellectual Property Rights
ISCO	International Standard Classification of Occupations
ISKUR	Turkish Employment Agency
IT	Information Technology
K/L	Capital-to-Labor ratio
KI	Knowledge-intensive
KIS	Knowledge-intensive services
KOR	Republic of Korea
KOSGEB	Administration for supporting and developing small and medium size enterprises in Turkey
LevPet	Levinsohn and Petrin
LFP	Labor Force Participation
LHS	Left Hand Side
M&E	Machinery and Equipment
MAX	Maximum
MENA	Middle-East and North Africa
MEX	Mexico
MFN	Most-Favored-Nation
MIC	Middle Income Countries
MIN	Minimum
MOIT	Ministry of Industry and Technology
MP	Melitz-Polanec
MPK	Marginal Product of Capital
MPL	Marginal Product of Labor
MTI	Macroeconomics, Trade and Investment
MYS	Malaysia
NACE	Statistical classification of economic activities in the European Community
NCES	US National Center for Education Statistics
NDP	National Development Plan
NEET	Not in Education, Employment, or Training
NEP	New Economic Program
NGO	Non-Governmental Organizations
OECD	Organization for Economic Co-operation and Development
OP	Olley and Pakes
PIAAC	OECD Survey of Adult Skills
PISA	Program for International Student Assessment
PMR	Product Market Regulation
POL	Poland
POV	Poverty
PPP	Purchasing power parity

PSM-DiD	Propensity score matching and difference in differences
R&D	Research and development
R&P	Rubber and Plastics
RHS	Right hand side
RICA	Regional Investment Climate Survey
RUS	Russia
SME	Small and medium size entrepreneurs
SPJ	Social Protection and Jobs
STRI	Services Trade Restrictiveness Index
TDI	Trade defense instruments
TEPA	Trade and Economic Partnership Agreement
TFP	Total factor productivity
TFPQ	Quantity total factor productivity
TFPR	Revenue total factor productivity
TFRS	Financial Reporting Standards of Turkey
TIMMS	Trends in International Mathematics and Science Study
TIVA	Trade in Value Added
TL	Turkish Lira
TUBITAK	The Scientific and Technological Research Council of Turkey
TUN	Tunisia
TUR	Turkey
TURKPATENT	Turkish Patent and Trademark Office
TURKSTAT	Turkish Statistical Institute
TUSIAD	Turkish Industry and Business Association
UK	United Kingdom
UMIC	Upper-middle income countries
UN	United Nations
UNCTAD	United Nationals Conference on Trade and Development
US	United States of America
US$	United States of America Dollar
VA	Value added
WB	World Bank
WBG	World Bank Group
WDI	World Development Indicators
WEF	World Economic Forum
ZAF	South Africa

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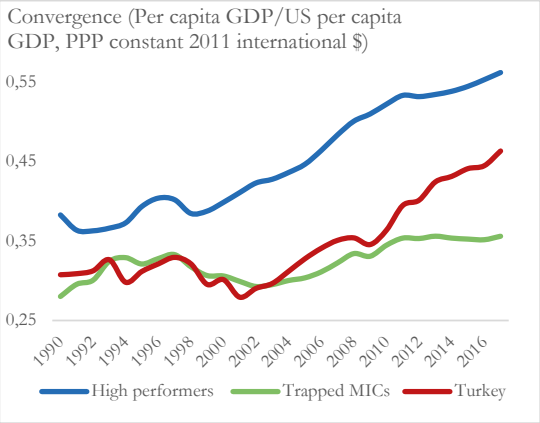
Executive Summary

Productivity and economic growth in Turkey

"Productivity isn't everything, but, in the long run, it is almost everything"
Paul Krugman (1994)

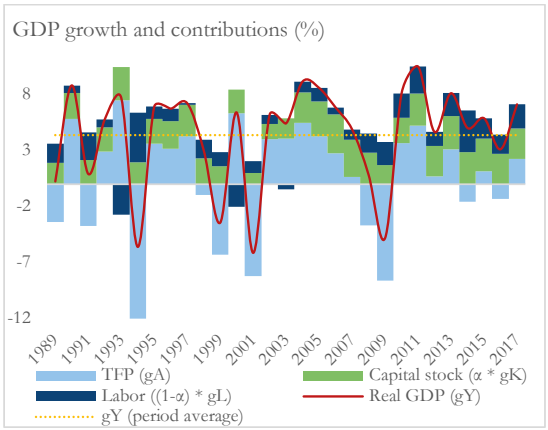
Turkey's pace of income convergence has globally been one of the most remarkable of the past fifteen years. Reforms starting in the early 2000s accelerated private activity and public service delivery. Per capita GDP has trebled in 15 years, reaching US$10,500 in 2017 and resulting in one of the biggest jumps in per capita income rankings since 2002. Job creation, particularly in services, helped absorb a lot of labor transitioning out of agriculture. This led to a sharp drop in the share of the population with per capita expenditure below the poverty line ($5.5 a day in 2011 PPP) from 37 percent in 2002 to 9 percent in 2017. Turkey experienced strong economic convergence (Figure 1), coming close to transitioning out of upper middle-income status in less than 20 years – a feat achieved only by a handful of countries in recent years.

Figure 1: Strong economic convergence



Sources: WDI, WB Staff estimates.
Note: Convergence estimates for high performers and trapped MICs based on their weighted averages of per capita GDP.

Figure 2: Declining contribution of productivity



Sources: TURKSTAT, WDI, WB Staff estimates.

Sustaining growth and improvements in living standards in Turkey will require higher productivity in the economy. Growth since the 1980s was driven largely by an increase in labor and physical capital inputs thanks to reforms that lifted constraints on factor mobility and reduced market distortions. The contribution of productivity on the other hand has been relatively less and on a declining path in recent years (Figure 2). As a result, potential output – what the economy can produce when factor inputs are fully utilized – has flattened out. Unless Turkey can produce more and better output with its available inputs, the return on those inputs, including labor, will stagnate. This can be offset by deepening capacity in industry and services that have strong pro-development characteristics (i.e. potential to boost productivity, growth and jobs).

This will require a rebalancing of reforms away from short-term demand management towards long-term structural reforms. Turkey has weathered several economic shocks since the Global Financial Crisis in 2008. Strong institutions, accumulation of fiscal and financial sector buffers since 2002, and post-GFC global monetary expansion, enabled effective policy stimuli that helped avert a prolonged recession. At the same time, short-term policies without long-term structural reform diminish the sustainability of growth. Demand incentives and supply subsidies provide temporary relief to consumers and producers, but in the absence of productivity gains they increase chances of boom-bust cycles once incentives and subsidies are withdrawn.

A necessary precondition for productivity growth is macroeconomic stability. Macroeconomic imbalances in Turkey intensified economic stress starting in mid-2018. This led to an economic downturn in 2018-19, which can dent productivity. Consistent economic policies are important to support an orderly adjustment. This means sustaining tight monetary policy, complemented by financial sector policies that enable gradual deleveraging and enhance financial risk monitoring and management. Critical to deleveraging is a strong corporate debt restructuring framework, the absence of which could spell the difference between a soft and a hard landing for the economy. Targeted and finite countercyclical fiscal policies will be important to help the economy tide over the difficult period ahead.

Policies adopted in mid-2018 helped stabilize financial markets and reduce external vulnerabilities. Monetary and fiscal policies were tightened to contain external and internal imbalances, whilst the Central Bank policies helped relieve liquidity pressures in the financial system. In addition, the authorities released a medium-term New Economic Program (NEP) in September 2018, which set out several measures to address immediate vulnerabilities and longer-term productivity. Though developments in the early part of 2019 highlight ongoing vulnerabilities.

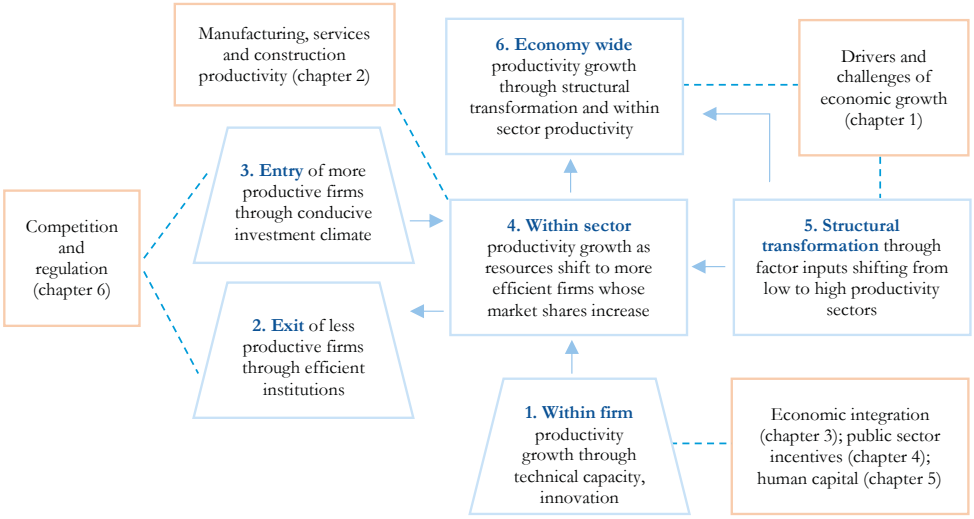
Longer-term productivity measures include structural reforms to deepen supply side capacity. Relative to high performing comparators, Turkey's structural reform gaps are greatest in labor markets, innovation, financial sector, and human capital. Relative to the EU, Turkey also faces reform gaps in business regulations. Weak and/or poor implementation of policies and institutions in these areas impact negatively on productivity; they can prevent resources from shifting to higher productivity sectors and firms, and/or prevent firms from investing in productivity enhancing skills and technology. This study examines the impact of structural reforms on productivity in Turkey and their implications for policy and institutional reform.

Analyzing micro-macro productivity linkages

"The growth of GDP may be measured up in the macroeconomic treetops, but all the action is in the microeconomic undergrowth, where new limbs sprout, and dead wood is cleared away."
The Growth Report: Strategies for Sustained and Inclusive Growth (2008)

The impact of structural reforms on productivity in Turkey is analyzed using firm-level data. The objective is to link micro analysis of firm and sector productivity to macro analysis of economic growth drivers and challenges in Turkey. Micro-macro productivity dynamics can be summarized as follows (Figure 3): (1) raising productivity within firms; (2) can force unproductive firms to exit the market; thereby (3) freeing up resources for more productive firms, be it new entrants or incumbents; (4) that in turn help expand the sector; and (5) support structural transformation as factors of production move into expanding, higher productivity industries, and out of low productivity ones; (6) a combination of which accelerates economy-wide productivity and growth.

Figure 3: Macro-micro productivity linkages



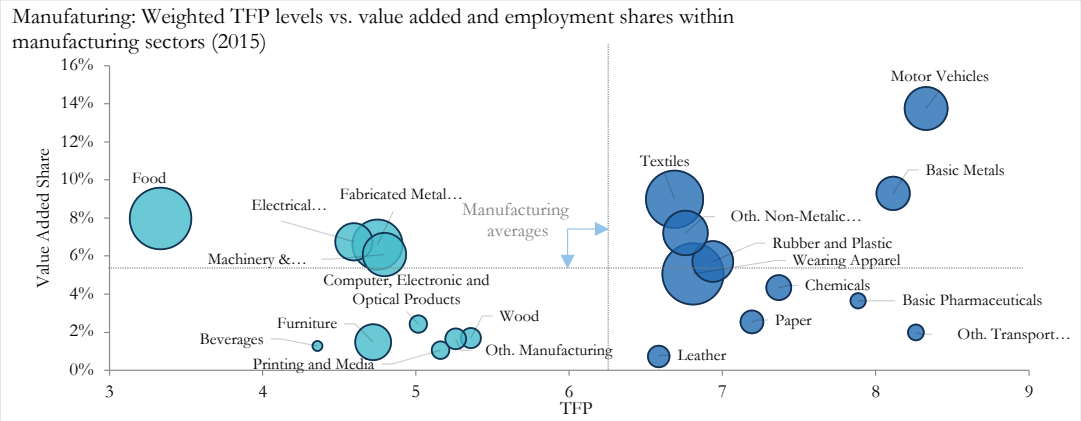
The first two chapters in this study provide a diagnostic of macro-micro productivity linkages in Turkey, whilst the subsequent four chapters analyze how those dynamics are affected by structural reforms. To illustrate (Figure 3), chapter 1 analyzes drivers and challenges of growth in Turkey to take stock economy wide/macro level productivity trends, including from structural transformation. Chapter 2 disentangles productivity trends within manufacturing, construction and services using firm-level data, to see how these add up to economic growth in Turkey. This is broken down further to analyze how within firm productivity is affected by: economic integration as a source of learning and technology for firms in chapter 3; the quality of business support services to promote firm growth and innovation in chapter 4; and human capital as a source of firm capability in chapter 5. Finally, chapter 6 looks at how competition and business regulations impact the economy's ability to reallocate resources to more productive firms and sectors.

Pro-development sectors and micro-macro productivity dynamics

A key question for micro-macro productivity dynamics is how, at micro-level, sectors with strong pro-development characteristics are faring, because these sectors are essential for sustaining growth at macro level. Manufacturing has traditionally had strong pro-development characteristics (i.e. value addition, productivity, tradability, low skill employment). It has been the big driver of growth in countries that have transitioned to high income. There is a concern however that developing economies more recently are transitioning too quickly out of manufacturing ("premature deindustrialization") and into other low skilled areas that do not have the same pro-development characteristics. These developments weigh on productivity and growth.

In Turkey, firm level analysis shows that resources are shifting to low productivity sectors with weak development characteristics, even within manufacturing. Other than a few breakout industries (e.g. motor vehicles, basic metals, textiles), manufacturing in Turkey has stagnated in recent years (Figure 4). Construction and services on the other hand have expanded rapidly, though suffer from low and falling productivity. Services are dominated by less knowledge intensive, low productivity industries (e.g. wholesale and retail trade), rather than more sophisticated services that raise productivity in manufacturing and other sectors (e.g. ICT).

Figure 4: Manufacturing growth constrained by large, low productivity sectors



Sources: EIS, WB Staff estimates.

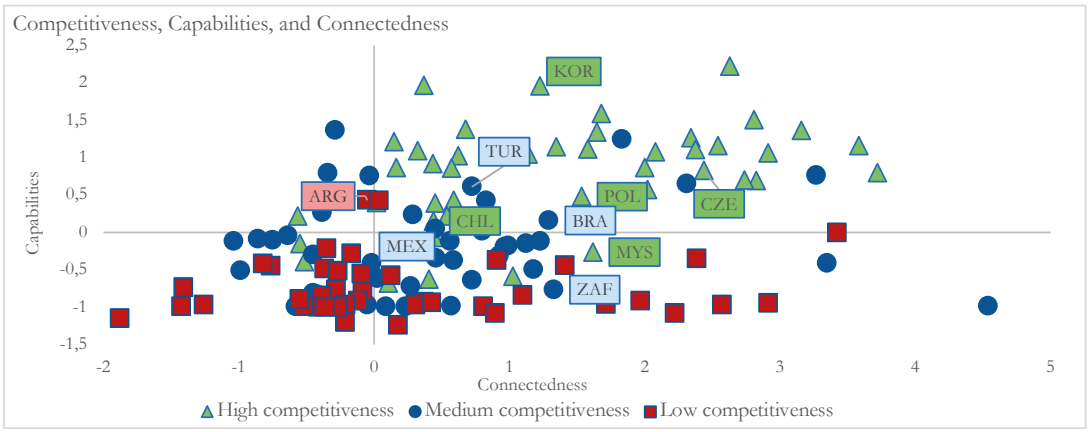
What are the implications for Turkey? At Turkey's current level of per capita income, it cannot compete with low skill, labor intensive manufacturing economies. It can also not keep raising prices to sustain wage increases unless the quality of output also improves. At the same time, labor-saving technologies have raised concerns for emerging markets with abundant labor (like Turkey) no longer having manufacturing as a ladder of development, which others had to climb the income pole. Turkey needs a new ladder of development. One that takes advantage of new technologies and changing patterns of globalization to deepen the country's manufacturing and services capacities.

A few pro-development sectors stand out as having potential for building such a strong ladder of development for Turkey. Basic pharmaceuticals, chemicals, motor vehicles and transport equipment tend to have the greatest scope for productivity growth, innovation and tradability. Except for basic pharmaceuticals, these sectors generated significant employment in recent years even though their employment shares are low. There are other sectors with good potential but in Turkey are suffering from allocative inefficiencies. They include machinery and equipment, electrical equipment and computers, electronics and optical equipment. Though these sectors perform poorly in terms of productivity, they are highly traded in international markets and are associated with more innovative activities.

These sectors however require strong competitiveness, capabilities and connectedness because they are more knowledge intensive, and therefore more vulnerable to disruptive technology (i.e. innovation or technology that uproots markets and firms). High income countries are well placed for the growth and development of these sectors. Turkey performs relatively well on connectedness, though it is only just above average on capabilities and is a middling performer on competitiveness (Figure 5). Therefore, whilst these types of sectors are critical to sustained growth in Turkey, they are also at high risk of being disrupted unless the challenges across the "three Cs" can be addressed.

This means deepening supply side capacity through structural reforms that promote allocative and productive efficiency, not "picking winners" through distortive policies. Allocative efficiency is the extent to which resources in a sector are being channeled to the most productive firms. This can be supported through policies that address market failures (e.g. anti-competitive practices, price distortions, information asymmetries, inefficient subsidies). Productive efficiency is the extent to which an individual firm is optimizing output with its given inputs. This is influenced by a range of factors including technology adoption, knowledge transfer, innovation and human capacity. These topics cut across the "three Cs."

Figure 5: Turkey scores well on connectedness and capabilities but lags on competitiveness[1]



Sources: Hallward-Driemeier and Nayyar (2017), International Telecommunications Union's ICT Indicators Database; WDI; Worldwide Governance Indicators, Global Findex, Logistics Performance Index.
Notes: (i) Competitiveness index combines ease of doing business, the rule of law, and the use of mobile technologies to complete financial transactions; (ii) Capabilities index combines information and communications technology use, tertiary school enrolment rates, and the share of royalty payments and receipts in trade; (iii) Connectedness index combines logistics performance, restrictions on trade in manufactured goods, and the restrictions on trade in professional services.
Z scores for each series are calculated by: (i) subtracting the average from the series for each country's value; and (ii) dividing by the standard deviation. The Connectedness and Capabilities values are the median Z scores by country. The high, medium, and low competitiveness categories are based on partitioning of Z scores into terciles.

These reforms are relevant not just for manufacturing firms but also service sector firms, which are critical if Turkey is to contain risks of disruption in more sophisticated manufacturing sectors. Manufacturing sectors use services either as an input for their production or as a complementary item bundled with goods in pre- or post-manufacturing phase and add greater value to the products. The growing interdependence of these sectors underscores the importance of the pro-development characteristics of services, which include: tradability; and source of innovation and technology diffusion. In Turkey, traditional services dominate. But high-end services such as IT and scientific sectors are more likely to help mitigate risks to disruption in deeper manufacturing sectors. This will require reforms that help reduce market distortions in these more sophisticated service sectors.

Economic integration and firm productivity

"All things will be produced in superior quantity and quality, and with greater ease, when each man works… without meddling with anything else"
Plato

Reforms that enhance economic integration (i.e. connectedness) can impact positively on within firm productivity. International evidence shows that 'learning by exporting' has been linked to productivity gains associated with exposure to demanding clients, or to highly productive competitors. 'Learning by importing' has been identified when access to a wider variety of intermediates and capital goods relax technological constraints allowing firms to produce in better conditions.[2] Exposure to multinationals through FDI, has also been linked with learning and with

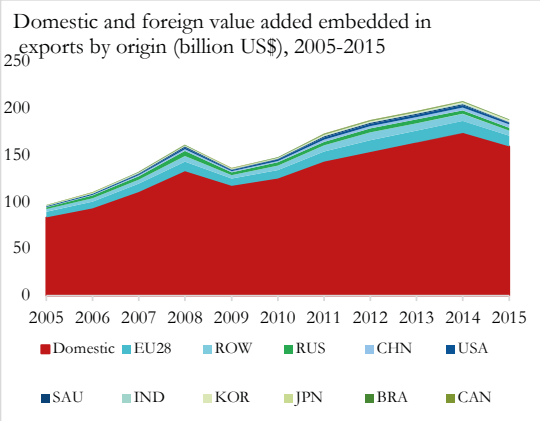
[1] Adapted from Hallward-Driemeier, M, G. Nayyar, "Trouble in the Making: The Future of Manufacturing-Led Development," World Bank Group (2017).
[2] See Pavcnik, 2002; Amiti and Konings, 2007; Brandt, Van Biesebroeck, Wang, Zhang, 2017, Atkins et al., 2017.

increased incentives to innovate**.** The effects of openness on productivity are not automatic. Gains accrue heterogeneously to different types of firms.[3] They can depend on market structure, the overall investment climate, or the rigidities that may exist in labor and capital markets (i.e. competitiveness and capabilities).

Turkish firms have become increasingly integrated in the global market place. Turkish merchandise exports as a share of global merchandise exports increased from 0.5 percent in 2000 to 1 percent in 2015. Exporters reach almost all countries in the world, though exports tend to be concentrated within the EU and the Middle East and North Africa (MENA) regions. At the product level, export concentration is relatively low and slightly decreasing over time. The top 5 products exported explain about 15 percent of export revenues in 2016. The number of exporters has increased by 70 percent over the period 2006-2016,[4] while the number of importers, mostly of intermediates, has increased by 41.5 percent. Turkish exports show a gradual substitution of low-tech for mid-tech products while imports continue being concentrated in more tech-intensive sectors.

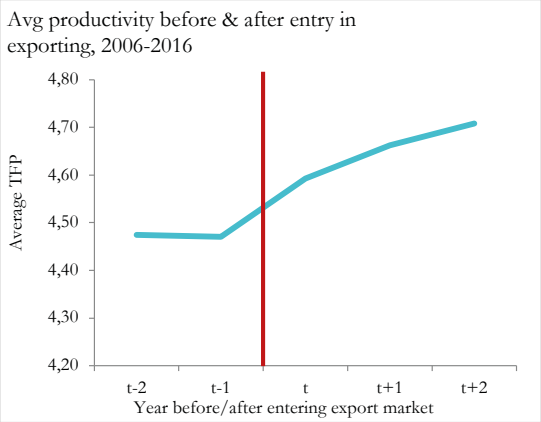
Turkey's integration into the world economy happened on the back of global value chains; Turkey integrates into GVCs as a buyer and as a seller. Turkey's backward participation into GVCs – measured as the portion of import content in Turkey's exports - has increased dramatically early in the turn of the century, and continued growing during the following fifteen years. In 1995, every US$ 100 exported by Turkish firms had US$ 8.9 of import content. In 2016, this increased to US$ 16.5. Forward participation – measured as the portion of Turkish content in other country's exports - has also increased. In 2005, of every US$ 100 exported, 13.5 ended up in the exports of other countries, while in 2015, US$ 14.6 did.[5] Turkish firms participate in GVCs by buying intermediates and producing final goods, as well as by producing intermediates themselves and exporting them to other firms producing final goods. To be sure, while import content of exports has increased, the domestic value added in exports has doubled since 2005 (Figure 6).

Figure 6: Rising domestic value added in exports



Sources: OECD Stat data, WB Staff estimates.

Figure 7: Productivity increases after exports



Sources: EIS.
Notes: Consider only manufacturing firms. The plot shows average TFP of first-time exporters in the year preceding and following the entrance to the export market. This refers to the first time a firm start exporting in the period 2006-2016.

[3] In Lithuania, Javorcik (2004) provides evidence of positive productivity spillovers from FDI taking place through interactions between foreign affiliates and their local suppliers in upstream sectors. The same author finds evidence of vertical spillovers through backward linkages also in the cases of Czech Republic and Latvia through multiple channels.

[4] Based on sample from EIS data; according to TURKSTAT data, the number of exporters increased by 52 percent from 2006 to 2016.

[5] Data on forward participation indicators for 2014 are not available.

Productivity of Turkish firms has grown thanks to increased integration. Turkish exporters enjoy a productivity premium comparable to what is observed in advanced economies; exporters are on average 7.5 percent more productive than non-exporters. Turkish importers and exporters show higher productivity growth than non-importers or non-exporters. Though exporting firms are more productive in the first place, their average productivity increases by about 3 percent after entering the export market (Figure 7). The benefits are larger for the pharmaceutical, paper, basic metal and motor vehicle sectors, which have strong pro-development characteristics.

Firms' productivity grows faster in export and import-intensive sectors *when* that intensity is linked to GVC participation. The link between productivity and import and export status is at work through GVC integration. Sectors that are better integrated in the global marketplace through GVCs, experience positive within-firm growth in productivity. Sectors with faster within-firm productivity growth have been those more exposed to trade, particularly those that display stronger GVC integration through forward and backward linkages. Though there is also evidence that increased integration on the back of GVCs helped markets allocate resources more efficiently. Therefore, in addition to the effects at the firm-level, evidence shows that in Turkey, the reduction in trade barriers improved selection, contributing to the shrinking and eventual exit of inefficient firms, and allowing the most efficient to thrive and grow.

Gains from integration have not accrued equally to all firms. The absorptive capacity of firms matters in determining how much they gain from increased exposure to foreign intermediates, or from the presence of multinationals upstream. Larger, more R&D intensive firms tend to benefit more than smaller, less innovative ones. For example, productivity gains from reduced upstream tariffs are larger for firms with a smaller "technology gap." In other words, firms with a large technology gap could lack the technical competency needed to absorb external knowledge. Similarly, Turkish firms have gained from FDI in upstream sectors, but the benefits accrue mostly to larger export firms that are engaged in R&D.

Several policy implications emerge from these results. Within Turkey's Customs Union with the EU, there is scope to reduce protection in agriculture and increase integration of services, both of which would be productivity enhancing. It is also important for Turkey to participate in EU committees to improve bilateral dialogue between parties for the design of a common commercial policy, and thereby avoid non-reciprocal arrangements with third parties that have negotiated FTAs with the EU. Beyond the Customs Union, it is worth reviewing the criteria for the use of trade defense instruments (TDI) with the aim of reducing the impact of TDIs on trade; and reduce barriers to FDI in the services sector. Finally, supporting firm capabilities through supplier development programs and support to R&D investment could widen the range of firms that benefit from integration.

Innovation support and firm productivity

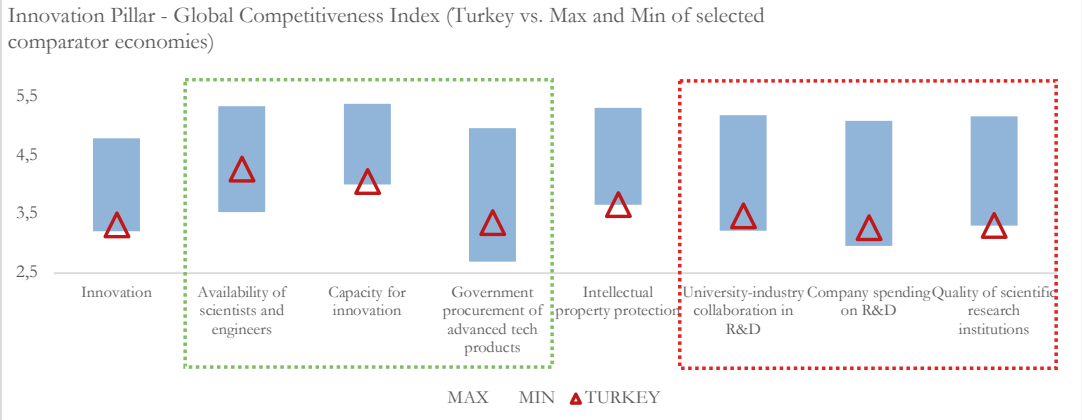
"Innovation is the market introduction of a technical or organizational novelty, not just its invention."
Joseph A. Schumpeter

Firms' ability to adapt and innovate is a big determinant of within firm productivity growth. Adaptation and innovation entail risks including large fixed costs, long gestation periods, and uncertain returns. A conducive investment climate can mitigate those risks through lower administrative burden on businesses, an efficient tax system, access to long-term finance, and agglomeration economies. In addition, public incentives (e.g. tax breaks, preferential credit, public procurement, direct grants) can support firms to invest in technology, spend on R&D, and innovate. They can help overcome market failures for productivity enhancing investments; or they can also distort markets, leading to allocative inefficiencies. This study assesses the impact of incentive grants delivered by two leading institutions: KOSGEB and TUBITAK. Together they are the largest providers of public grants for

business support, including for investments in R&D and innovation.

Turkish firms have accelerated R&D expenditure and intellectual property applications in recent years but faces important gaps in innovation capacity relative to comparators. R&D expenditure grew rapidly from a low base, nearly doubling between 2005 and 2010 standing at just over 1 percent of GDP. The scale up in R&D expenditure has sharply increased demand for researchers, particularly in manufacturing and industry. The boost in R&D spending has been associated with intellectual property applications, though also from a low base. In general though, Turkey and its comparators were not the best innovators in the past ten years. Turkey's innovation gaps relative to its comparators are greatest in the areas of university-company collaboration in R&D, private R&D spending, and the quality of research institutions (Figure 8).

Figure 8: Large innovation gaps relative to peers



Source: World Economic Forum, Global Competitiveness Index (2017-2018).
Notes: The figure omits the sub-indicator on "Patent Cooperation Treaty patents applications" because of outliers. Country comparators include the High Performers and Trapped MICs listed above.

This study shows that TUBITAK grants are better targeted to firm innovation in sectors with strong pro-development characteristics compared to KOSGEB. KOSGEB targets SMEs not just for R&D and innovation, but for broader business support. KOSGEB grants are evenly distributed across firms (i.e. little variance around average size of grants) regardless of which sub-sectors they are in. TUBITAK grants on the other hand are more targeted to specific projects or firm level upgrades. Plus, more technology intensive industries with pro-development characteristics (e.g. motor vehicles, machinery and equipment and computer, electronic and optical products) receive a relatively largely share of TUBITAK grants. At the same time, there is scope to increase TUBITAK support for younger firms, who tend to be more innovative.

The targeting of TUBITAK and KOSGEB grants in turn affects their impact on firm level performance, which is generally positive. For example, KOSGEB has a much bigger positive impact on employment growth than TUBITAK. On the other hand, TUBITAK has a much bigger positive impact on R&D investment than KOSGEB. It is therefore not surprising also that the impact of TUBITAK support on innovation is larger and significant in more industries than the impact of KOSGEB. These results are in part reflective of the nature of the two programs; TUBITAK grants are not necessarily aimed at increasing the firm size but innovation, while the KOSGEB grants are mainly targeted to accelerate the growth of the SMEs.

Whilst the impact on employment, R&D and innovation is encouraging, ultimately what matters in terms of sustainability is the impact

on firm productivity. In other words, without productivity gains, the impact of grants on employment, R&D investment and innovation may not be sustainable. The evidence for Turkey shows that the impact of R&D investment and innovation is positive for firm productivity. It follows from this that the impact of KOSGEB support on productivity is neither large nor positive, whilst the impact of TUBITAK on firm productivity is both positive and strong.

This raises questions over the sustainability of results achieved, particularly under KOSGEB. KOSGEB programs have been successful in employment creation. But KOSGEB support does not always impact productivity positively. Therefore, employment creation may be temporary i.e. supported firm is likely to shrink back to its pre-support size. Alternatively, KOSGEB grants may also be sustaining less productive firms that would otherwise go out of business through "creative destruction." In other words, subsidies may be creating rather than correcting market failures by protecting firms from market exit. Similarly, the impact of grants on R&D and innovation could also improve through better firm selection, particularly by taking account of firm size and age.

Several policy implications emerge from these results. It is worth reviewing grant award criteria to; (i) target productivity enhancing interventions – these do not necessarily have to be R&D or innovation related, they could include other business improvements that generate efficiencies; (ii) explicitly target firms that have strong growth and innovation potential. On the latter, support to SMEs should distinguish between young and/or high growth potential firms from older/lower growth potential firms. The evidence in this chapter shows that young firms generally have higher potential to grow and innovate. This research, and principles behind the efficacy of public interventions for innovation and R&D could be expanded to other instruments.

Human capital and firm productivity

"Education is another magic formula that failed us in our quest for growth"
William Easterly (2002)

"In this globalized world, physical capital and technology are always available. But human capital is still very immobile, so you should have good education and job-training programs to acquaint people with the necessary technology."
Han Duck-soo, The Growth Report (2008)

New technologies and business lines from economic integration and innovation discussed above can create new and better jobs that will require enhanced human capital. New technologies and business lines boost the demand for more capable workers, that in turn enhance firms' absorptive and technical capacities. These factors work together to accelerate within firm productivity growth. Investing only in new technologies and business lines without human capital would create unutilized, excess capacity; whilst investing only in human capital without new technologies and business lines would create an excess supply of workers with redundant qualifications. Both outcomes are inefficient and will not accelerate productivity.

The supply of more educated workers in Turkey has outpaced the labor market's ability to absorb those educated workers. This is reflected in rapidly growing unemployment among the more educated (Figure 9); a relatively large share of unemployed workers with vocational and university education; and an important share of people that are not in employment, education or training (NEET) with university degrees in technical subjects (Figure 10).

Figure 9: Growing unemployment among educated

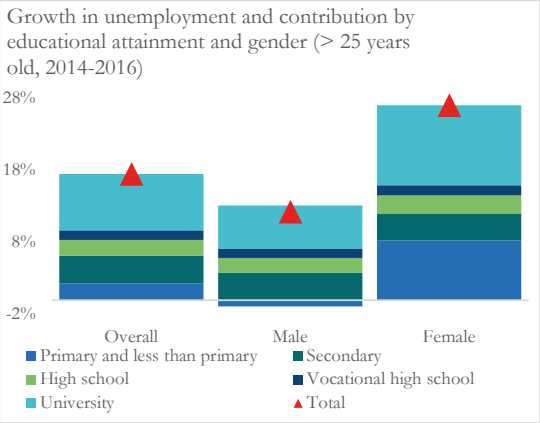
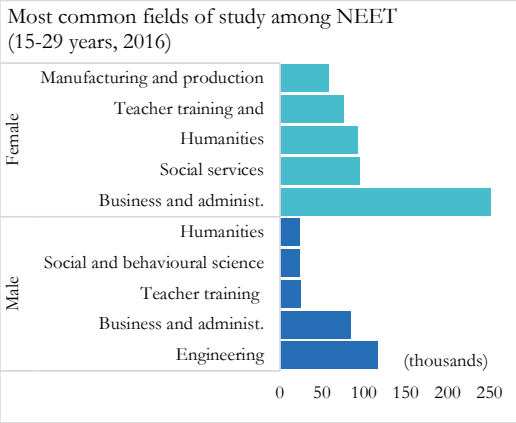


Figure 10: NEET and technical qualifications



Sources: LFS 2016, WB Staff estimates.

There could be a variety of structural reasons that explain why the demand for more educated workers has not kept pace with the supply of educated workers. The first could be an excess supply of more educated workers. This could be linked to the pace of economic integration and innovation discussed in chapters 3 and 4. For example more integration through FDI can boost demand for more educated and skilled workers in a way that domestic investment cannot. The second could be due to labor market rigidities and other market failures discussed in chapter 1. These can prevent labor from being efficiently reallocated to more productive areas. Thirdly, it could be due to the quality of education. Fourthly, it could reflect a lack of skills that cannot be offset by higher educational attainment only. Various skills assessments show that Turkey does indeed perform less well compared to other OECD economies.

The demand for more cognitive and technical skills in the Turkish economy has increased, albeit quite slowly. This is in line with earlier findings on the rapid increase in low-skilled employment relative to high-skilled employment. Whilst the public sector is working on better matching the supply of skills to the demand for skills, the role of the private sector in fostering the demand for more skills is also limited. This is evident in the relatively low levels of firm investment in training of employees. If demand for more and better skills does not accelerate, the incentives to acquire more and better skills on the supply side will decrease.

An analysis of wage developments and premia point to the relative importance of demand side factors in deterring the acquisition of deeper skills. This is reflected in the high wage growth for low skill workers relative to high skill workers, and the decline in wage premia for university educated workers relative to primary educated workers. Whilst the impact of minimum wages certainly plays a role in driving up earnings of those at the lower end of the wage spectrum, these developments together with the above findings suggest that a demand side boost is needed to deepen the skills of the Turkish labor force.

The study finds no significant relationship between skill composition and firm productivity. Firms characterized mostly by medium-skills absorb nearly half of all employment. Low skill firms absorb around 35 percent of employment, whereas high skill firms account for around 16 percent of employment. One might expect labor productivity to be higher in firms that have higher incidence of high skill workers. However, there is little evidence of a clear association.

These counter-intuitive results are likely linked to the prevalence of small-micro firms in the economy. These firms absorb the bulk of employment and suffer from declining productivity. Larger firms exhibit constant productivity over the last 10 years across all skill incidences. In other words, small firms will not drive demand for higher skills. This means that even as the supply of skilled workers increases in the future, the prevalence of small-micro firms limits the labor market's capacity to absorb fully the next cohort of skilled graduates

Turkey needs a boost in the demand for more educated and skilled workers. Without this, rising labor supply will not be absorbed in good quality jobs. This in turn could reverse gains in standards of living over the past few years. Boosting demand for more educated and skilled workers links back to other parts of the report including the deepening of economic integration and more effective support to firm level innovation, both of which would help to deepen production capacity of firms, which in turn would require more qualified workers. It would require more targeted education policies that would help strengthen the relationship between skills and firm-level productivity. It would also require a reduction in the mandatory costs of labor through reform of labor market regulations.

Competition, regulation and productivity

A famous economist once said that the best of all monopoly profits is a quiet life. You don't want a quiet life for a firm; you want it forever to improve its productivity"
Robert Solow, The Growth Report (2008)

The final chapter in the study analyzes the impact of competition and business regulations on firm and sector level productivity. Barriers to competition and burdensome business regulations distort markets and prevent a reallocation of resources to more efficient firms. Competition may free up the efficient re-allocation of market resources from low- to high-productivity firms as well as from low-efficiency sectors to high-efficiency ones. Turkey has over time reformed its business regulatory framework, which has gradually helped increase market competition. The big wave of reforms in the early 2000s targeted a reduction of state intervention in the economy and establishment of independent regulators, and through these aimed to encourage more private investment and competition in key sectors of the economy.

Firm level analysis shows that these reforms increased competition across manufacturing and services in Turkey over the past ten years. There has been reduced market concentration across all major sectors, which bodes well for productivity, though manufacturing concentration remains high. More high-tech manufacturing and skill intensive services tend to be more concentrated as these sectors are more difficult to break into. But even here, the trend, particularly in terms of employment shares of large firms, has been on a downward path.

With reduced concentration, labor share is rising whilst markups are declining. Total labor compensation as a share of firm revenues has consistently risen over the past decade largely due to a shift towards labor-intensive production. This is positive for Turkey given a more global concern over the secular decline of the once-stable share of revenues going to labor. In more concentrated sectors, firms can command higher prices and revenues, with a lower share of total firm revenues accruing to labor. Firm-level markups (i.e. price above marginal cost of producing one unit) have been declining across all sectors. In general, if market power is declining, firms cannot command prices too far above the marginal cost required to produce a good or service (i.e. a markup); this will also result in a larger share of the bottom line accruing to labor, as is the case in Turkey.

Despite higher labor share and lower markups, the observed declines in concentration have also been associated with declining productivity. This should not be taken to say that more competitive markets result in declining productivity. First, manufacturing remains notably concentrated. Second, under a

model of 'winner take most' competition, where a few highly productive firms capture increasing market share, such trends are consistent with the lack of highly productive market superstars and the presence of increasing numbers of less productive (and possibly more labor-intensive) firms. That is, the prevailing market conditions are such that there has been declining market concentration at the same time as a re-allocative shift toward less productive activities. This is consistent with findings across the rest of the report.

The study looks at two aspects of the regulatory framework that affect competition and productivity. The first relates to regulatory barriers for firm entry and exit, which are implicit constraints on competition. Regulatory barriers to firm entry and exit can dampen within sector productivity gains as more efficient entrants are prevented from displacing less efficient incumbents. While Starting a Business in Turkey is comparatively efficient and less burdensome, an opposite conclusion emerges when looking at Resolving Insolvency. In economies where these procedures are burdensome, less productive firms are more likely to remain in the market, dampening overall productivity. To address these challenges, a new 'concordat' procedure was recently introduced, which enables authorities to set timelines for the procedure, and puts a heavy focus on business continuation rather than its liquidation through new financing, confirmation of contracts and sale of essential assets in bankruptcy.

The second aspect are regulations in the services sector, which in Turkey pose obstacles to competition and productivity. Regulatory reform in services has a positive impact on downstream manufacturing and services firms' productivity. When service inputs are effectively supplied, this has a knock-on effect on industries that use services. A recent World Bank study finds that Turkey has much potential to increase the impact of services on manufacturing productivity (Haven and Van Der Marel, 2018). There is much scope to reduce restrictions on FDI in services; domestic regulatory barriers in services that affect Turkish and foreign firms; discriminatory services trade barriers that prevent foreign service providers from entering and operating in Turkey.

These results have several policy implications. To increase dynamism in high-value added industries with strong pro-development characteristics, there is scope to increase competition (e.g. through anti-trust policies) as some of these sectors remain relatively more concentrated. Moreover, aligning capital risk, via policies that, for instance, would increase creditor recovery rates would help support more activity in these sectors. Secondly, to help release resources for more productive firms by enabling exit of less productive ones will require review of bankruptcy and insolvency frameworks, which is already underway (e.g. through the concordat reform). Thirdly, in the services sector, there is much scope to remove FDI restrictions and opening up professional services to greater competition.

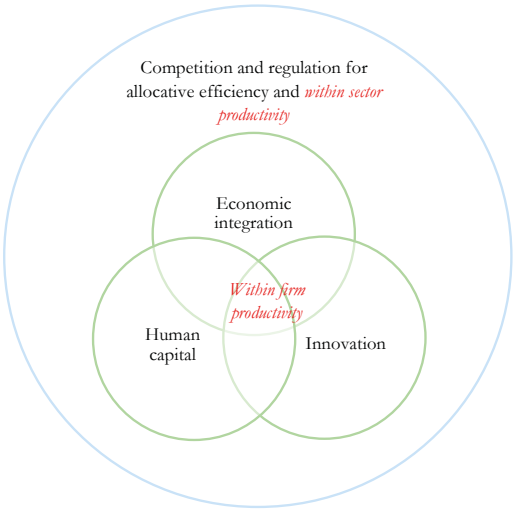
Conclusion

The analysis of micro-macro productivity linkages in this study reveal that the recent years' focus on managing demand shocks has diverted resources away from sectors with strong pro-development characteristics. Other than a few breakout sectors (e.g. motor vehicles, basic metals, textiles), manufacturing in has stagnated in recent years (Figure 4). Construction and services on the other hand have expanded rapidly, though suffer from low and falling productivity. However, Turkey has scope to expand sectors that have strong potential for boosting productivity, economic growth and jobs.

This will require reforms that promote within firm productivity growth. The study looks at three inter-related factors (Figure 11). The first two – economic integration and innovation – can be big sources of new technology and business lines. The third is human capital, which is necessary to increase firms' ability to absorb new technology and develop business lines. The study finds that economic integration and innovation have boosted firm-level productivity, though reforms could further accelerate these positive impacts. Particularly as productivity gains have not sufficiently increased the demand for more educated and skilled workers.

The growth of more productive firms could in turn also be accelerated through reforms that increase competition and reduce regulatory burden.

Figure 11: Reforms for within firm and within sector productivity growth



Chapter 1

Drivers and challenges of economic growth

I. Drivers and challenges of economic growth

1. **Sustaining Turkey's impressive record of growth and poverty reduction will require another round of reforms to boost productivity in the economy**. A big wave of reforms in the early 2000s accelerated capital and labor accumulation, and helped shift resources to higher productivity sectors and firms. Turkey as a result experienced unprecedented economic growth between 2002 and 2007.[6] These early reforms also enabled Turkey to bounce back quickly from a series of shocks since 2007. As growth from factor accumulation and structural shifts begins to plateau, the economy needs to use factor inputs more efficiently to generate additional output. This requires reforms that enable resources to shift to higher productivity sectors and firms, and that enable firms to invest in productivity enhancing skills and technology.

2. **This report analyzes options to improve productivity in Turkey and propel the economy to its next phase of development**. It links economic growth trends to microeconomic evidence of firm and sector level productivity. It aims to better understand productivity bottlenecks and propose options to address these. The report starts below with an analysis of the drivers and challenges of economic growth in Turkey. It connects these findings to firm level analysis of productivity in manufacturing, construction and services. The report then analyzes the impacts of four factors on firm productivity and their implications for reform: (i) economic integration; (ii) competition; (iii) government support programs; and (iii) human capital.

Strong economic convergence not sustainable without long-term supply reforms

(a) Short-term policies help manage demand-side shocks between 2010 and 2017

3. **Turkey's pace of convergence to high income levels since 2002 matches that of a few countries that recently transitioned quickly out of upper-middle income status** (UMIC). Turkey's convergence picked up rapidly after 2002 with market and regulatory reforms, and expansion of public services (World Bank, 2014). Between 2002 and 2007, real per capita income in Turkey grew by more than it did in the previous decade and a half. Convergence accelerated further after 2009 (Figure 1, Box 1). Controlling for income and natural resource wealth, Turkey has experienced one of the biggest jumps in per capita income rankings since 2002 (Figure 2).

Box 1: Higher Performer and Trapped MIC comparators

Several parts of this report use two sets of comparator countries. One set includes "high performer" countries that recently graduated from Upper Middle Income to High Income in less than 20 years: Chile; Czech Republic; Korea, Rep; Poland. The other set, referred to as "trapped MICs," includes countries that have remained in the Upper Middle Income category for more than 20 years: Argentina; Brazil; Malaysia; Mexico; and South Africa.

The time series data on transition across income categories is based on World Bank data on per capita GNI and Felipe et al. (2012). The twenty-year threshold is based on a similar approach used in the WBG (2017) report: Lessons from Poland, Insights for Poland.

[6] WBG, "Turkey's Transitions: Integration, Inclusion, Institutions," (December 2014).

The measure of comparison is limited to income graduation. It does not include the distribution of income or social outcomes. The report however assesses possible economic and structural characteristics that can enable, or pose challenges to, graduation from UMIC to HIC.

Comparators and reform paths are diverse, but there are common traits. For example, most trapped MICs are relatively resource rich. Among them, Brazil and Malaysia are 2 of only 13 economies that since 1950 experienced high sustained growth (average of 7 percent a year or more for 25 years or longer); but Brazil and Malaysia did not cross the HIC threshold.[7] Korea, Rep., on the other hand, also among the 13 high growth countries, did graduate to HIC.

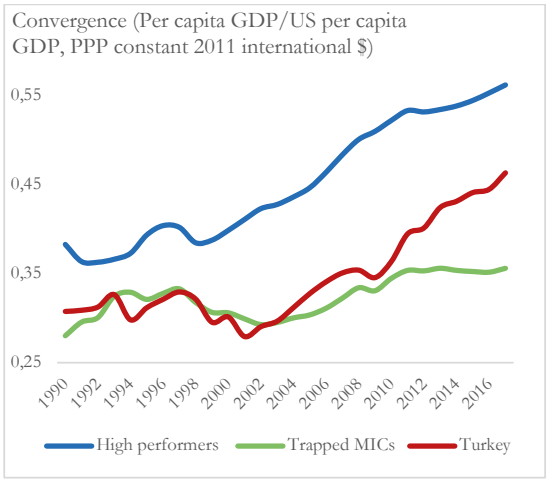
Successful high growth economies have some common features. The Commission on Growth and Development highlights the following:[8] (i) integration in the global economy; (ii) maintenance of macroeconomic stability; (iii) high rates of (domestic) savings and investment; (iv) market structures to allocate resources; (v) committed, credible and capable governments.

4. **Turkey's convergence is even more remarkable given the shocks it suffered since 2008**. Strong institutions, accumulation of fiscal and financial sector buffers since 2002 (World Bank, 2014), and post-GFC global monetary expansion, enabled effective policy stimuli. After the 2016 crisis for example, fiscal incentives boosted demand and sustained supply through subsidies to employers. These short-term measures helped offset labor market rigidities that otherwise would have precipitated retrenchments, particularly among low income earners. Similarly, government guarantees in 2017 for credit to Small and Medium Enterprises (SMEs) helped maintain access to working capital during the downturn. Banks would have otherwise not extended credit due to financial market frictions, increasing the probability of business closures.

5. **Short-term policies since 2008 diverted Turkey from its earlier focus on long-term supply reforms, though also helped avert a recession until recently.** Downturns can promote efficient resource allocation; more productive firms drive out less productive ones (creative destruction), and incentives for productive investments rise with falling profits from short-term projects. But structural constraints, which require major reform, pose hurdles to price adjustments and factor mobility needed for efficient reallocation of resources. For example, countercyclical finance for productive investments is limited in Turkey by the depth of the financial sector (capital markets, private equity, insurance) and market imperfections, which are long-term challenges. Therefore, a sharp downturn caused by an exogenous shock like the one in 2016 would have taken a long time to recover from.

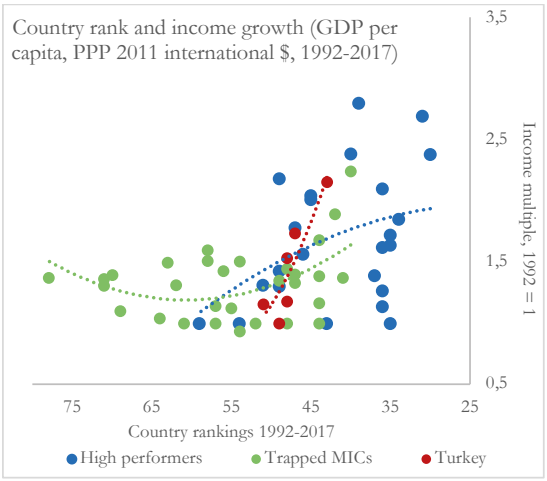
[7] WB, "The Growth Report: Strategies for Sustained Growth and Inclusive Development," (2008).
[8] Ibid (Part 1).

Figure 1: Turkey's economic convergence continued to accelerate after the Global Financial Crisis



Sources: WDI, WB Staff estimates.
Note: Convergence estimates for high performers and trapped MICs based on their weighted averages of per capita GDP.

Figure 2: This enabled Turkey to catch up with high performers and pull away from trapped MICs



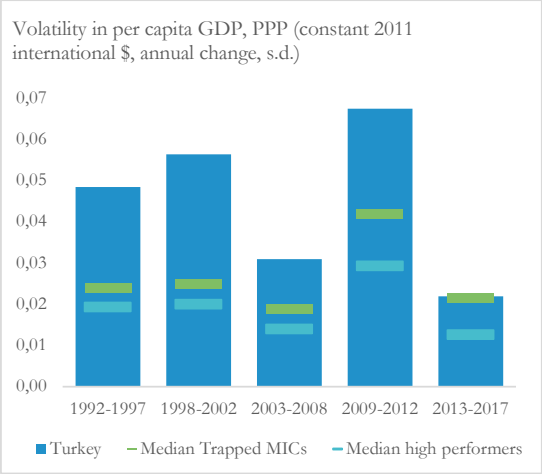
Sources: WDI, WB Staff estimates.

(b) Diversion from long-term supply reforms diminish the sustainability of growth

6. **That said, short-term supply subsidies without long-term structural reform affect the sustainability of growth.** They can provide temporary relief for unproductive firms, and in the absence of allocative efficiency they increase the chances of a boom-bust cycle once subsidies are withdrawn. In Turkey this is reflected in highly volatile growth per capita relative to other UMICs (Figure 3). Growth volatility is associated with volatility in consumption (Figure 4), which hurts household welfare particularly poorer households with lower savings; it could arise from shocks to permanent income or a breakdown in financial and/or jobs market intermediation, increasing the need for inefficient fiscal incentives. Growth volatility is also associated with volatility in investment, which can translate into lower per capita GDP growth over the long-term.[9] The greater the swings in demand, the more pronounced the negative impact on longer-term productive investment.

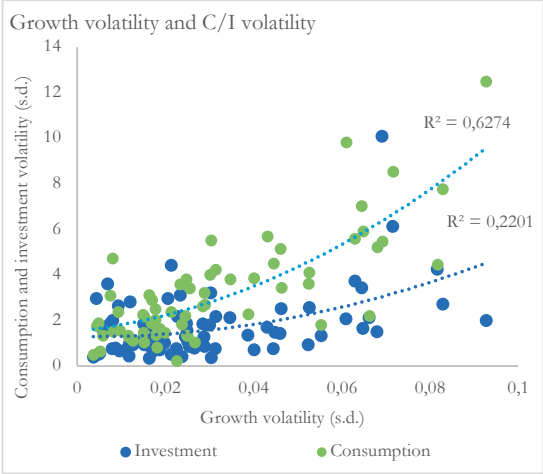
[9] Ramey, G. and V.A. Ramey (1995); Easterly, W., R. Islam, J.E. Stiglitz (2000); Loayza, N.V., R. Ranciere, L. Serven, J. Ventura (2007); Dabusinskas, A., D. Kulikov, M. Randveer (2012).

Figure 3: Per capita growth in Turkey is highly volatile particularly relative to high performers



Sources: WDI, WB Staff estimates.
Note: Standard deviation for period average growth of per capita GDP.

Figure 4 This is associated with volatility in consumption and investment



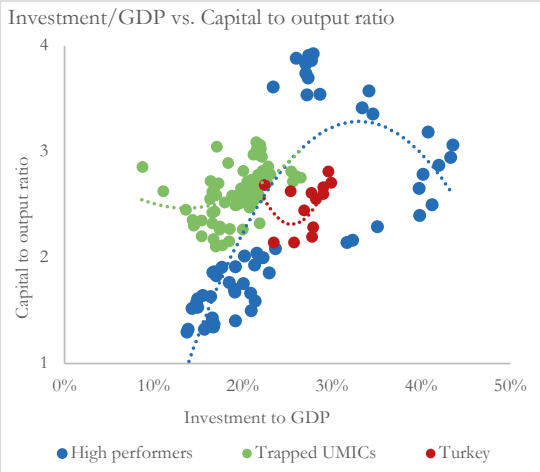
Sources: WDI, WB Staff estimates.
Note: Includes China, Hungary, India, Indonesia, Romania and Russia in addition to high performers and trapped MICs.

7. **The impact of these trends in Turkey is reflected in the quality of investments and the importance of consumption in growth.** Investment levels are above those of countries in the trapped MICs category, but the return on capital is close to that of trapped MICs, and below that of high performers when they were UMICs (Figure 5). Some point to the growing share of less productive construction activities,[10] though others highlight evidence of an increasingly productive construction sector [11] (see below and Chapter 2). Private consumption in Turkey on the other hand has been consistently higher than for both trapped MICs and high performers (Figure 6).

8. **These developments are driven in part by Turkey's domestic savings-investment gap and types of external financing.** Capital inflows helped plug the savings gaps (Figure 7) and fuel growth since 2002, but the composition since 2008 has shifted from FDI to portfolio and other investment flows. FDI as discussed in chapter 3 of the report has been a big source of learning and productivity, but inflows have been considerably below those experienced by high performers when they were UMICs (Figure 8). The impact of portfolio and direct lending flows on productivity is less known. They have been an important source of longer-term financing through the banking sector. But the benefits of technology and knowledge transfer are less compared with FDI. They are also more prone to sudden stops, which Turkey has been highly vulnerable to in the past 15 years. The impact of those sudden stops has also been severe for Turkey in terms of protracted downturns.[12]

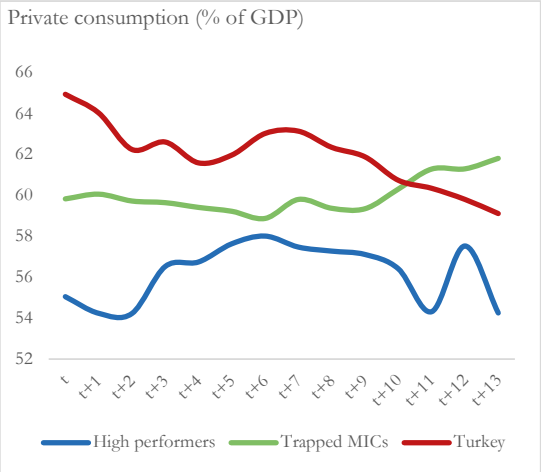
[10] WB, "Turkey's GDP revision: understanding the sources of changes," (2017).
[11] Atiyas, I and Z.T. Taspinar, "Labor productivity in manufacturing vs. construction in Turkey: A few puzzles," (January 2018).
[12] Caner, M, F. Koehler-Geib, G.A. Vincelette, "When Do Sudden Stops Really Hurt?" WB Policy Research Working Paper 5021 (August 2009).

Figure 5: Investment efficiency in Turkey is closer to Trapped MICs than high performers



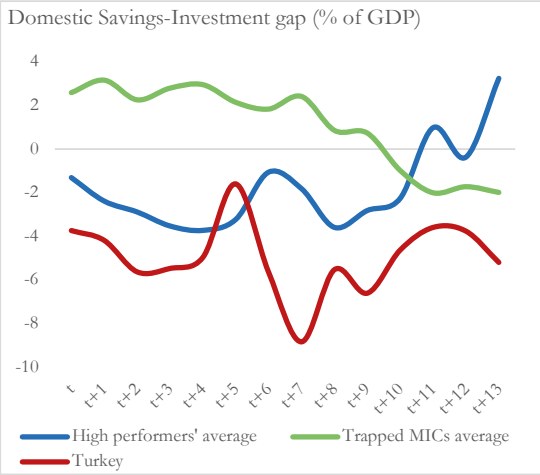
Sources: WDI, WB Staff estimates.
Notes: Period for High performers are years they were in UMIC group; for Trapped MICs, 2002 onwards, for Turkey 2004 onwards.

Figure 6: Whilst private consumption levels are higher than Trapped MICs and high performers



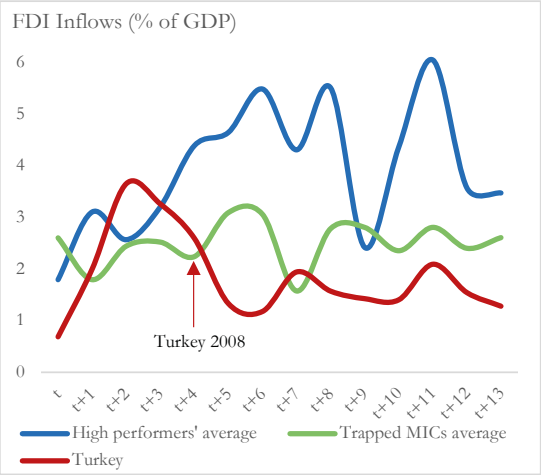
Sources: WDI, WB Staff estimates.
Notes: Periods are the same as Figure 5.

Figure 7: Macro stability and reforms accelerated capital inflows to plug a large savings gap



Sources: IMF WEO, WB Staff estimates.
Notes: Periods are the same as Figure 5.

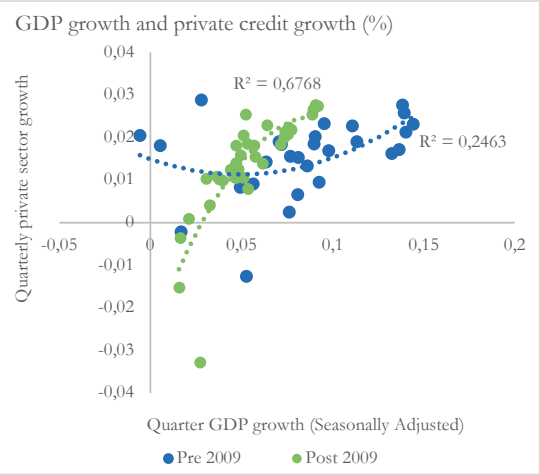
Figure 8: But composition of external flows has shifted from FDI to volatile portfolio flows



Sources: WDI, WB staff estimates.
Notes: Periods are the same as Figure 5.

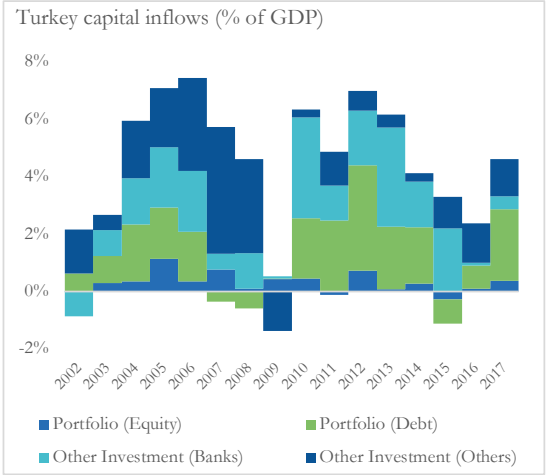
9. **The dependence on volatile portfolio flows amplifies economic swings and allocative inefficiencies through the financial sector**. Private credit in Turkey has become increasingly procyclical after 2009 (Figure 9), which coincides with global monetary easing and increased external borrowing by Turkish banks (Figure 10). Credit growth accelerated during upturns when collateral values appreciated and decelerated during downturns when collateral values fell. Procyclical finance can therefore prolong downturns when leveraged companies experience tighter access to and higher cost of finance (Figure 11). Market failures restrict funding during downturns even for profitable and innovative projects. A symptom of the resulting allocative inefficiency in Turkey is the high credit-to-GDP gap,[13] signaling credit expansion beyond the economy's absorptive capacity (discussed further in the last section of this chapter).

Figure 9: Credit to the private sector has increasingly become procyclical after 2009



Sources: WDI, WB Staff estimates.

Figure 10: Driven in big part by a sharp increase in debt creating flows to Turkish banks



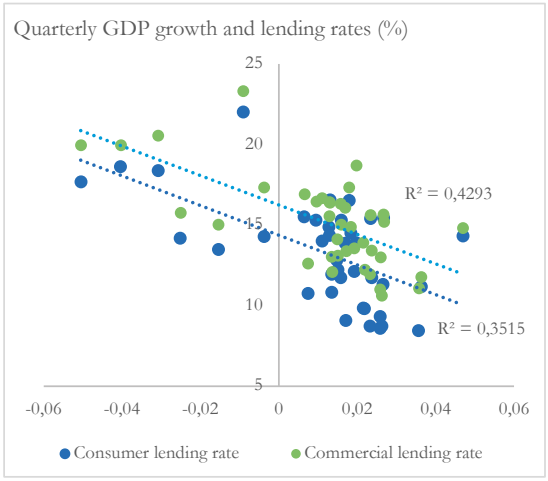
Sources: WDI, WB Staff estimates.

(c) Risks of premature deindustrialization will limit growth sustainability

10. **Short-term macro policies, investment inefficiency, volatile external flows, and procyclical finance impact negatively on the quality of structural transformation**. One angle to this is premature deindustrialization.[14] In Turkey, the share of industrial employment has remained stable in the past 15 years, whilst the share of industrial output has risen (Figure 12), suggesting rising labor productivity in industry. At the same time, industry shares of employment and value added in Turkey today are lower compared to those of high performers during their UMIC stage. Industry, however, and particularly manufacturing, has historically been the big driver of development in countries that have transitioned to high income. The sector's ability to accelerate growth are thanks to characteristics that generate strong productivity dynamics and spillovers (Table 1).

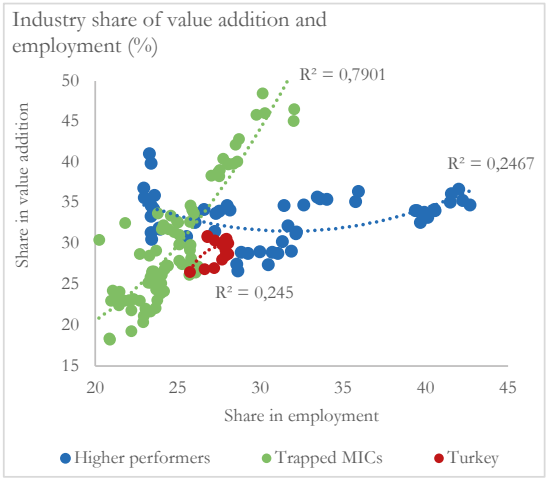
[13] WB, "Turkey Economic Monitor: Minding the External Gap," (May 2018).
[14] Rodrik, D, "Premature Deindustrialization," JFK School of Government, Harvard University (November 2015).

Figure 11: Procyclical credit means tighter access and higher cost of financing during downturns



Sources: Haver Analytics, WB Staff estimates.
Notes: Quarterly growth rates 2008-2017.

Figure 12: Stable employment and rising value-added of industry suggest rising labor productivity



Sources: WDI, WB Staff estimates.
Notes: Periods are the same as Figure 5.

Table 1: Pro-development characteristics across sectors in Turkey[15]

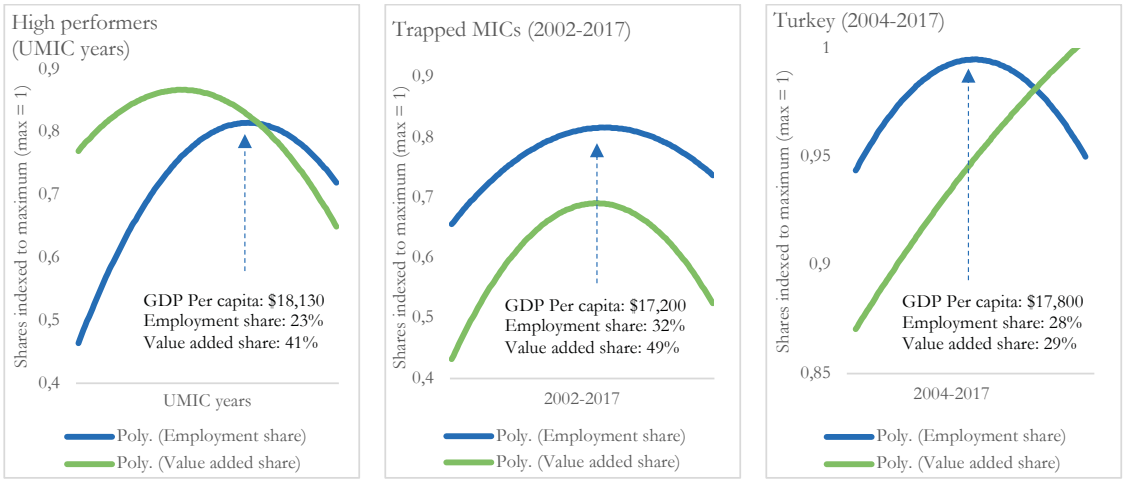
	Exports (% of sector output) 1/	Employment (% of total) 2/	Low skill employment (% of sector employment) 3/	R&D spending (% of total) 4/	Value added per worker (US$ thousand, constant 2010) 5/
Agriculture	11.1	19.5	89.5	7.2	12.7
Industry	60.7	26.8	65.1	61.8	39.2
Services	8.1	53.7	41.7	32.0	39.1

Sources: WDI, Haver Analytics, Turkey Labor Force Survey, MOIT, WB Staff estimates.
Notes: 1/ Access to international markets, scope for technology and knowledge spillovers (2017); 2/ Significance as an employer (2016); 3/ Ability to absorb low skilled workers defined as those with less than high school education (2017); 4/ Innovation and technology diffusion (2014); 5/ Labor productivity (2016).

11. **That said, changes in the global nature and distribution of industrial production means that there may be different paths to industrial development and structural transformation**. Comparator UMICs seem to have reached their highest shares of industry employment at around US$ 17,000- US$ 18,000 per capita GDP (PPP 2011 $), beyond which the industry employment shares begin to decline (Figure 13). But at this point, industrial labor productivity for high performers is higher than for Turkey and trapped MICs. This could be due to labor saving technology and increased productivity in upstream and downstream services that help deepen industrial production, which in turn requires investment in skills.

[15] Adapted from Hallward-Driemeier, M, G. Nayyar, "Trouble in the Making: The Future of Manufacturing-Led Development," World Bank Group (2017).

Figure 13: Trends in industrial employment and value-added shares during UMIC phase



Sources: WDI, WB Staff estimates. Notes: Periods are the same as for figure 5. GDP Per capita in PPP 2011 $.

12. **Labor-saving technologies have raised concerns about emerging markets like Turkey no longer having the ladder of development that others were able to use to climb up the income pole.**[16] Some however have noted that countries can prepare and adapt to take advantage of technological and other changes.[17] This means better understanding productivity dynamics across and within sectors, particularly as pro-development characteristics (i.e. potential to boost productivity, growth and employment) varies (Chapter 2). Before going into these, the next two sections take stock of aggregate productivity trends and reform gaps in Turkey.

A productivity boost is needed to sustain Turkey's solid economic performance

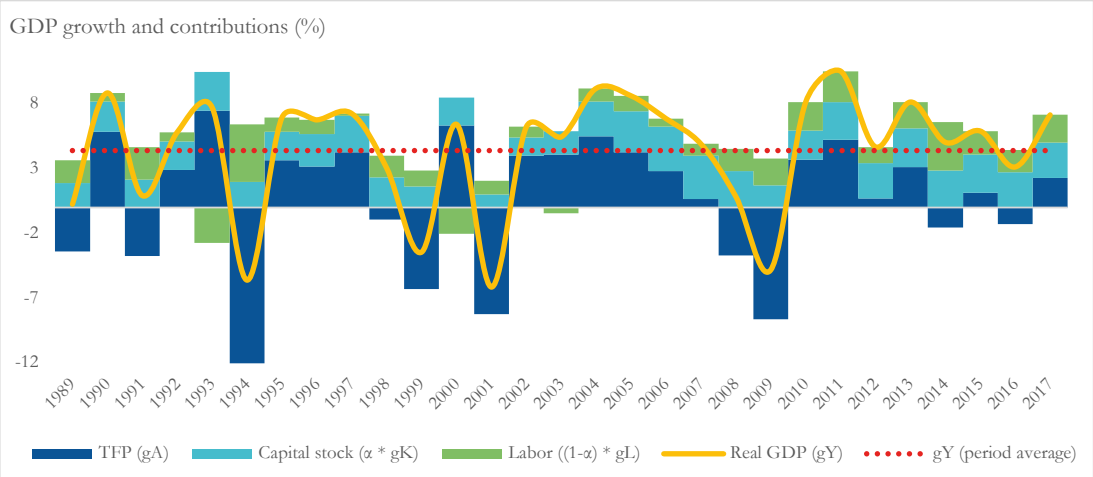
(a) Growth driven mostly by factor accumulation and only periodic boosts in productivity

13. **Economic growth in Turkey since the 1980s has been driven largely by factor accumulation, with only periodic boosts in productivity** (Figure 14). The liberalization of foreign exchange, price and trade policies in the 1980s, transport and energy investments in the late 1980s, and the commercialization and regulation of public utilities in the late 1990s and early 2000s led to an acceleration in investment and physical capital accumulation.[18] Turkey's relatively young population provided a boost in labor supply, with a near doubling in the labor force between 1988 and 2017.

14. **Productivity boosts were associated with periods of strong reforms** (1995-1998, 2002-2007), which also led to growth accelerating to above the period average for more than two years in a row. Periods of economic crisis (1994, 1999, 2001, 2008-09) saw negative contributions of Total Factor Productivity (TFP), which is ascribed to unobservable factors captured in the residual such as a decline in capacity utilization or an accumulation of inventories that are common during economic contractions.

[16] Rodrik, D, "No more growth miracles," Project Syndicate (2012).
[17] Hallward-Driemeier, M, G. Nayyar (2017).
[18] WBG, "Turkey's Transitions: Integration, Inclusion, Institutions," (December 2014).

Figure 14: Productivity growth in Turkey after the GFC has declined



Sources: TURKSTAT, WDI, WB Staff estimates

Box 2: Economic growth and productivity

This first chapter of the report analyses economic growth (Y) in terms of the growth of factor inputs, namely Capital (K) and Labor (L), and Total Factor Productivity (TFP) (Solow growth model):

$$Y_t = A_t K_t^{\alpha} L_t^{1-\alpha},$$

where $\mathbf{Y_t}$ = GDP in year t, $\mathbf{A_t}$ = TFP in year t, $\mathbf{K_t}$ = Capital stock in year t, $\boldsymbol{\alpha}$ = the income share of capital, and $\mathbf{L_t}$ = Labor force (Population 15 +) in year t. The growth rate is calculated as a geometric average growth rate between the beginning and end year using a compound average growth rate.

The growth rate of factor inputs can accelerate through the lifting of institutional constraints (e.g. access to finance for investment, elimination of labor market rigidities) or through exogenous factors (e.g. population growth, migration). TFP is the efficiency with which factor inputs are used to produce goods and services. Long-term sustainability of growth depends on TFP growth. TFP is the ratio of output to input volumes – the higher the ratio, the less input is needed for a given output.

The growth in TFP is calculated as a residual; it is the growth in output that is not explained by the growth in capital or labor inputs. TFP can be driven by a reallocation of resources or investment in skills and technology that enables the economy to produce more with less. Labor productivity – real output or value added per worker – is also used in empirical analysis as a close substitute to TFP.

This first part also uses the Shapley method to decompose the growth of per capita GDP into four components: labor productivity growth, employment growth, labor force growth, and change in working age population. This calculates the contribution of different sectors to aggregate productivity and employment growth to understand the role of structural transformation in driving productivity vs. the role of within sector productivity gains.

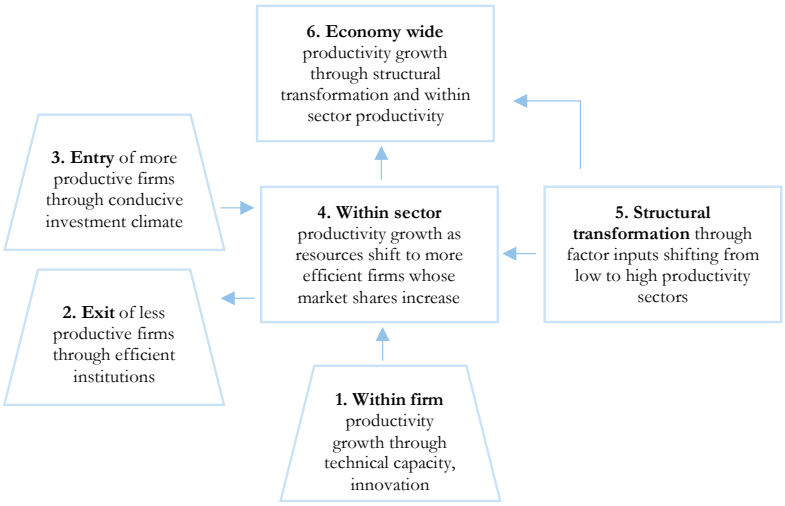
The sources of productivity growth, and their micro-macro links can be illustrated by the figure below:

(1) Firm level productivity gains can come from strengthening technical capacity and innovation. Policy areas that impact this include openness to trade and investment, the supply of skills and public sector incentives for growth and innovation.

(2) Firm level productivity gains could lead to less efficient firms exiting the market. Policy areas that impact this include the bankruptcy and insolvency framework, regulations for hiring and firing workers, degree of unionization, and unemployment benefits.

(3) The exit of less productive firms could release resources for more productive incumbents and new entrants. Policy areas that impact this include business entry regulations, competition policy, financial sector depth, and R&D expenditure.

Figure 15: Sources of productivity gains and their macro-micro links



(4) This process of "creative destruction" – as coined by economist Joseph Schumpeter – that reallocates resources to more efficient firms and sub-sectors can fuel productivity gains within a sector and enable that sector to grow.

(5) At a macro level, this can support a process of structural transformation as factor inputs shift to more productive and rapidly growing sectors. Policy areas that impact this include basic health and education, labor market flexibility, the quality of infrastructure, and the quality of public finances.

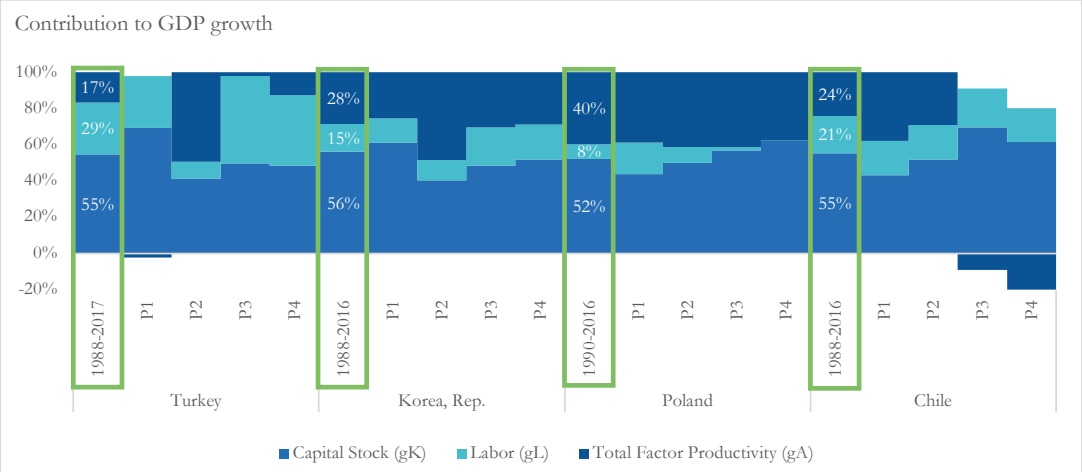
(6) A combination of productivity growth within sectors and structural transformation can help accelerate economy wide productivity growth.

Based on the above, chapter 1 analyzes productivity and economic growth trends at the macroeconomic level. Chapter 2 digs deeper into productivity dynamics within sectors, reallocation of resources across sub-sectors and firms, and efficiency dynamics within firms and sectors. Chapters 3 to 6 analyze policy and institutional factors that impact on the above productivity dynamics.

Source: WB Staff.

15. **There is scope for further factor accumulation in Turkey, but TFP growth is needed to sustain improvements in living standards**. Relative to high performing comparators, TFP contribution to growth in Turkey over the past 30 years was low, whilst labor input contribution was high (Figure 16). Reforms helped increase labor force participation (LFP), particularly after the GFC, which contributed to growth and poverty reduction.[19] Overall LFP however remains low, particularly for women (Table 2).[20] This together with Turkey's young population points to further growth in labor supply in the coming years (Chapter 5). Without TFP growth this labor cannot be absorbed in better jobs with higher earnings.

Figure 16: TFP growth among high performers during their UMIC stage faster than Turkey's



Sources: WDI, WB Staff estimates. Notes:

	P1	P2	P3	P4
Turkey	1988-2001	2002-2007	2008-2011	2012-2017
Korea, Rep	1988-1997	1998-2007	2008-2011	2012-2016

	P1	P2	P3	P4
Poland	1990-1996	1997-2007	2008-2011	2012-2016
Chile	1988-2001	2002-2007	2008-2011	2012-2016

Table 2: Labor Force Participation

	Turkey	UMICs	ECA (exc. HICs)
LFP, total (% of total population ages 15+)	52.8	66.6	62.5
LFP, female (% of female population ages 15+)	33.5	NA	53.3

Source: WDI.

(b) Improvements in living standards not possible without higher productivity

16. **Whilst patterns of structural transformation benefited Turkey till now, more of the same will run into diminishing returns.** Increased employment in services played a big role in Turkey's development, even if, as discussed below and in chapter 2, productivity has been flat compared to industry. But at current levels of income, further growth in low skill, non-tradable services will dent living standards.

[19] WBG, "Turkey's Transitions: Integration, Inclusion, Institutions," (December 2014) (Chapter 5).
[20] WBG, "Turkey's Future Transitions: Towards Sustainable Poverty Reduction and Shared Prosperity," (2017).

17. **This can be illustrated by looking at labor productivity gaps across sectors**. Large gaps in labor productivity – as measured by the value added per worker in a sector as a share of the value added per worker in agriculture – can signal allocative inefficiency. It suggests that a reallocation of labor from low to high productivity sectors (i.e. structural transformation, Box 2) could accelerate growth, even if productivity within the receiving sector remains weak.

18. **Over time, labor productivity gaps between agriculture and services have gradually narrowed, whereas labor productivity gaps between agriculture and industry have remained stable** (Table 3). This is due to a combination of rising labor productivity in agriculture as employment shares have declined, relatively stagnant productivity growth in services as employment shares have increased, and rising labor productivity in industry with slower growth in employment.

Table 3: Labor productivity gaps and growth across sectors

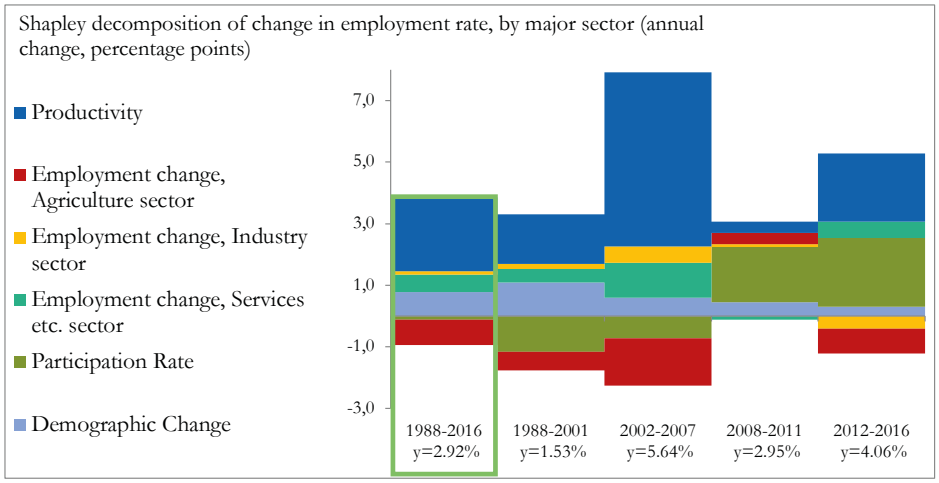
	1988	1990	1995	2000	2005	2010	2015	2016
Labor productivity gaps (Sector VA per worker/Agriculture VA per worker)								
Agriculture	1	1	1	1	1	1	1	1
Industry	3.0	3.5	3.6	2.8	2.7	2.6	3.0	3.1
Services	4.4	4.9	5.3	4.2	3.6	3.2	3.2	3.1
Marginal Product of Labor (Period change in sector VA/Period change in sector employment)								
Agriculture		-1.6	4.7	-5.7	-4.5	87.6	27.7	10.1
Industry		187.3	21.8	29.5	132.2	43.5	78.6	336.1
Services		50.9	50.3	43.8	62.6	36.6	49.2	23.7

Sources: WDI, WB Staff estimates.

19. **In other words, labor shifted to more productive services, even though productivity growth within services was relatively low, which lowered overall productivity**. The expansion of low skill services helped absorb labor from agriculture. The expansion of critical services (transport, logistics, banking and finance) also helped expand industry. However, since services make up around 60 percent of value added and a growing share of employment (from 36 percent in 1988 to 53 percent in 2016), slow productivity growth in services has also contributed to overall stagnation in productivity.

20. **A decomposition of per capita GDP growth by employment dynamics confirms the above patterns of structural transformation and factor accumulation driving growth in Turkey.** The decomposition shows how, particularly since 2008, per capita GDP growth was driven by a combination of rapid growth in service sector employment – offsetting contraction in agriculture employment – labor force participation rate, and demographic changes (Figure 17). The contribution of employment growth in industry on the other hand has been more limited. Industry employment overall has grown at a relatively slow pace, and even contracted in the 2012-2016 period, though value addition was high resulting in strong labor productivity growth within industry.

Figure 17: Per capita GDP growth since 2008 driven by service employment, LFP and demographic shifts



Sources: WDI, WB Staff estimates.

21. **The slowdown in Turkey's TFP growth has also meant lower potential growth –** the rate of increase in potential output, a level reached when the economy is operating at full capacity and employment. It is an indicator of the economy's supply capacity. Potential growth can increase if factors are used more efficiently i.e. TFP growth. Turkey's potential growth rate has been on a declining trend (Figure 18), particularly since the GFC (in line with global trends)[21] and currently stands at around 5 percent. The relative contribution of potential employment (i.e. full use of available labor) to potential growth rises sharply since 2009 (Figure 19). The contribution of potential TFP growth has in recent years become negligible, which needs to reverse to accelerate potential growth and Turkey's supply capacity in the future.

[21] WBG, Global Economic Prospects (January 2018).

Figure 18: Potential growth has been on declining trend in Turkey since the GFC

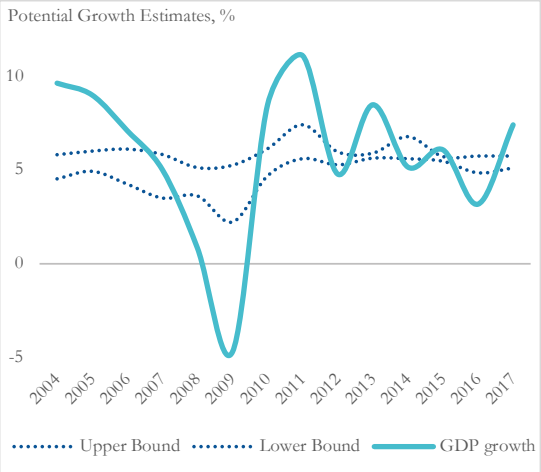
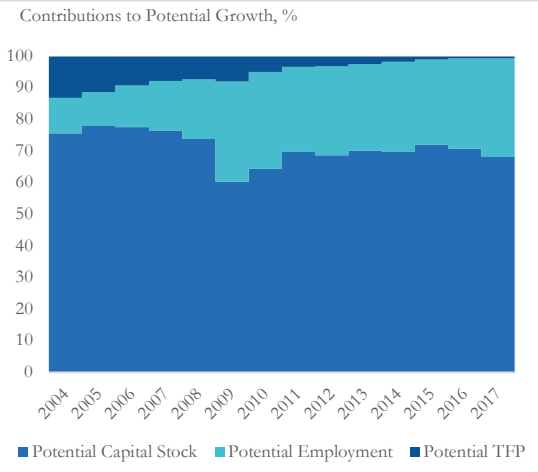


Figure 19: This is largely due to falling potential TFP growth, which is a drag on supply capacity



Sources: WDI, TURKSTAT, WB Staff estimates.
Notes: Potential growth rates are estimated by HP filter, Multivariate filter, Cobb-Douglas Production and CES production function methodologies. Contributions to potential growth is calculated based on Cobb-Douglas production function estimates.

22. **A combination of all the above factors illustrates why it would be difficult for Turkey to sustain improvements in living standards without productivity growth.** Labor supply is projected to increase in the coming years. But the Marginal Productivity of Labor (MPL) in services is falling as increased services employment is associated with declining growth in real value added per worker in the sector (Table 3, Figure 20). This is linked to a growing concentration of employment in low skill sectors that suffer from low real value added per worker (e.g. retail and wholesale trade, hospitality services) (Figure 21). Additional labor input in services is therefore associated with diminishing returns. In industry, on the other hand, whilst labor productivity is higher, the pace of job creation is low as noted above and even there it seems that the MPL is declining. This could be a symptom of falling allocative and productive efficiencies within industry and manufacturing, as discussed further in chapter 2.

23. **Therefore, labor incomes will stagnate unless more employment is created in relatively higher productivity industry or more skill intensive services sectors**. At Turkey's current level of per capita income, it cannot compete with low skill, labor intensive manufacturing economies. It can also not keep raising prices to sustain wage increases unless the quality of output also increases. Turkey needs a new ladder of development. One that takes advantage of new technologies and changing patterns of globalization to deepen the country's industrial and manufacturing base with high quality, complementary services.[22] This should help accelerate TFP growth as TFP gains from structural transformation (i.e. labor shifting from agriculture to industry and services) begin to run their course.

[22] Hallward-Driemeier, M, G. Nayyar (2017).

Figure 20: Services are experiencing declining marginal productivity of labor

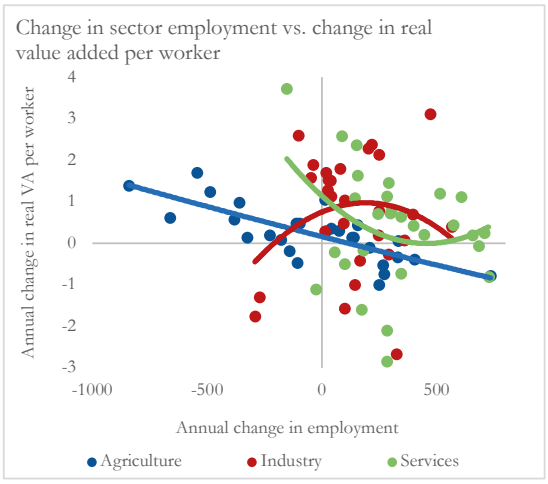
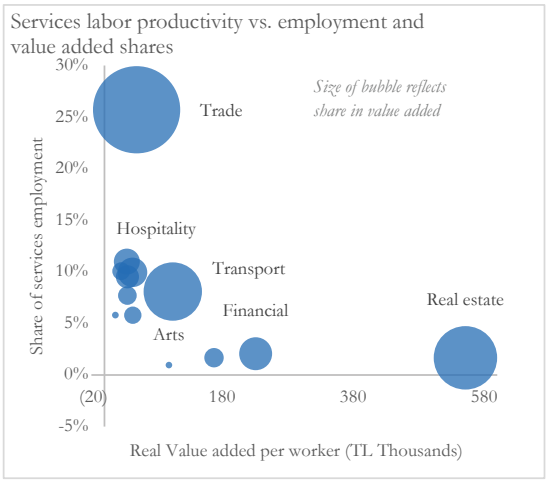


Figure 21: Which is driven by increased employment in low knowledge-intensive sectors



Sources: WDI, TURKSTAT, WB Staff estimates.

Rebalancing reforms towards macro stability and filling structural reform gaps

(a) Macroeconomic stability as a precondition to accelerating TFP

24. **How to accelerate TFP growth in Turkey? A near term challenge is to continue restoring macroeconomic stability.** Though Turkey has effectively weathered demand shocks in recent years, delays in unwinding policy stimuli in 2017 created macroeconomic imbalances that started unraveling in mid-2018. Market volatility and economic stress rose sharply over the summer of 2018. This led to a 50 percent depreciation in the Lira between January and August 2018, with knock on effects on inflation and external debt burden for corporates.

25. **Market volatility in Turkey temporarily subsided since the turbulence in August, but the economic situation remains fragile**.[23] The external shock in the summer of 2018 translated into significant real sector impacts, including a sharp acceleration in inflation from already elevated levels. Private consumption and investment contracted in the second half of 2018; this combined with rising production costs has prompted supply side adjustments including rising unemployment. Supply side corrections combined with elevated corporate debt, including FX exposure, have raised corporate solvency and liquidity concerns. Though the financial sector entered the recent period of turbulence with adequate buffers, cracks are beginning to appear because of real sector developments and tighter international finance.

26. **The economic outlook is subject to higher levels of uncertainty than usual given high domestic and external vulnerabilities**. Growth is projected to slow to a 10-year low in 2019 followed by a medium-term recovery. Monetary tightening and commitments in the New Economic Program (NEP, September 2019) signal important policy adjustment, which temporarily helped calm the markets, though any

[23] For more detailed analysis on this, please see: WBG, "Turkey Economic Monitor: Steadying the Ship," (Dec 2018).

uncertainty or inaction could tip the economy into further difficulty. The lack of progress on an orderly deleveraging in the private sector could precipitate this tipping point.

27. **A deep recession resulting from a hard landing can be very detrimental to TFP growth**.[24] Firstly, a contraction in investments, exacerbated by an ongoing credit crunch, will delay much needed productivity enhancing expenditures. And as discussed above, given the depth of the financial market and the pro-cyclical nature of finance in Turkey, the scope for funding long-term projects is very limited. Secondly, deep recessions can also erode human capital through extended unemployment spells. Output contractions can lower potential growth by as much as 1 percentage point on average four to five years after the onset of contraction.[25]

28. **The authorities' New Economic Program released in September 2018 provides a good foundation for gradually restoring macro stability**. **Building on the NEP, a consistent package of economic policies could ensure an orderly adjustment for the Turkish economy**. This would include tight monetary policy, complemented by a financial sector response that supports gradual deleveraging and enhances financial risk monitoring and management. Critical to supporting the deleveraging process is a strong corporate debt restructuring framework, the absence of which could spell the difference between an orderly adjustment for the economy and a hard landing. Fiscal adjustment will be necessary to help the economy tide over the difficult period ahead. Some key elements of the economic policy program could include:

(i) **Tight monetary policy:** Recent monetary tightening through interest rate hikes are helping to restore price stability, maintain exchange rate stability, and rebuild external buffers. Price pressures since the summer have been driven by cost-push rather than demand pull factors. Tight monetary policy should support a gradual deleveraging in the private sector. Macro-policy mix should therefore target a gradual recovery in demand through countercyclical fiscal policy *relative to* boosting short-term supply through accommodative monetary policy; the latter is likely to be ineffective at a time when the economy is experiencing a negative output gap. Premature loosening of monetary policy could fuel further exchange rate pressures, increased costs, and further supply cuts. In addition, sustaining the monetary policy framework rationalized in May 2018, including adoption of a central policy rate, is important for monetary policy transparency.

(ii) **Consistent financial sector policies:** Credit to the private sector has started to adjust down very significantly. Evidence from past financial crises that were preceded by credit booms, as in the case of Turkey, suggests that credit plays little role in supporting economic recovery after growth has bottomed out.[26] Therefore, efforts to curtail deleveraging (e.g. through credit guarantees, loosening macroprudential regulations) are likely to be counter-productive. The focus should be on analyzing the impact of current conditions (i.e. weak Lira, economic downturn, credit crunch) on banks' credit risk, liquidity, and capital. This would help target interventions, including potential resolution of problem banks.

(iii) **Corporate debt resolution:** The above analysis should provide details on the links between the financial system and corporate debt distress. This would provide the basis for a corporate debt resolution framework. There is a Concordat system adopted earlier this year to enable companies to negotiate debt restructuring through the courts with all creditors. The authorities are also

[24] WBG, "Global Economic Prospects: Broad-Based Upturn, but for How Long," (January 2018).
[25] Ibid.
[26] Takats, E. and Upper, C (July 2013) "Credit and growth after financial crises," BIS Working Papers (No. 416).

exploring out of court options like the Istanbul Approach adopted in 2001, and there has been talk of setting up an Asset Management Company to (temporarily) absorb troubled assets. Whatever the mechanism, corporate debt resolution is central to an orderly adjustment; it can help provide much needed breathing space for both corporates and banks, without which there are heightened risks of corporate insolvency, rapid deterioration of banks' asset quality, debt overhang, and potential government bailout.

(iv) **Complementary macro-prudential policies:** These processes can help further enhance Turkey's already extensive macroprudential toolkit,[27] which has played an important role in containing risks in the financial sector, including those transmitted through volatile capital inflows. Demand shocks in recent years, however, led to some loosening of macroprudential regulations in 2016.[28] Though this contributed to countercyclical finance, the policy mix should now be revisited. Macroprudential instruments are central to the effectiveness of monetary policy targets.[29] Macroprudential measures should be focused on financial stability (countercyclical buffers, mitigating systemic risks, liquidity). This means unwinding short-term relaxation of macroprudential policies aimed at accelerating consumption or expanding sector investments.

(v) **Fiscal adjustment:** Credible tightening of monetary policy, with consistent financial sector and macro-prudential policies, will require careful adjustment to fiscal policy. In the short-term, to ensure that tighter financing does not lead to a sudden stop, supply side subsidies (e.g. minimum wage support, tax relief) need to be withdrawn gradually (which is important too for longer-term productivity as discussed above). There may also be scope to adjust other inefficient expenditure to ease pressures on the supply side of the economy; this requires deeper analysis of public expenditures as proposed in the New Economic Program 2019-2021. But in general, fiscal policy will need to play an important countercyclical role, particularly through public transfers given the projected declined in demand.

In addition to short-term fiscal measures, it is also important to maintain momentum medium-term fiscal policy reforms, some of which are highlighted in the New Economic Program (2019-2021) that are critical to TFP. These are covered in more detail by an earlier World Bank report,[30] and include among other things: (i) a rebalancing of tax burden from labor towards capital, including through property tax and rationalization of tax incentives, which can have positive impacts on domestic savings and labor formality; (ii) containing recurrent spending growth, and a slight rebalancing towards good quality public investments.

[27] Kara, H. (2016): "A brief assessment of Turkey's macroprudential policy approach: 2011-2015", Central Bank Review 16 (2016).
[28] Baziki, S.B. (2017): "Impact of macroprudential policies on loan utilization," CBRT Blog.
[29] Chadwick, M.G. (2018): "Effectiveness of monetary and macroprudential shocks on consumer credit growth and volatility in Turkey," Central Bank Review.
[30] WB (May 20, 2014), "Turkey Public Finance Review: Time for a Fiscal Policy Pivot?"

29. **Clear communication of such a package of economic policies is central to avoiding a short-term challenge becoming a longer-term problem**. A predictable, credible and transparent policy framework is essential for market stability. This would provide a clearer indication of how the authorities plan to manage a soft landing. This means protecting the integrity of macroeconomic institutions and policy anchors, which Turkey has significantly strengthened over the past decade and a half.[31] Key among those institutions and policy anchors are an independent Central Bank; monetary policy framework based on inflation targeting; strong bank supervision; transparency of public finances; a medium-term expenditure framework; and sound public debt management.

(b) Priorities in Turkey's structural reform gaps

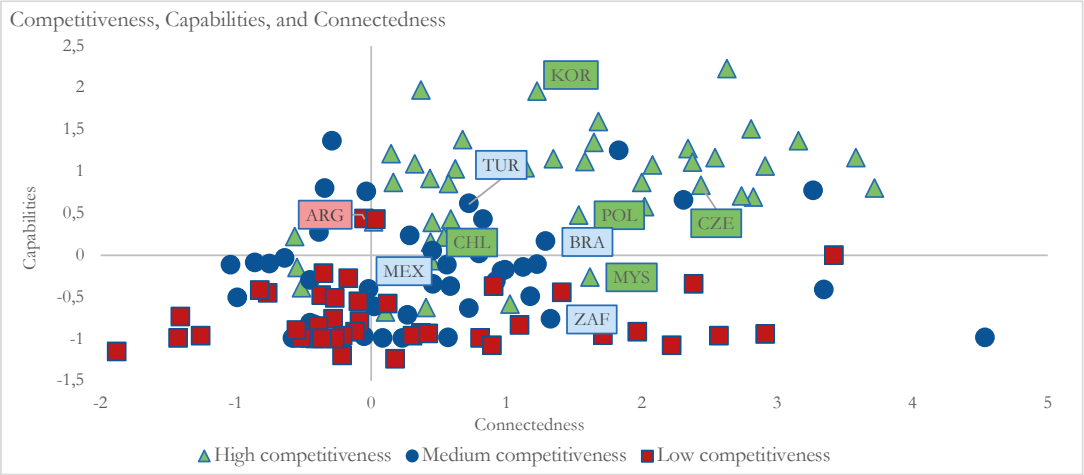
30. **The relative importance of structural reforms could be assessed through competitiveness, capability and connectedness (3Cs) challenges to expanding pro-development sectors.** This framework, proposed by Hallward-Driemeier and Nayyar (2017), suggests that success in different manufacturing and service sectors can be a function of performance across the 3Cs. They can determine the extent to which countries are able to take advantage of technological developments and changes to production patterns to deepen supply capacity.

31. **In sum**: (i) **Competitiveness** factors consider the efficiency of the business environment to offset increased labor costs (indicators include ease of doing business, the rule of law, and the use of mobile technologies to complete financial transactions); (ii) **Capability** factors consider the ability of workers and firms to adopt and use new technologies (indicators include ICT use, tertiary school enrolment rates, and the share of royalty payments and receipts in trade); (iii) **Connectedness** factors look at not only shifts in international trade, but also the cross sector synergies needed for success in manufacturing (indicators include logistics performance, restrictions on trade in manufactured goods, and the restrictions on trade in professional services).

32. **Turkey performs relatively well on connectedness, though, it is only just above average on capabilities and is a middling performer on competitiveness** (Figure 22). High performer comparators have strong scores across all three dimensions, whereas trapped MIC comparators on average do not perform as well as Turkey. These results are broadly consistent with findings from other chapters in the report – chapters 3 on integration; chapter 5 on labor market capabilities; and chapter 6 on competition. The risks and implications in terms of growth of manufacturing sectors is discussed in more detail in chapter 2. In general, though, Turkey needs to address competitiveness challenges most urgently if it is to expand more sophisticated and skill intensive sectors through higher quality financing.

[31] See IMF, "Structural Reforms and Macroeconomic Performance – Country Cases," (November 2015); and WBG, "Turkey's Transitions: Integration, Inclusion, Institutions," (December 2014).

Figure 22: Turkey scores well on connectedness and capabilities but lags on competitiveness[32]



Sources: Hallward-Driemeier and Nayyar (2017), International Telecommunications Union's ICT Indicators Database; WDI; Worldwide Governance Indicators, Global Findex, Logistics Performance Index.

Notes: (i) Competitiveness index combines ease of doing business, the rule of law, and the use of mobile technologies to complete financial transactions; (ii) Capabilities index combines information and communications technology use, tertiary school enrolment rates, and the share of royalty payments and receipts in trade; (iii) Connectedness index combines logistics performance, restrictions on trade in manufactured goods, and the restrictions on trade in professional services.

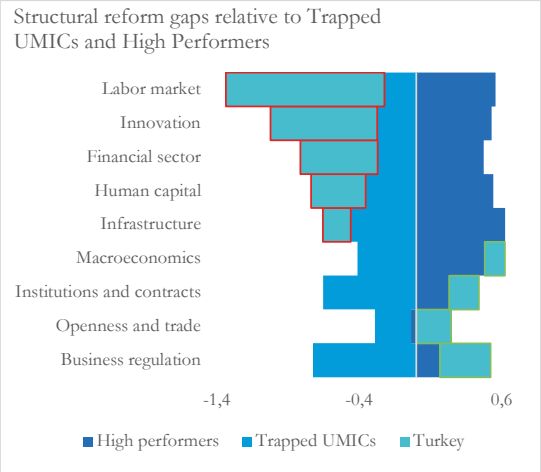
Z scores for each series were calculated by: (i) subtracting the average from the series for each country's value; and (ii) dividing by the standard deviation. The Connectedness and Capabilities values are the median Z scores by country. The high, medium, and low competitiveness categories are based on partitioning of Z scores into terciles.

33. **The relative importance of competitiveness challenges can be assessed across a range of policy and institutional areas**. Competitiveness is defined as "the set of institutions, policies and factors that determine the level of productivity in a country."[33] Macroeconomic instability, low quality investments, and high costs of doing business for example are symptoms of low competitiveness that can result from weak (or poor implementation of) policies and institutions. To assess Turkey's performance relative to peers, indicators from various surveys are grouped across 9 dimensions of competitiveness; composite Z scores are derived for each dimension to measure how many standard deviations below or above the population mean a raw score is for Turkey, high performers and trapped MICs (Figure 23). Turkey's performance is also assessed relative to the top, average and bottom performers in the EU (Figure 24).

34. **Based on this, Turkey's biggest competitiveness gaps relative to high performer comparators are in the areas of labor markets, innovation, financial sector, and human capital** (Figure 23). Turkey even trails Trapped MICs in these policy and institutional areas. Across all areas, high performer comparators do better than Turkey, with the slight exception of openness to trade where Turkey performs better. This is consistent with findings in chapter 3; gaps on innovation policy and institutions are in line with discussions in chapter 4. Relative to the EU average, Turkey trails most on human capital, labor market efficiency and business regulations. The financial sector indicator in the EU assessment measures the narrower dimension of credit market rigidity where the gap is not very significant.

[32] Adapted from Hallward-Driemeier, M, G. Nayyar, "Trouble in the Making: The Future of Manufacturing-Led Development," World Bank Group (2017).
[33] World Economic Forum – Global Competitiveness Report.

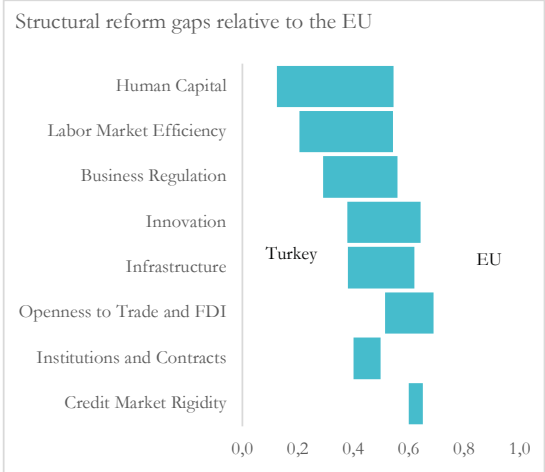
Figure 23: Turkey lags most on labor markets, innovation, financial sector, human capital



Sources: Economic Freedom Index (2018), OECD Product Market Regulations (2013), World Bank Doing Business (2018), Global Competitiveness Index (2018).

Notes: Z scores are derived for sub-indicators by survey, then grouped according to 8 categories (labor market, innovation, financial sector, human capital, infrastructure, institutions and contracts, openness and trade, business regulations). Results are averages of Z scores of sub-indicators under each category.

Figure 24: Gaps between Turkey and EU average greatest for human capital and labor market



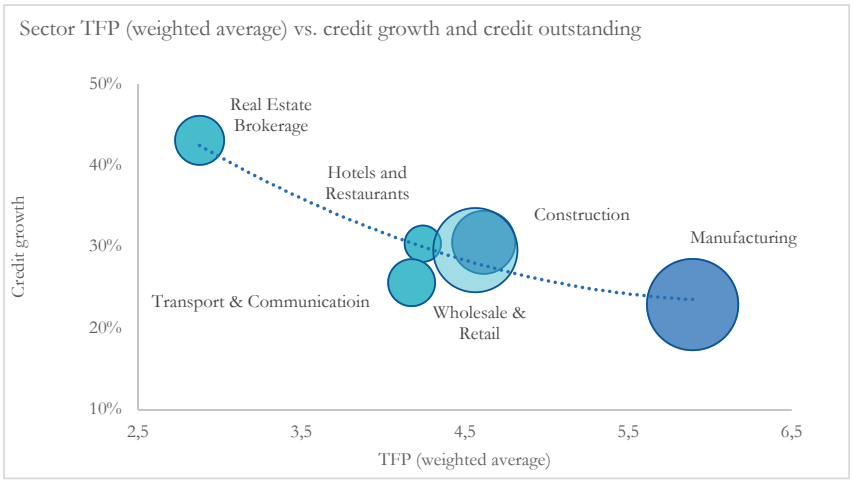
Sources: Sources: Economic Freedom Index (2018), OECD Product Market Regulations (2013), World Bank Doing Business (2018), Global Competitiveness Index (2018), Penn World Tables.

Notes: Indexes and rankings across the above indicators were normalized for EU and Turkey between 0 (bottom EU performer) and 1 (top EU performer). The size of each bar shows the gap between Turkey and the EU average.

35. **Human capital and labor markets consistently appear as major challenges for Turkey, which is of concern given the projected increase in labor supply over the coming years**. One of the key issues is that the recent increase in the supply of more educated workers in Turkey has not been matched by an increase in demand (Chapter 5). One possible explanation is that despite increased education, workers lack important skills. It is however argued in this report that demand side factors (i.e. employers not seeking higher skills) *relative to* supply side factors (i.e. workers not having appropriate skills) explains the excess supply of more educated workers. This in turn can create disincentives to acquire more education and skills, which further dents competitiveness and capabilities, and thereby long-term productivity.

36. **The relative lack of demand for higher skills in turn can be linked to the quality of financial flows and its impact on the financial sector, another important competitiveness bottleneck.** On the external front, FDI levels in Turkey are low. Yet, FDI can boost demand for higher skills through the new knowledge and technology it embodies, in a way that domestic investment simply cannot. Rather, the dominance of portfolio and debt flows may be perpetuating allocative inefficiencies through the banking system. This is evident in most recent years where credit growth has been highest among low productivity sectors (Figure 25). Though financial stability risks are managed through macroprudential policies, the countercyclical capacity and allocative efficiency of the financial sector in Turkey is limited by its depth. This includes the relatively small non-bank financial sector (e.g. capital markets, private equity, insurance). Recent reforms (e.g. secured transaction system) should address market failures to some extent and gradually strengthen the financial sector's countercyclical capacity. But this requires a deeper effort to accelerate the development of the non-bank financial sector.

Figure 25: Allocative inefficiencies perpetuated by the banking sector



Sources: EIS, Haver Analytics, WB Staff estimates.
Notes: Credit growth is annual average for the 2010-2017 period; TFP level for 2015; credit outstanding for 2017.

Conclusion and policy implications

37. **The main messages that emerge from the analysis on the drivers and challenges of economic growth are as follows**:

(i) **Strong economic convergence with limits on sustainability:** Turkey's ability to absorb short-term demand shocks in the past years has helped sustain a strong pace of convergence to high income status. But a lack of focus on long-term supply capacity has dented the sustainability of growth with risks of premature deindustrialization.

(ii) **A productivity boost is needed to sustain improvements in living standards:** Economic growth in Turkey since the 1980s has been driven largely by factor accumulation, with periodic boosts in productivity. Labor incomes will stagnate unless more employment is created in relatively higher productivity industry or more skill intensive services sectors.

(iii) **Restoring macroeconomic stability is a precondition to accelerating TFP:** A consistent package of economic policies could be central in ensuring an orderly adjustment – tight monetary policy, corporate deleveraging and debt resolution, consistent macroprudential policies, and fiscal adjustment. Communication of stabilization is key to anchor economic expectations.

(iv) **Priorities in Turkey's structural reform gaps:** Address competitiveness challenges most urgently if Turkey is to expand more sophisticated and skill intensive sectors through higher quality financing.

38. **The rest of this report builds on the above to identify challenges and options for accelerating TFP growth through reforms that**: (i) deepen Turkey's international economic integration as a source of learning and technology that enhances firm productivity and growth; (ii) improve the investment climate, including through greater competition, to facilitate the reallocation of resources to more productive firms and sectors; (iii) improve the quality of business support services to promote innovation and firm productivity; and (iv) equip workers with the skills needed to participate in a more modern economy.

Issues	Policy options
Restoring macroeconomic stability	
Though Turkey has effectively weathered demand shocks in recent years, delays in unwinding policy stimuli in 2017 have led to large macroeconomic imbalances that risk unraveling with tighter financial conditions at home and abroad. The risks of a boom-bust scenario have been exacerbated due to heightened external vulnerabilities.	A consistent package of economic policies could be central in ensuring an orderly adjustment: • Tight monetary policy; operational and policy independence of the Central Bank; credible inflation target supported by a transparent and predictable adjustment to policy rates. • Financial sector diagnostic; corporate sector deleveraging; corporate debt resolution. • Unwinding of short-term relaxation of macroprudential policies aimed at accelerating consumption or expanding sector investments. • Gradually withdraw supply side subsidies provided through the budget. • Clear communication of stability package.
Addressing priority structural reform gaps	
Turkey performs relatively well on connectedness, though, it is only just above average on capabilities and is a middling performer on competitiveness. Turkey's biggest competitiveness gaps relative to high performer comparators are in the areas of labor markets, innovation, financial sector, and human capital.	• Boost demand for more educated and skilled workers in the economy through improved quality of financial flows: (i) prioritizing FDI policy including links to local suppliers and the liberalization of foreign investment in the services sector (Chapters 3, 6); (ii) accelerate development of non-bank financial sector.

Chapter 2

Manufacturing, construction and services productivity

II. Manufacturing, construction and services productivity

1. **Turkey has experienced important structural transformation in the past twenty years.** A drop in the share of agriculture value added (11 to 7 percent between 1998 and 2016) was offset by industry (26 to 30 percent), whilst services remained relatively flat (63 percent). Agriculture employment share fell sharply (36 to 20 percent between 1998 and 2016), offset by an increase in service's share (38 percent to 54 percent). Underlying these macroeconomic trends were big shifts within sectors. In industry, the construction sector's share in value added and employment rose most quickly; within services the value-added share of the financial sector grew quickly from a low base (4 to 8 percent between 1998 and 2016), though it is retail and wholesale, accommodation and food services that absorbed most labor (14 to 19 percent between 1998 and 2016).

2. **This chapter disentangles productivity dynamics within manufacturing, construction and services using firm-level data (Box 3), to see how these add up to explain economic growth in Turkey**. Microeconomic analysis of firms and sectors can provide more detail on productivity challenges that constrain growth at a macro level, and from this help target policy more effectively. The chapter: (i) starts with a review of productivity levels across sectors within manufacturing; (ii) it reviews the link between productivity levels and allocative efficiency; (iii) it then analyses drivers of efficiency – namely productivity within firms, resources shifting across firms, and creative destruction. This analysis is repeated for the construction and services sectors. It concludes with a review of risks and implications for long-term growth.

Box 3: Approach and methodology for firm-level productivity analysis

Data source and coverage: The firm-level data used in this chapter and the rest of the report comes from the Entrepreneur Information System (EIS) database provided by the Ministry of Industry and Technology. The EIS is compiled from various administrative sources. It contains balance sheet, income statement, and trade flow data for all firms[34] in Turkey over the 2006-2016 period. The report however does not analyze all non-agriculture sectors in the economy. Almost all 2-digit manufacturing sectors are covered except for repair and installation of machinery and equipment. In services, sectors excluded from the analysis are finance and insurance, public administration, education, health and other services; these sectors either have very few firms or are state owned. Further detail on the data is provided in Technical Appendix.

Productivity measures: This report uses two main measures of productivity. The first is labor productivity which is defined as the real value added per worker. The second is a Total Factor Productivity measure estimated using the Ackerberg, Caves and Frazer (ACF) (2015) methodology. The ACF method is based on a two-step estimation procedure to help overcome the issue of functional dependence when the elasticity of labor is estimated in the first stage as done in Olley and Pakes (1996), and Levinsohn and Petrin (2003). Intermediate inputs are used as a proxy to control for unobserved productivity shocks. While estimating TFP, real value added is used to measure the output of a firm. Since firm level price data is not available, 2-digit sectoral deflators are used to estimate real value added at the firm level. The TFP measure in this report is therefore a revenue-based indicator.

[34] The only exception is banking sector which is not covered in the dataset.

Challenges with revenue-based TFP (TFPR) measures: Deflating a firm's nominal output or value added with a sectoral deflator poses several difficulties. Firms within a sector might produce similar goods but may charge different prices for that good depending on a firm's market power or product quality. Sectoral deflators cannot control for these differences. For firms producing near identical products in a highly competitive market, this is less of an issue. But in other cases, the extent and quality of design, craftsmanship, raw materials, and other inputs might differ, making the final product quite different. TFPR then overestimates the productivity of firms producing high price (quality) products and underestimates the productivity of firms producing low price (quality) product as revenues of two types of firms are deflated by using the same deflator at sector level.

A quantity-based TFP (TFPQ) measure: The availability of product-level price data can help address shortcomings of TFPR measures of productivity. Firm-level input and output prices can help disaggregate firm performance by its physical efficiency, market power, and product quality. The residual in the production function (namely TFPQ) therefore gives a more precise estimate of firm productivity relative to market power and product quality. In Turkey, however, the lack of economy-wide information on firm-level input and output prices makes it difficult to use the TFPQ measure.

Other ways to estimate TFPQ: To get around the data issues, there are two alternative ways that TFPQ could be estimated: (i) unit value of exports could be used as a proxy for product prices. However, this would mean excluding non-exporting firms, which account for the majority in Turkey; (ii) Hsieh and Klenow (2009) offer an alternative methodology to estimate TFPQ in the absence of firm-level prices. The correlation between the estimated TFPQ and TFPR is around 0.51. But TFPR is still preferred this report as Hsieh and Klenow (2009)'s methodology relies on very strong assumptions and does not control for unobserved productivity shocks unlike the ACF methodology.

TFPR vs. TFPQ: Haltiwanger (2016) argues that researchers should not inherently prefer TFPQ measures over TFPR as the latter "have the virtue that they will reflect idiosyncratic profitability factors beyond TFPQ". In other words, TFPQ is a good measure of technical efficiency. However, if one would like to compare firms in terms of their capacity to earn profits or create value either through producing high quality products or exerting market influence, TFPR seems as a better measure.

Additionally, there are studies that measure TFPQ using firm level price and quantity data, which also show that traditional measures of TFPR and TFPQ are highly correlated. Foster, Haltiwanger, and Syverson (2008) consider a traditional revenue productivity measure where output is deflated with industry level price indices and they find a correlation of 0.75 between this traditional measure of TFPR and TFPQ. Using Colombian data that includes data on firm level prices and quantity, Eslava et al. (2004, 2013) find a correlation of 0.69 between TFPR and TFPQ.

3. **Results from aggregating firm level productivity estimates within manufacturing, construction and services are consistent with macroeconomic trends discussed in the previous chapter.** The macro analysis looked at total industry trends; the micro analysis on the other hand focuses on manufacturing (63 percent of industry output) and construction (27 percent of industry output). Manufacturing is of big interest given its pro-development characteristics (Chapter 1), and construction is of interest given its rapid expansion in the past ten years. Services account for the largest share in GDP and provide critical inputs that affect the productivity of other sectors in the economy. Firm level analysis of services excludes financial services and public services (e.g. education, health). Results from aggregating firm level TFP and labor productivity in these three sectors show that:

(i) **Aggregate productivity:** Has fallen and remained below pre-GFC levels.[35] Labor productivity picked up recently but remains low (Figure 26).

(ii) **Productivity within manufacturing**: Weighted TFP dipped slightly in most recent years, but overall has remained relatively flat (Figure 27).

(iii) **Productivity within construction:** TFP has remained low and generally on a declining path since 2006 (Figure 27).

(iv) **Productivity within services**: TFP has remained low and on a declining path (Figure 27), which has driven much of the drop in aggregate TFP fall.

Figure 26: Labor productivity and TFP in manufacturing, construction and services on a declining path

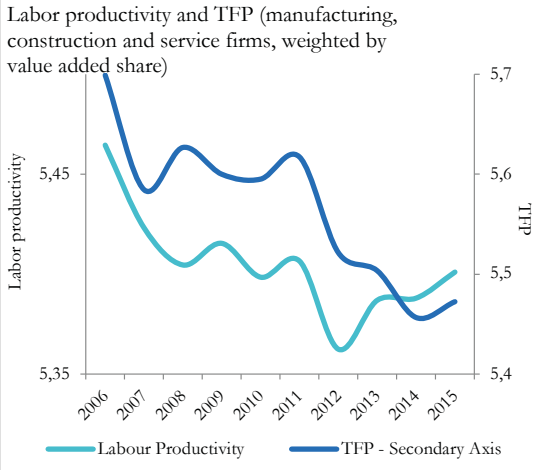
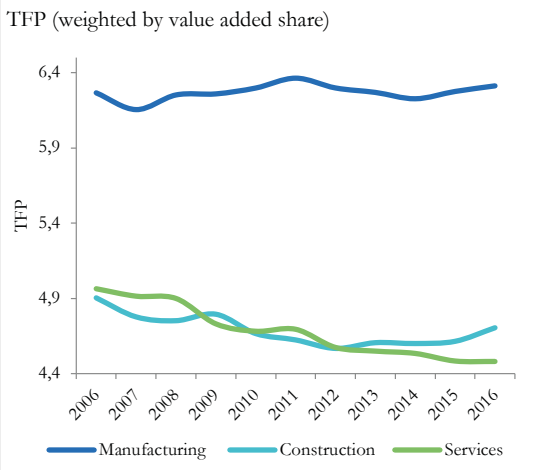


Figure 27: Manufacturing productivity remains flat whereas construction and services are low and declining



Sources: EIS, WB Staff estimates.

4. **Firm level data also confirm the importance of labor accumulation as a driver of growth in the past decade relative to productivity.** Much of the labor shed from agriculture was absorbed in construction and services rather than manufacturing. Results from aggregating firm level employment and value-added show that (Figure 28):

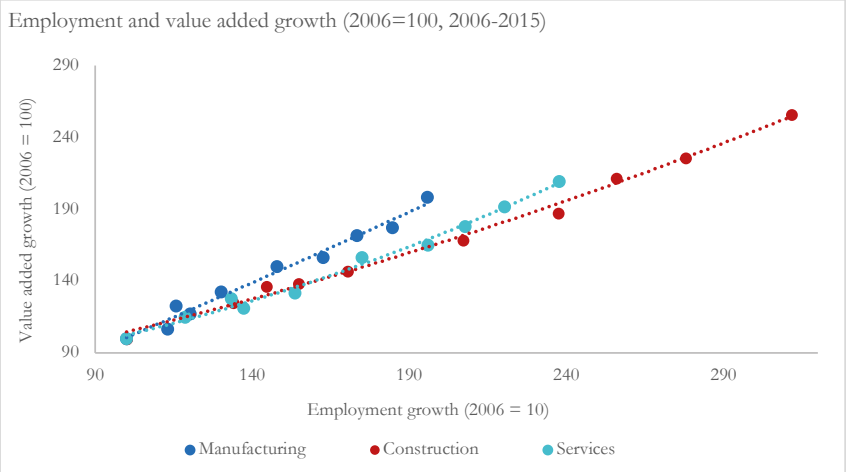
(i) **Manufacturing**: Employment growth kept pace with growth in value added, contributing to flat labor productivity over this period.

(ii) **Construction**: Employment growth far outpaced value-added growth, by 30 percentage points on average per year between 2006 and 2015, contributing to a sharp drop in labor productivity.

(iii) **Services**: Employment growth also outpaced value-added growth, by 18 percentage points on average per year between 2006 and 2015, contributing to a fall in labor productivity.

[35] The productivity figures for 2016 are excluded throughout most of the report. In 2016, official employment contracted due the shock of failed coup attempt and the increase in minimum wage by 30 percent. However, this employment contraction is not observed in household labor survey as informal employment increased by around 6 percent in 2016. This distorts the labor productivity estimates.

Figure 28: Employment growth exceeded growth in value added in construction and services



Sources: EIS, WB Staff estimates.

Manufacturing: Some breakout sectors but falling allocative efficiency weighs on productivity

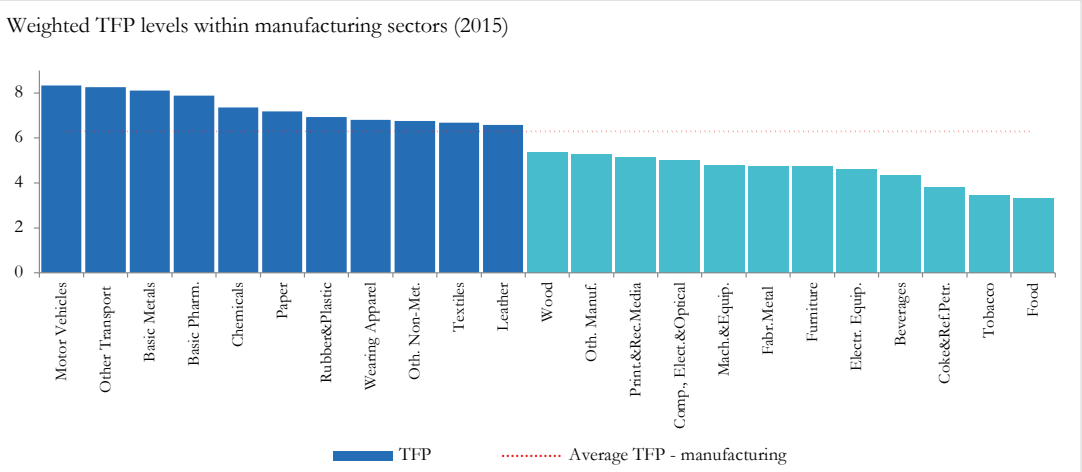
(a) Productivity patterns within manufacturing weigh on overall manufacturing TFP

5. **Within the manufacturing sector, tradable sectors are more productive than non-tradable sectors** (Figure 29)**.** Sectors that are more globally integrated and engage in more technologically intensive production have higher than average TFP levels; they include motor vehicles, basic metals, transport equipment, chemicals, pharmaceutical, chemicals, textile and wearing apparel. In contrast, sectors involved in the processing of agricultural products or those that have higher state presence have lower than average productivity levels; they include: food, tobacco, beverages or coke and refined petroleum.

6. **Current productivity patterns within manufacturing have been a drag on the growth of the manufacturing sector** (Figure 30). This is driven by low productivity sectors (below average TFP) capturing close to 37 percent of value addition and 44 percent of employment. Relatively large sectors (in terms of value added and employment) that exhibit low productivity include food, electrical equipment, fabricated metals and machinery equipment. These sectors may be experiencing one of or a combination of: low or negative within firm productivity growth; a shift of labor and capital resources less productive firms; limited creative destruction (i.e. net entry of productive firms). This is analyzed in more detail below.

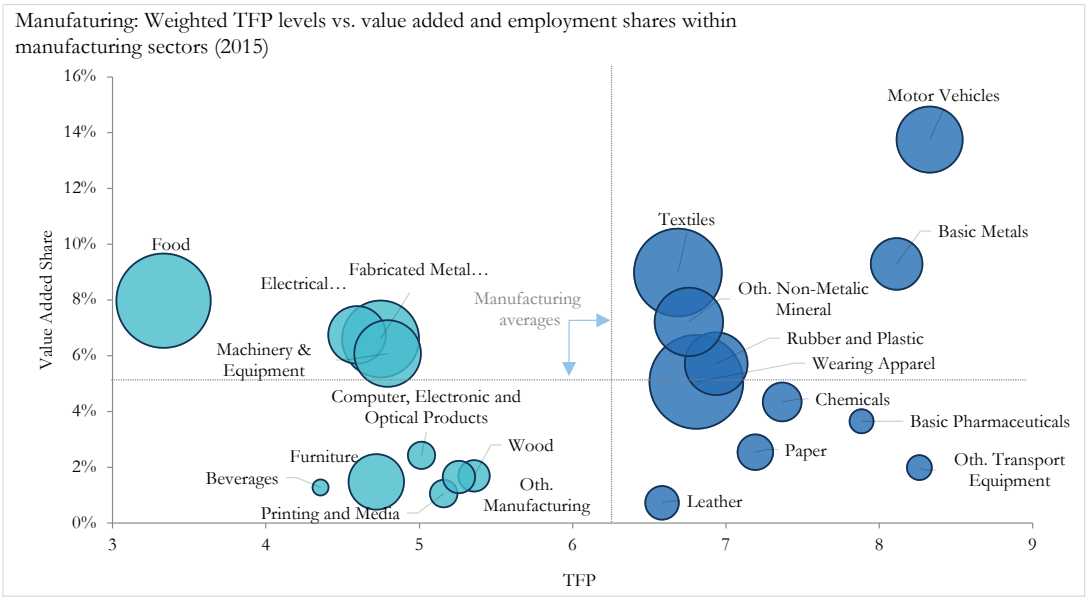
7. **High productivity manufacturing sectors that grew quickly include those that have benefited from foreign investment and exports**. Key among those is the motor vehicles sector, which has been an export champion in the last decade. But others that are also relatively more productive, and capture above average share of employment and value addition include: basic metal, rubber plastic, textile and wearing apparel. Other more sophisticated sectors exhibit high productivity, but are relatively small employers and drivers of value addition e.g. basic pharmaceuticals, chemicals.

Figure 29: TFP levels in tradable sectors are higher than non-tradable sectors



Sources: EIS, WB Staff estimates.

Figure 30: Manufacturing growth constrained by large, low productivity sectors



Sources: EIS, WB Staff estimates.

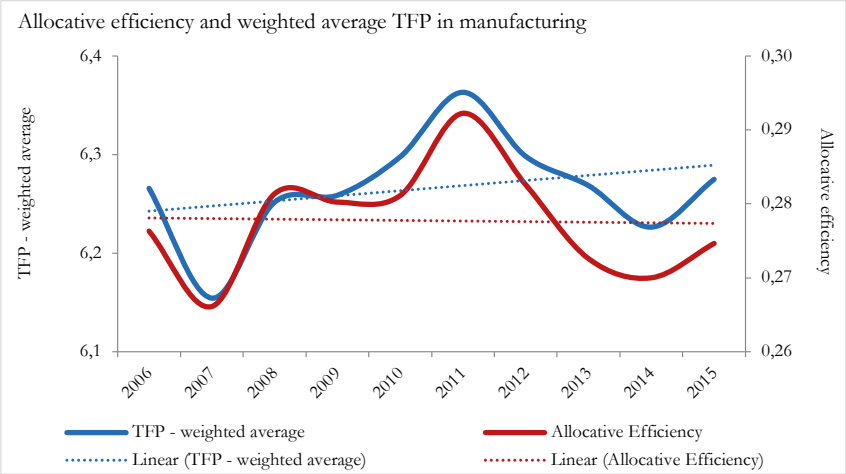
(b) Allocative efficiency in manufacturing is positive but declining since 2011

8. **The above patterns in productivity levels across manufacturing sectors are in part a result of changes in allocative efficiency over time**. Allocative efficiency is the extent to which resources in a sector/economy are channeled to their most productive use. Efficient allocation implies that firms with higher than average productivity in a sector has a larger than average employment or value added in the sector. More productive firms capturing smaller shares of employment or value added relative to less productive firms is a symptom of allocative inefficiency.

9. **The extent to which more efficient firms have a greater market share can be assessed by comparing weighted and unweighted TFP measures**.[36] A high and positive value of the covariance term between the weighted and unweighted measures is associated with high allocative efficiency; a positive but declining covariance term signals some loss in allocative efficiency even though more productive firms still capture most resources; a negative covariance term signals allocative inefficiency.

10. **Allocative efficiency in manufacturing is positive but has declined since 2011, consistent with productivity levels discussed above** (Figure 31).[37] The most allocatively efficient sectors have high TFP levels but have also experienced a drop in allocative efficiency (motor vehicles, basic metals, chemicals) (Figure 32). On the other hand, there is evidence of significant resource misallocation (negative covariance term) in low productivity but relatively large sectors (food). Surprisingly, high tech and high productive sectors (e.g. electrical equipment; machinery and equipment; computer, electronic and optical products) have performed poorly on allocative efficiency. These sectors experienced significant efficiency losses following the crisis.

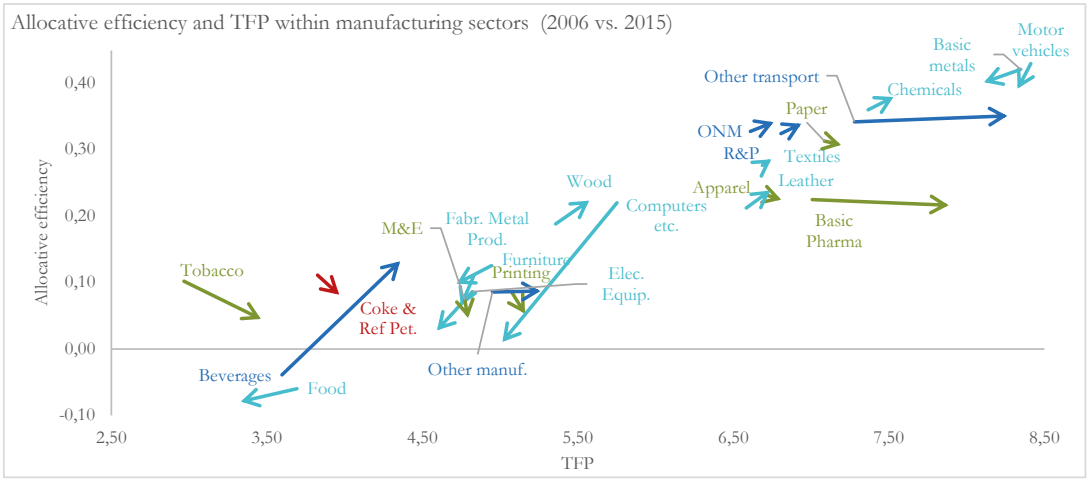
Figure 31: Allocative efficiency in manufacturing positive but declining



Sources: EIS, WB Staff estimates.

[36] Olley, G., and A., Pakes. (1996). "The Dynamics of Productivity in the Telecommunications Equipment Industry." Econometrica 64 (6): 1263–97.
[37] Results need to be interpreted with caution because positive covariance can also reflect the reallocation of resources and economic activity towards firms with monopoly power.

Figure 32: Most efficient sectors have high TFP but experienced a drop in allocative efficiency



Sources: EIS, WB Staff estimates.

11. **Manufacturing TFP in Turkey could grow substantially if efficiency of resource allocation improved**. Hsieh and Klenow (2009)[38] have developed a methodology to measure how much aggregate manufacturing TFP could increase if capital and labor were reallocated to equalize marginal products across firms within each sector, or if all resource misallocation were removed. In Turkey, if resources were reallocated such that the marginal products of labor and capital were equalized, manufacturing TFP would increase by 63 to 78 percent over the period of analysis. This result is consistent with Nyguen et al.'s (2016) study which find large potential to improve allocative efficiency in the Turkish manufacturing sector.

(c) Within firm productivity growth in manufacturing offsets fall in allocative efficiency

12. **The slight decline in allocative efficiency in manufacturing is consistent with the sources of productivity shifts in recent years**. This is analyzed using the Melitz Polanec (2015) [39] decomposition, which breaks productivity changes into: (i) a within component (gains from existing firms) (ii) a between component (reallocation of market shares towards more productive firms), (iii) firm entry (gains obtained through the entrance of more productive firms); and (iv) firm exit (gains obtained through the exit of unproductive firms).

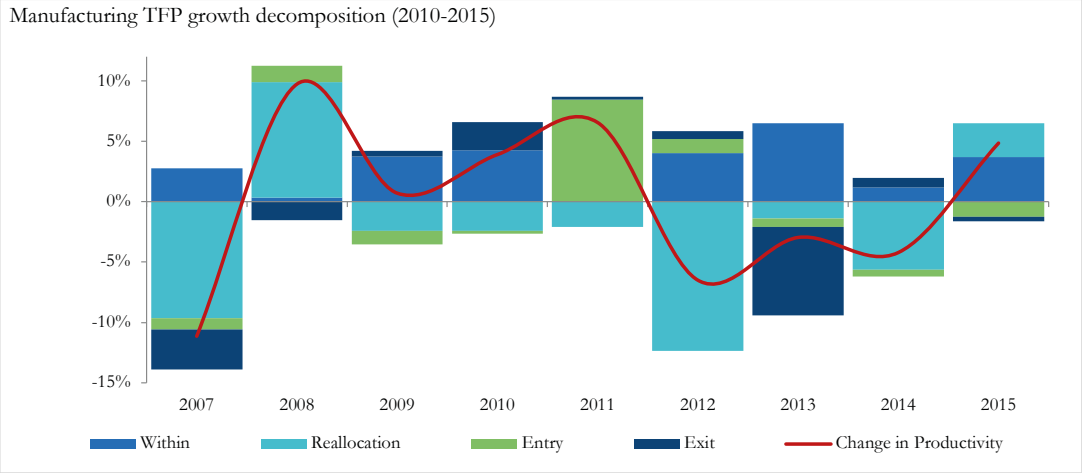
13. **In Turkey, the negative impacts of resource reallocation and net entry on manufacturing productivity are consistent with the decline in allocative efficiency.** The contribution of the reallocation component is negative in almost every year between 2007 and 2015 (Figure 33). Firm entry and exit also affect allocative efficiency as more (less) productive firms entering and less (more) productive firms exiting could lead to a net gain (loss) in productivity as resources are released (captured by) for more (less)

[38] Hsieh and Klenow (2009) methodology measures the degree to which resources are misallocated in the manufacturing industry due to capital or output distortions. They build a model of monopolistic competition with heterogeneous firms to estimate the degree of misallocation of resources and the potential for improvement in TFP. The methodology interprets any difference across firms in TFPR as reflecting distortions, but allows TFPQ to vary. If there are no distortions, TFPR is expected to be same for all firms within the same industry.

[39] Melitz, M., and S., Polanec. (2015). "Dynamic Olley-Pakes Productivity Decomposition with Entry and Exit." RAND Journal of Economics 46 (2): 362-375.

productive firms. The overall impact of net entry has been slightly negative – there is entry of relatively more productive firms, but this is not sufficiently offset by exit of relatively less productive firms. This would also contribute to a drop in allocative efficiency.

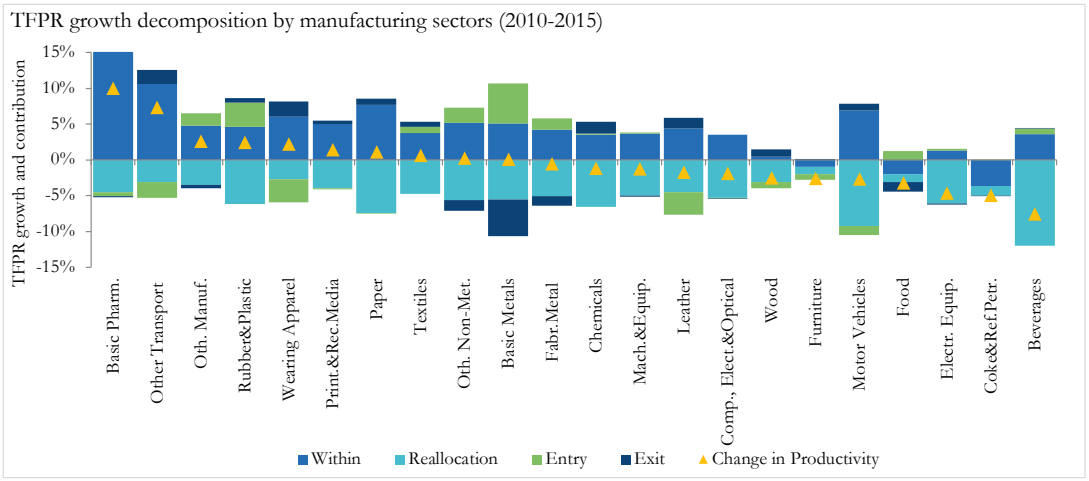
Figure 33: Within firm productivity growth helps partially offset negative reallocation and net entry



Sources: EIS, WB Staff estimates.

14. **The negative impact of reallocation and net entry on manufacturing productivity is evident across individual manufacturing sectors.** Within each sector, the reallocation of resources between firms has made a negative contribution to TFP growth for that sector (Figure 34). Despite some indications of relatively more productive firms entering and relatively less productive ones exiting, the impact of net entry is neither clear nor definitive except for a handful of sectors (e.g. other manufacturing, rubber and plastics, textiles). Even the most productive sector – motor vehicles – was impacted negatively in terms of productivity in the 2010-2015 period by reallocation effects within the sector.

Figure 34: Negative reallocation and net entry effects are evident within manufacturing



Sources: EIS, WB Staff estimates.

15. **Within firm productivity growth helped offset the negative reallocation and net entry impacts on productivity, and may have helped sustain positive, albeit declining, allocative efficiency.** Confirming the latter would require more analysis of the interactions between within-firm productivity growth and measures of allocative efficiency.[40] But without productivity gains within firms, allocative inefficiencies from negative reallocation and net entry could have dragged manufacturing TFP down.

16. **Much of this within firm productivity growth was driven by larger and more mature firms, as well as firms engaged in external trade** (Box 4). The manufacturing sector in Turkey is characterized by a few large firms, together with many small firms. Manufacturing firms with more than 500 employees make up less than 1 percent of all firm in manufacturing. However, these firms account for 28 percent of employment and 53 percent of total value added in manufacturing. Due to their large share in total value added, these very large firms drive the weighted average of productivity in the whole manufacturing industry.

17. **Yet, there is also evidence that the productivity of the largest firms in recent years has slowed down**.[41] These very large firms are, on average, more productive than other manufacturing firms throughout the period of analysis (Figure 35). However, the productivity of these firms dropped by almost 6 percent on average between 2011 and 2015, whereas the productivity of an average firm increased by 5 percent. Therefore, flat productivity and allocative efficiency trends in manufacturing can also be attributed to very large firm becoming less productive (Figure 31 above).

[40] See for example Decker, Ryan A., John Haltiwanger, Ron S. Jarmin, and Javier Miranda (2017). "Declining Dynamism, Allocative Efficiency, and the Productivity Slowdown," Finance and Economics Discussion Series 2017-019. Washington: Board of Governors of the Federal Reserve System (link).

[41] Within the group of large firms, a special group is defined by picking those that have a value-added share of 1 percent or more. This group consists of the largest manufacturing firms in Turkey which are very few in numbers. However, their value-added share in total manufacturing is around 21 percent and their employment share is 5 percent as of 2016. Due to confidentiality rules, the information about the number of firms belonging to this group or NACE code of the sectors they operate in cannot be shared.

Figure 35: Largest firms are more productive, but their productivity growth is slowing

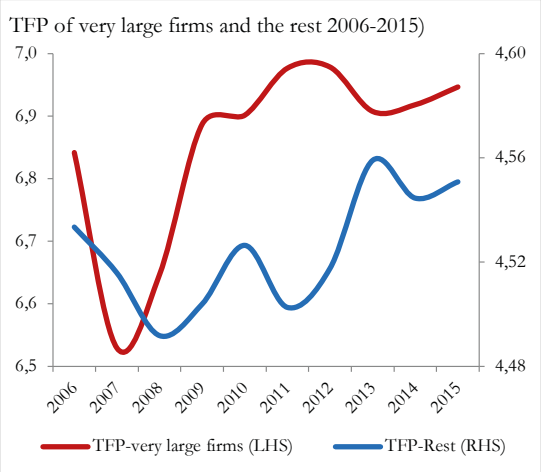
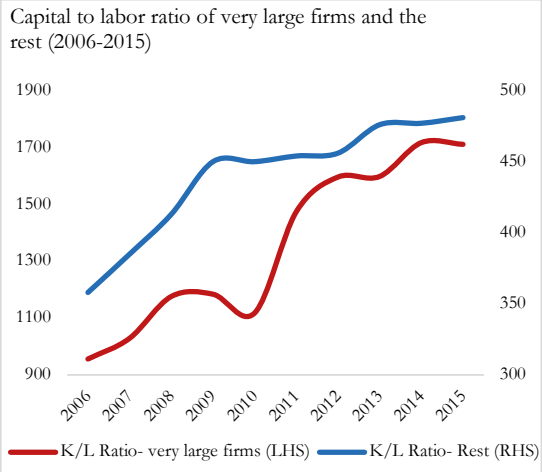


Figure 36: This may be due to capital deepening among the largest firms



Sources: EIS, WB Staff estimates.

18. **One of the possible reasons behind this could be capital deepening of very large firms, which may dent productivity in the short-term but boost productivity in the long-term.** The evidence does in fact show that the capital to labor ratio (K/L) of the largest firms is much higher over the period of analysis. K/L ratios of the largest and other firms follow similar trends until 2010 (Figure 36). After 2010, the K/L ratios of the largest firms started to rise rapidly whereas the K/L of other firms grew more slowly. This may partly explain the decline in the TFP of the largest firms, especially as this is not matched by a decline in their labor productivity. It is worth exploring whether the increase in the K/L ratio is due to investment in productive capital (such as machinery and equipment or R&D) or due to relatively unproductive capital (such as land). This question deserves more analysis as this will impact on long-term productivity in manufacturing.

19. **The above findings have important policy implications, which are discussed in other parts of the report.** Falling allocative efficiency in manufacturing is linked to the shift in policy emphasis towards short-term demand stimulus and supply subsidies (Chapter 1), constraints to competition (Chapter 6), and targeting of public grants for private sector growth and innovation (Chapter 4). Within firm productivity growth is encouraging, but there is more scope for productivity enhancing investments (Chapter 1), technology transfer and learning (Chapter 3), and improving firms' capacity to absorb technology through human capital (Chapter 5).

Box 4: Firm characteristics and productivity

Firm characteristics and productivity: The size, age, ownership and tradability of firms are the most important correlates of firm level productivity.[42] These characteristics are also correlated to each other. To understand the relative importance of each characteristic therefore requires controlling for the other characteristics. A TFP regression was run on size, age, exporting status, importing status, technological intensity and year dummies.

Manufacturing firm size: Firm size is found to be positively associated with higher TFP. Small firms employing less than 19 employees account for around 70 percent of manufacturing firms in Turkey. Even though large firms constitute a small part of the sector, they produce over two thirds of the value added in the sector, Therefore their productivity performance weighs heavily on aggregate productivity.

Manufacturing firm age: More mature firms are found to be more productive than younger firms in the manufacturing sector. This reflects learning effects as firms that defend or extend their market position can learn over time about both what products the firm's capabilities are best suited for and how to improve those capabilities (World Bank, 2014). At the same time, however, young firms exhibit very strong growth potential in Turkey and tend to be more innovative than older firms (Chapter 4).

Manufacturing firms' external trade: In Turkey, exporter firms are, on average 26 percent more productive than non-exporters. Importers are, on average, 41 percent more productive than non-importers. Competitive pressures from international markets can enhance the efficiency of domestic firms. Exporting can also push firms to learn, access technology and grow.[43] Similarly, importing firms can access better quality inputs.

Manufacturing firms' technological intensity: Firms in high technology sectors are, on average, more productive than the rest. But there is no statistically significant difference in average productivity between medium, medium-low and low-tech industries. Most of Turkish manufacturing operates with low and medium-low technology. Since the value-added share of high-tech industries is only around 6 percent (2016), high productivity in those industries does not weigh heavily in aggregate productivity. These are nevertheless important sectors for future growth of manufacturing in Turkey.

Service sector firms' characteristics and productivity Firm size, age, technological intensity, external trade matter for service sector firms' productivity too. As in manufacturing: (i) productivity increases significantly with age; (ii) exporting and importing firms are significantly more productive than non-exporters and non-importers respectively; (iii) high-technology knowledge intensive services (KIS) sectors are the most productive followed by firms in other KIS, less KI market services and KI market services sectors, respectively. However, the relationship between firm size and productivity in the services sector is very different to that in manufacturing. Firms with 2-9 employees are the most productive group.

Foreign ownership: Foreign-owned firms are usually more productive than domestic firms due to their high-quality resources and superior technological, organizational, management and marketing practices. Based on TURKSTAT firm level data,[44] domestic firms exhibit very low levels of productivity compared to firms with any type of foreign involvement. This is evident for both manufacturing and service sectors.

Construction: Growing but low productivity sector suffering from allocative inefficiency

(a) Construction dominated by less capital intensive, low productivity sectors

20. **Productivity in the construction is considerably lower than in the manufacturing sector, and has been on a declining trend over the period of analysis**. This coincided with a period of rapid expansion for the construction sector.[45] The construction sector has three sub-sectors namely:

(i) **Construction of buildings** (development of building projects, construction of residential and non-residential buildings): This sub-sector has the highest level of productivity, though that level is low and has been declining over the past decade (Figure 37). It is the largest sub-sector, accounting for around 70 percent of employment and 60 percent of value added in construction sector (Figure 38). It also includes airport and hospital construction projects, which are mostly Public Private Partnership involving a lot of subcontracting enterprises with various specializations. Activity in the construction of buildings sector is highly cyclical, influenced by business and consumer confidence, interest rates and government programs.[46]

(ii) **Civil engineering construction** (constructions of roads, railways, bridges, tunnels and utility projects): Though TFP levels are lower than in the construction of buildings, labor productivity is higher, which is likely due to high capital intensity of civil engineering construction. Civil engineering works are carried out mostly through the public-sector; they play a significant part in the infrastructure. The recent expansion of large PPP infrastructure projects falls under this category.

(iii) **Specialized construction activities** (demolition, site preparation, electrical, plumping, sewerage activities etc.): Activities are mostly labor-intensive sector and stand out as the worst performer in both labor productivity and TFP. Activities are mostly sub-contracted. has the lowest value-added share but account for a larger share of employment compared to civil engineering.

[42] See Diaz and Sanchez (2008), Biesebroeck (2005), Lundvall and Battesse (2000), Bernard and Jensen (1999, 2001), Girma et al. (2004), Halpern et al. (2005), Head and Ries (2003), Castellani (2001) among others.
[43] Bernard and Jensen, 1995; 1999; Baldwin, 2000; Giles and Williams, 2000a, 2000b; Yasar et al., 2006; Loecker, 2007.
[44] There is no firm ownership information available in EIS dataset.
[45] Turkish construction sector expanded significantly in the last decade and Turkish construction companies have increased their global presence. According to rankings by the magazine Engineering News-Record, (ENR the world's top 250 construction companies by overseas operations), Turkey ranked as a second country in terms of its total number of firms in the list (46 companies) followed by China.
[46] http://ec.europa.eu/eurostat/statistics-explained/index.php/Construction_of_buildings_statistics_-_NACE_Rev._2.

Figure 37: TFP across all construction sub-sectors is low relative to manufacturing

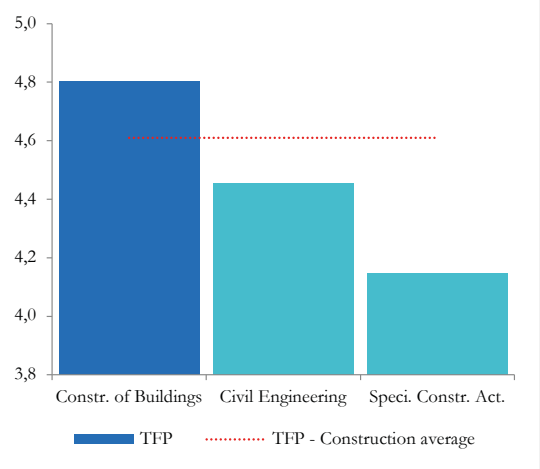
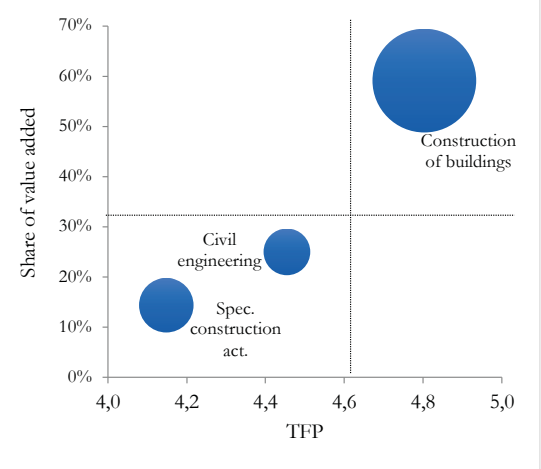


Figure 38: Construction of buildings is most productive with highest VA and employment shares



Sources: EIS, WB Staff estimates.

21. **The construction sector is characterized by low skill intensity, with little scope for learning-by-doing and innovation**. Hallward- Driemeier and Nayyar (2017) defines construction as a stand-alone sector having low productivity enhancing traits: formal worker training programs, use of foreign technology, exports (direct and indirect), introduction of new products and new processes, and R&D spending. On the other hand, they also argue that there is possibility for technology to enable construction sector to be internationally traded while continuing to generate employment for unskilled labor.

(b) Allocative inefficiencies in construction have increased after 2009

22. **Poor productivity performance in construction is consistent with low allocative efficiency since 2009**. Allocative efficiency dropped after the Global Financial Crisis and did not improve much since then (Figure 39). Increased exclusive incentives on construction sector might partially explain the decline in allocative efficiency.[47]

23. **The construction of buildings experienced both a decline in allocative efficiency and falling productivity in the last decade** (Figure 40). This was a big driver of the overall drop in allocative efficiency in the construction sector. This sector has the highest simple average of productivity implying that the average firm in this sector is performing well. However, due to more resources going to the least productive firms, the weighted average of productivity is dragged down. While the relatively small sectors civil engineering and specialized construction activities experienced efficiency improvements in the last decade, they experienced drops in their productivity levels. The improvement in allocative efficiency of these two sub-sectors mitigated the deterioration in the allocative efficiency of construction sector.

[47] See IMF Article IV 2017 Selected Issues for regulatory arrangements on the construction sector.

Figure 39: Allocative efficiency in construction has declined together with TFP

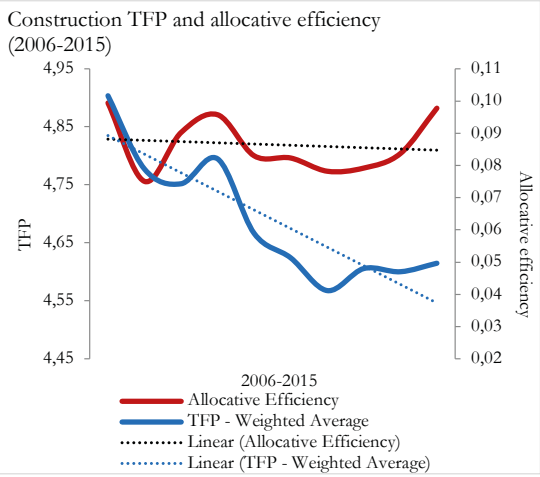
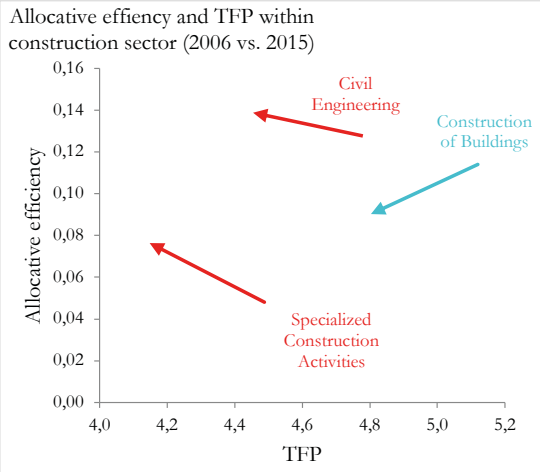


Figure 40: Allocative inefficiency increased in the largest sub-sector



Sources: EIS, WB Staff estimates.

(c) Resource misallocation and within firm productivity impact negatively on construction

24. **Poor productivity in the construction sector productivity is due both to allocative inefficiency and within firm productivity** (Figure 41). The construction sector suffers from both misallocation of resources and existing firms in construction becoming less productive. As in the services sector, the exit of productive firms weighs heavily on construction productivity. Even though entering firms display a better performance compared to surviving firms in recent period, it did not suffice to offset the large negative effect of productive firms exiting the market.

25. **The negative impact of reallocation and exit on construction productivity is evident across all sub-sectors** (Figure 42). In all sub-sectors of construction, the exiting of productive firms is pulling down their productivity and entering firms are impacting positively on productivity. However, the net entry effect is only positive for the civil engineering sector that helped the sector to record productivity growth. The only sector that performed well in the within component following the financial crisis is construction of buildings sub-sector while the other sectors performed very poorly.

Figure 41: Net entry mostly contributing negatively to construction sector TFP

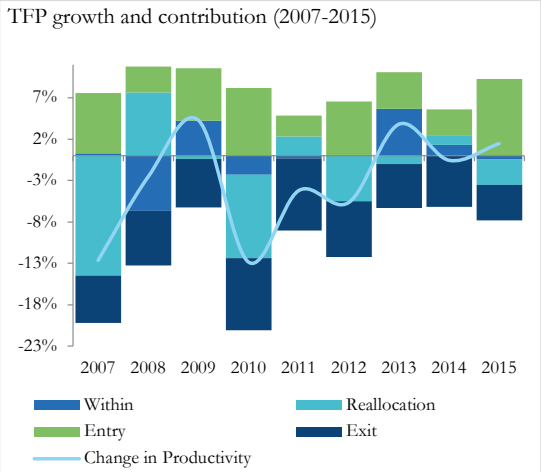
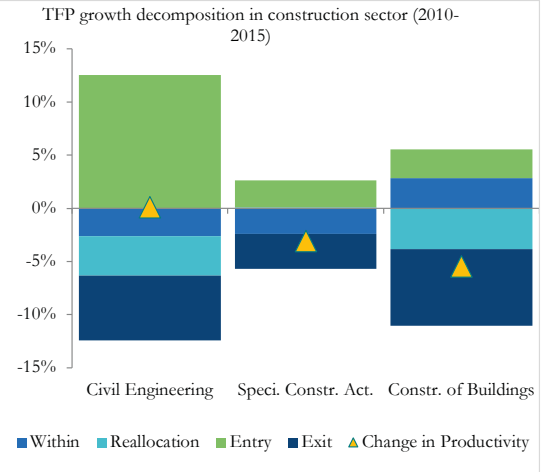


Figure 42: Net entry effect is positive only in civil engineering sub-sector



Sources: EIS, WB Staff estimates.

Services: Declining allocative efficiency and within sector productivity growth

(a) Services dominated by less knowledge intensive, low productivity sectors

26. **Services in Turkey are dominated by sectors that are relatively less knowledge intensive (KI).** Wholesale and retail trade account for nearly half of value addition and employment. The weighted TFP level of the service sector is very close to that of the wholesale and retail trade because of the latter's dominance. More skill intensive sectors on the other hand – such as ICT; scientific and technical activities – account for only 10-15 percent of value addition and employment. Productivity levels for transportation and storage services are below sector average TFP levels, which significantly impacts services productivity given the size of the transport sector (16 percent of value addition) but also manufacturing (Chapter 3).

27. **Not only is productivity in service sectors low and declining, knowledge intensive (KI) sectors have fared particularly poorly**. Firms in relatively less KI sectors have higher than average productivity (e.g. administrative and support, wholesale and retail trade) (Figure 43). Firms in more KI sectors on the other hand (scientific, occupational and technical activities, transportation and storage, ICT) have below average productivity levels (Figure 44). Occupational and technical activities, and ICT, however, can act as productivity enhancers. They have capacity to add value compared to traditional sectors (e.g. retail and wholesale, accommodation and food); they offer more scope for learning-by-doing and innovation.

Figure 43: TFP in service is low, including within knowledge-intensive sectors

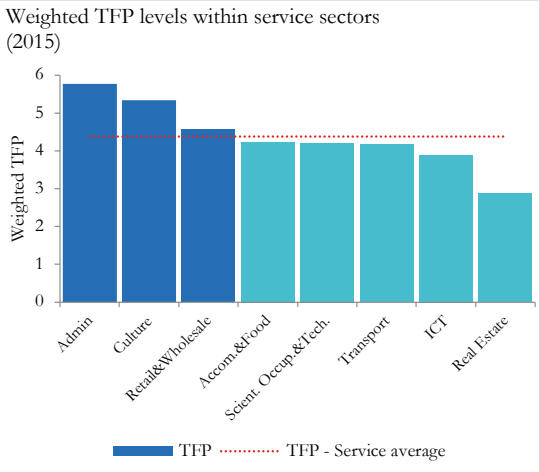
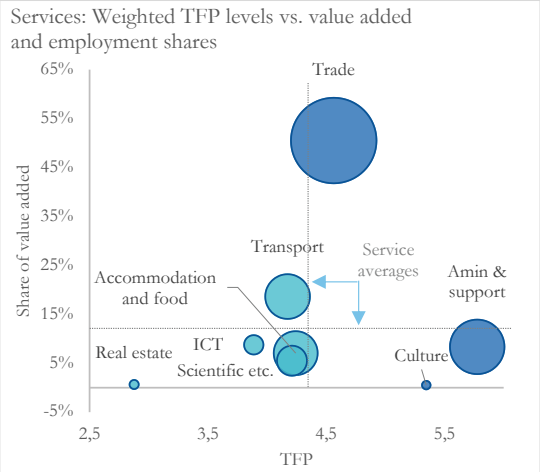


Figure 44: Poor performance of relatively high KI sectors affects sectors beyond services



Sources: EIS, WB Staff estimates.

(b) Allocative inefficiencies in services have risen rapidly since 2009

28. **Weak productivity outcomes in services is consistent with low and falling allocative efficiency since 2009.** Allocative efficiency dropped significantly after the Global Financial Crisis (Figure 45). Fiscal and monetary stimulus, together with a surge in capital inflows from global monetary expansion, fueled a consumption boom and associated growth in inefficient consumer services.

29. **Not only did allocative efficiency decline, but allocative inefficiencies also increased, including in important sectors like ICT and transport** (Figure 46). The ICT sector experienced both increased allocative inefficiency and lower productivity in the last decade. This sector has the highest simple average of productivity implying that the average firm in this sector is performing very well. However, due to more resources going to the least productive firms, the weighted average of productivity is dragged down. The transport sector also experienced significant efficiency losses and declining productivity in the last decade. This result partly explains why firms that have post-manufacturing (e.g. transport and distribution) service affiliates are less productive in Turkey (World Bank, 2017). Similar efficiency losses are observed in retail and wholesale sector.

Figure 45: Allocative efficiency in services has declined together with TFP

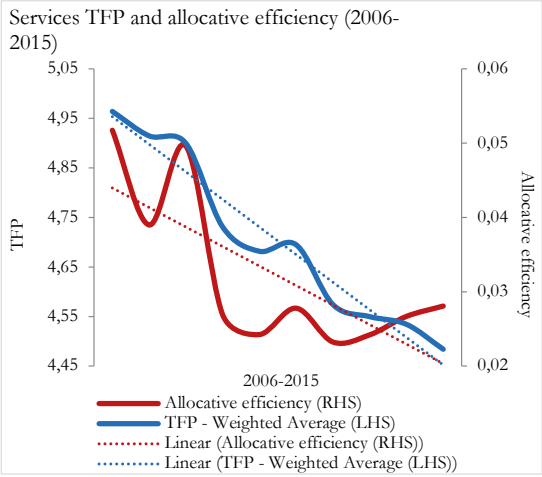
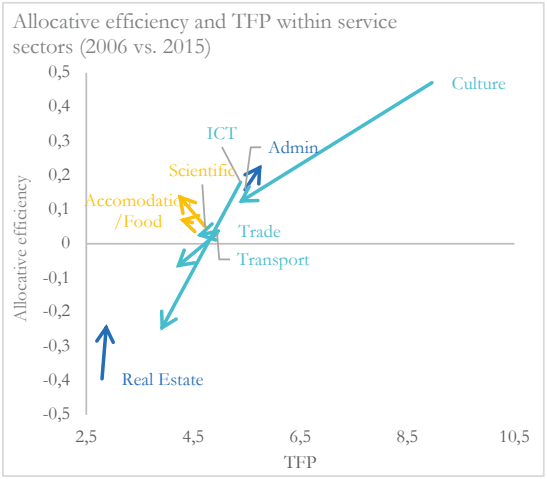


Figure 46: Allocative inefficiencies in important sectors like transport and ICT



Sources: EIS, WB Staff estimates.

(c) Within firm productivity is dragging down overall services productivity.

30. **Unlike in the manufacturing sector, within firm productivity in the services sector has contributed negatively to productivity growth** (Figure 47). In other words, existing firms in services are getting less productive. The reallocation of resources between those firms therefore also did not help pull productivity up. It is striking that firm exit has weighed so much on productivity. Therefore, exiting firms are relatively more productive than those that are remaining, which is puzzling. Even though new entrants tend to be more productive than incumbents surviving firms in recent years, this was not enough to offset the large negative effect of within firm productivity change and the change due to productive firms exiting the market.

31. **Within the service, the sources of productivity changes vary a lot across sectors** (Figure 48). The only common pattern among sub-sectors is that the exiting of productive firms is pulling down their productivity. This signals potential market distortions, including non-competitive practices that allow less productive firms to survive. The ICT and transportation sectors suffer from the misallocation of resources while retail and wholesale, scientific, occupational and technical activities and transportation sectors underperformed in the within component linked to the internal capabilities.

Figure 47: Within firm productivity contributing negatively to service sector TFP

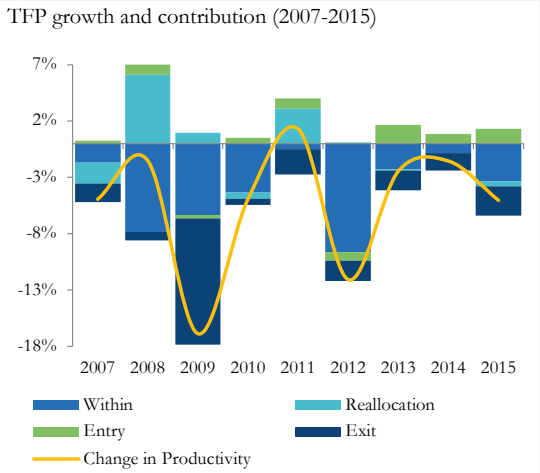
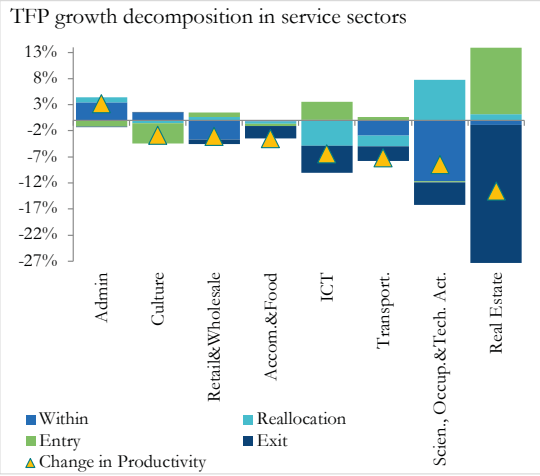


Figure 48: Within services, sources of productivity changes varies across sectors



Sources: EIS, WB Staff estimates.

Boosting pro-development sectors will require competitiveness reforms

32. **Given the above trends in firm employment, growth and productivity across major sectors, how well is Turkey positioned to sustain its strong economic performance?** As discussed in the previous chapter, Turkey needs to build its own ladder of development, which enables it to take advantage of new technologies and changing patterns of globalization. This means strengthening the investment climate so that pro-developments sectors can expand and absorb more labor to avoid a stagnation in incomes and living standards (Chapter 1, 3, 4, 6); this includes equipping the workforce with the skills needed to engage in pro-development sectors (Chapter 5).

33. **The analysis above suggests that sectors that could ordinarily be regarded as having strong pro-development characteristics are not faring very well**. Except for a few star performers (e.g. motor vehicles), more sophisticated manufacturing sectors suffer from declining allocative efficiency and little job creation (e.g. basic pharmaceuticals), low productivity (e.g. machinery and equipment), or a combination of all three (e.g. computers, electronics and optical products). Complementary high skill services are also suffering from declining allocative efficiency, low productivity, low employment and low value addition.

34. **This section builds on a framework from Hallward- Driemeier and Nayyar (2017) to identify more precisely pro-development manufacturing sectors; it then identifies potential risks and implications for the growth of those pro-development sectors in Turkey drawing on the above analysis.** The pro-development characteristics of a sector, as noted in Chapter 1, refer to sectors' potential to boost productivity, growth and employment. For example, a sector's exportability shows the potential for spillovers through learning by doing, scale economies, technology diffusion and competition (Hallward-Driemeier and Nayyar 2017).

35. **Pro-development characteristics in the manufacturing sector in Turkey are defined by 6 criteria:**[48]

(i) **Productivity:** Index of average productivity level in 2015 and productivity growth following the 2009 crisis. Indicates the sectors' potential for growth and convergence.

(ii) **Employment:** Sector's share in employment and employment growth. Indicates the sectors' potential for job creation;

(iii) **Value addition:** Sector's share in value added and value-added growth. Indicates the sectors' significance and growth performance.

(iv) **Low skill employees:** Share of manual workers in total employment. Indicates the sectors' potential to employ low-skilled workers.

(v) **Tradability:** Sector's export to sales ratio, number of exporter firms. Indicates demand beyond domestic market.

(vi) **Innovation:** Number of firms engaging R&D and innovative activities. Scope for innovation and diffusion.

36. **Manufacturing sectors are in turn grouped in five categories** (Hallward-Driemeier and Nayyar 2017))**:** (i) commodity-based regional processing; (ii) capital intensive regional processing; (iii) low skill labor intensive tradables; (iv) medium skill global innovators; and (v) high skill global innovators. These groupings underlie the differences in how they are traded. For instance, the high skill global innovator industries are both highly traded and global value chain intensive with high GVC length followed by medium skill global innovators and low-skill labor intensive tradables. These have potential for providing more opportunities to low and middle-income countries. However, commodity processing sectors which are closely linked to the use of agricultural raw materials or mining products, are the least GVC intensive with low GVC length (Hallward- Driemeier and Nayyar, 2017). This typology also helps identify pro-development sectors across a range of skill levels (i.e. not all high skill intensive).

37. **A few sectors stand out as having potential for building a strong ladder of development for Turkey** (Table 4 – darker shades of green signal stronger pro-development characteristics relative to other sectors in the group). Basic pharmaceuticals, chemicals, motor vehicles and transport equipment tend to have the greatest scope for productivity growth, innovation and tradability. Relatively more technology intensive sub-sectors (basic pharmaceuticals, other transport equipment, basic metals, motor vehicles and chemicals) tend to have higher scores in the productivity index. These sectors are more engaged in R&D and innovation and their products are highly traded. Except basic pharmaceuticals sector, these sectors generated significant employment in the recent period even though their employment shares are at low levels. With these characteristics, they stand out and seem to be good candidates for escalating growth.

[48] Draws on a combination of Hallward- Driemeier and Nayyar (2017) and Amirapu, A and Subramanian, 2015. "Manufacturing or Services: An Indian Illustration of a Development Dilemma," Center for Global Development (Working Paper 409).

38. **There are other sectors with good potential but in Turkey are suffering from allocative inefficiencies**. They include machinery and equipment, electrical equipment and computers, electronics and optical equipment. Though these sectors perform poorly in terms of productivity, they are highly traded in international markets and are associated with more innovative activities. Hallward-Driemeier and Nayyar (2017) suggest that these are likely to be the most competitive sectors to break in or maintain given both their high export concentration and high automation. The global competition is likely to be the most intense in electronics, computers and optical equipment, pharmaceutical products and transportation equipment sectors as they also embody a relatively high share of professional services input.

39. **Some sectors have strong job creation potential but little scope for innovation, and therefore less likely to contribute to Turkey's longer-term ladder of development.** They include food, textiles and wearing apparel sectors, leather and other manufacturing products. These are highly traded in international markets and labor intensive. But they are not R&D intensive and have limited scope for technology diffusion, which hinders their ability to act as growth escalators.

40. **Food, beverage, wood, furniture and leather sectors are relatively less traded sectors and have a high share of manual workers, thereby also unlikely to act as growth escalators**. The food sector stands out in its high share of employment and value added, though it performs very poorly in allocative efficiency and across most pro-development characteristics. From a global perspective, Hallward-Driemeier and Nayyar (2017) highlight that global competition will likely be less intense in textile, apparel and footwear sectors. These sectors are both less automated and have the lowest trade concentration ratios so are likely to continue absorbing low-skill employment. However, they also highlight that in food, beverages, tobacco and coke and refined petroleum are among the subsectors of manufacturing that are relatively more professional services intensive.

41. **Turkey stands at higher risk of more technology intensive and complex sectors being disrupted given current levels of competitiveness, capabilities and connectedness** (Chapter 1). The need for these qualities – competitiveness, capabilities, and connectedness – can vary across sectors depending on the sectors' relative levels of automation, export concentration and services intensity (Hallward-Driemeier and Nayyar (2017). The idea is summarized below (Table 5) – for example more sophisticated and KI sectors (e.g. transport equipment; electronics; pharmaceutical; electrical machinery; machinery and equipment n.e.c; and manufacturing n.e.c) have high trade concentration, exposure to new technology and services intensity. They therefore will require high levels of competitiveness, capabilities and connectedness. High income countries are well placed for the growth and development of these sectors. In the case of Turkey, as discussed in chapter 1, though it is globally just above average on capabilities and connectedness, it is in a middling category on the competitiveness dimension. These more sophisticated and KI sectors are therefore at high risk of being disrupted in Turkey, unless it can address challenges across the "three Cs."

42. **These are also Turkey's main exporting sectors, so closing gaps across the 3Cs sustain the future growth of these sectors**. Strengthening firm capabilities to facilitate the technology adoption and managerial practices and deregulating and improving the quality of professional services will be critical areas to develop (Chapters 3, 5 and 6). The second group of sectors (textiles, apparel and leather products) require connectedness and high competitiveness even though these sectors are low-skill labor intensive. Turkey's position is relatively better in these sectors compared to the first group of sectors. However, policy actions are required to improve the business environment and labor market given the demands on connectedness and competitiveness.

Table 4: Manufacturing sub-sectors, by pro-development characteristics

Nace 2-digit	TFP Index Value	Emp. Share	Δ in Emp. (2010-2015)	Value Added Share	Δ in Value Added (2010-2015)	Foreign Sales / Net Sales	Exporters / Number of Firms	R&D Active / Number of Firms	Innovative / Number of Firms	Share of Manual Workers in Total Empl.
COMMODITY-BASED REGIONAL PROCESSING										
Food	24.0	13.0%	7.2%	7.7%	4.1%	17.5%	13.2%	0.8%	1.3%	83%
Beverages	20.6	0.4%	10.0%	1.2%	5.0%	4.1%	35.9%	1.1%	3.3%	69%
Wood	69.4	1.6%	10.3%	1.6%	11.2%	8.8%	12.3%	0.6%	0.7%	90%
Fabricated Metal Products	67.8	8.7%	11.1%	6.3%	15.2%	18.7%	21.7%	1.2%	2.6%	88%
Paper	126.2	2.0%	10.1%	2.4%	10.9%	20.3%	39.7%	0.5%	2.5%	83%
Printing & Repr. of Recorded Media	88.5	1.2%	4.4%	1.0%	8.4%	7.7%	13.8%	0.3%	0.8%	76%
Rubber and Plastic	128.9	5.9%	10.7%	5.5%	11.8%	20.1%	28.6%	1.2%	4.3%	89%
Other Non-Metalic. Mineral	112.8	7.0%	9.8%	6.9%	10.4%	11.6%	20.2%	1.1%	1.4%	87%
Basic Metals	139.8	4.0%	8.3%	8.9%	7.3%	28.3%	31.8%	1.7%	2.4%	84%
CAPITAL-INTENSIVE REGIONAL PROCESSING										
Chemicals	118.3	2.3%	7.7%	4.2%	7.2%	17.9%	42.9%	3.4%	2.8%	73%
LOW-SKILL LABOR INTENSIVE TRADABLES										
Textiles	113.4	11.3%	10.7%	8.6%	10.3%	17.4%	30.5%	0.7%	2.5%	90%
Wearing Apparel	125.4	12.9%	8.8%	4.9%	10.3%	35.6%	25.6%	0.3%	1.2%	84%
Leather	97.7	1.8%	8.8%	0.7%	7.9%	12.9%	27.4%	0.3%	3.0%	87%
Furniture	56.6	4.6%	11.2%	1.4%	9.0%	11.9%	21.0%	0.3%	5.4%	87%
Other Manufacturing	97.3	1.7%	7.2%	1.3%	13.0%	30.7%	31.2%	2.0%	3.6%	77%
MEDIUM-SKILL GLOBAL INNOVATORS										
Machinery and Equipment n.e.c.	64.8	6.6%	12.3%	5.8%	18.3%	27.6%	43.0%	4.1%	4.5%	83%
Motor Vehicles, Trailers &Semi-trailers	126.9	6.5%	9.5%	13.2%	6.5%	41.2%	41.4%	5.2%	5.6%	65%
Other Transport Equipment	184.2	1.0%	7.7%	1.9%	14.0%	59.4%	40.2%	5.1%	3.8%	75%
Electrical Equipment	40.6	5.0%	8.8%	6.5%	3.9%	38.5%	35.7%	3.4%	5.0%	81%
HIGH-SKILL GLOBAL INNOVATORS										
Computer, Electronic & Optical Products	65.3	1.2%	8.0%	2.3%	8.6%	45.0%	42.8%	11.3%	6.3%	41%
Basic Pharmaceuticals	191.0	0.9%	0.2%	3.5%	14.1%	12.2%	53.3%	17.8%	7.6%	28%

Sources: EIS database, WB Staff estimates.
Notes: Darker shades of green signal stronger development characteristics relative to sectors with lighter green within one of the 5 categories above.

Table 5: Risk of disruption across manufacturing sectors in Turkey

Sectors	Competitiveness, capabilities and connectedness priorities	Risk of disruption in Turkey
Transport equiment, electronics, pharmaceutical, electrical machinery, machinery and euipment n.e.c and manufacturing n.e.c	All 3Cs needed	Higher risk
Textiles, Apparel and Leather Products	Higher competitiveness and high connectedness needed	Medium to high risk
Rubber and Plastics, Fabricated Metals	High capabilites needed	Low risk
Food and Beverages, coke and refined petroluem	Higher competitiveness needed	Medium to high risk
Wood, paper, basic metals, non-metallic mineral products	No significant change anticipated	No risk

Sources: Adapted from Hallward- Driemeier and Nayyar (2017).

43. **The services sector will also need a significant boost if Turkey is to contain risks of disruption, particularly in more sophisticated manufacturing sectors.** Though the absorption of low skill labor in the services sector has played a major role in reducing poverty (Box 5), as discussed above, it will not be possible to sustain this unless better jobs within manufacturing and services are created in the future given Turkey's current levels of per capita income. Moreover, manufacturing sectors use services either as an input for their production or as a complementary item bundled with goods in pre- or post-manufacturing phase and add greater value to the products. The growing interdependence of these sectors underscores the importance of the pro-development characteristics of services, which include: tradability; and source of innovation and technology diffusion. In Turkey, traditional services dominate. But high-end services such as IT and scientific sectors are more likely to help mitigate risks to disruption in deeper manufacturing sectors. This will require reforms that help reduce market distortions in these more sophisticated service sectors (Chapter 6).

Box 5: Intersectoral movement of labor and poverty reduction

The contribution of intersectoral labor movement (productive, unproductive sectors) to poverty reduction is assessed by using the Survey of Income and Living Conditions panel dataset (2012-2015). The sectors are categorized into three groups: (i) Manufacturing; (ii) Construction; and (iii) Services (Retail and Wholesale, Transportation and Storage, Accommodation and Food, Real Estate and Administrative and Support). According to this definition, one third of individuals in the sample work in the manufacturing sector, 13 percent work in construction, and 58 percent in services. Some sectors, including agriculture are not included in this analysis to match the rest of the report.

Inter-sectoral movement show significant variation across sectors (Table 6). The diagonal elements refer to the percentage of workers employed in the same sector both in 2012 and 2015. Some sectors, manufacturing, retail and wholesale and transportation and storage, displayed high persistence compared to other sectors. Those sectors also attracted workers from other sectors i.e. 16 and 13 percent of unemployed individuals in 2012 found employment in manufacturing and retail and wholesale in 2015, respectively.

Table 6: The distribution of employment at sector level (% of total)

			2015								
					Services						
			Manufacturing	Construction	Retail and Wholesale	Transportation and Storage	Accommodation and Food	Real Estate	Administrative and Support	Unemployment	Total
2012		Manufacturing	84	2	4	1	1	0	1	6	100
		Construction	7	72	4	3	1	1	1	10	100
	Services	Retail and Wholesale	9	2	79	2	2	0	1	5	100
		Transportation and Storage	4	4	2	82	1	1	2	5	100
		Accommodation and Food	5	5	3	1	80	0	4	2	100
		Real Estate	0	0	0	0	15	53	11	22	100
		Administrative and Support	2	4	6	5	0	8	71	4	100
		Unemployment	18	10	16	5	9	1	7	34	100

Source: WB staff calculations by using Survey of Income and Living Conditions panel data 2012–2015.

Inter-sectoral movement is lower in manufacturing and services sector (Table 7). Persistence among employed individuals between 2012 and 2015 is very high in those sectors. Around 84 percent of individuals, who worked in manufacturing sector in 2012, worked in manufacturing in 2015; 8 percent of those individuals found employment in services sector in 2015. The persistence is lower among individuals who worked in construction in 2012. Around 72 percent of those individuals worked in construction sector while 10 percent moved to unemployment and services sector in 2015. Among unemployed individuals, 38 percent started working in services sector while 18 percent found employment in manufacturing sector.

Table 7: Transition matrix of employment

			2015			
			Unemployed	Employed		
				Manufacturing	Construction	Services
2012	Unemployed		34	18	10	38
	Employed	Manufacturing	6	84	2	8
		Construction	10	7	72	10
		Services	4	6	3	86

Persistence | Job destruction | Job creation | Transition

Source: WB staff calculations by using Survey of Income and Living Conditions panel data 2012–2015.

Table 8: Transition matrix of employment (Bottom 40 and Top 60 groups)

				2015				
				Unemployed	Employed			
					Manufacturing	Construction	Services	Total
2012	Unemployed		B40	38	13	16	33	100
			T60	30	24	3	44	100
	Employed	Manufacturing	B40	6	83	3	8	100
			T60	6	85	2	7	100
		Construction	B40	11	5	74	9	100
			T60	9	11	69	12	100
		Services	B40	5	5	4	85	100
			T60	4	7	2	87	100

Persistence | Job destruction | Job creation | Transition

Source: WB staff calculations by using Survey of Income and Living Conditions panel data 2012–2015.

While the unemployed Bottom 40 is less likely to find employment, they are more likely to find employment in construction sector (Table 8). Among unemployed only 13 percent of bottom 40 could start working in manufacturing and 33 percent in services sector while 24 and 44 percent of top 60 could find employment in manufacturing and services sector, respectively. The transition from employment to employment in all sectors however is very similar for Bottom 40 and Top 60, although B40 is less likely than T60 to move out of construction.

A decomposition analysis of the contribution of those working in manufacturing, construction and services to the reduction in poverty between 2012 and 2015 shows that poverty reduction derives from higher incomes in services (Table 9). Higher incomes in the sector accounts for about 45 percent of the poverty reduction between both years, followed by construction (27 percent) and manufacturing (8 percent). Lower incomes of those unemployed slightly increased poverty since 2012. Movements between sectors explain the rest; about 18 percent of the reduction in poverty responds to population shifts.

Table 9: Huppi Ravallion decomposition - **changes in moderate poverty in Turkey 2012 - 2015**

Poverty in period 1 (headcount)	13.6	
Poverty in period 2 (headcount)	10.5	
Change in poverty (HC)	-3.1	
By Groups	Absolute change	Percentage change
Manufacturing	-0.2614	8.46
Construction	-0.8399	27.19
Services	-1.4153	45.82
Unemployed	0.0213	-0.69
Total Intra-sectoral effect	-2.4954	80.79
Population-shift effect	-0.5554	17.98
Interaction effect	-0.0381	1.23
By Sector	Absolute change	Percentage change
Manufacturing	-0.2614	8.46
Construction	-0.8399	27.19
Retail and Wholesale	-0.2886	9.34
Transportation and Storage	-0.1618	5.24
Accommodation and Food	-0.5683	18.4
Real Estate	-0.0225	0.73
Administrative and Support	-0.3556	11.51
Unemployed	0.0213	-0.69
Total Intra-sectoral effect	-2.477	80.19
Population-shift effect	-0.5448	17.64
Interaction effect	-0.0671	2.17

Note: Huppi Ravallion decomposition with variable low productive if zero and high productive if 1 and Huppi Ravallion with sector variable. Huppi Ravallion decomposes changes in poverty over time into intrasectoral effects.

Conclusion and policy implications

39. **The main messages that emerge from the analysis on productivity in manufacturing, construction and services are as follows**:

(i) **Manufacturing: some breakout sectors but overall productivity has remained flat in the past decade:** Tradable sectors that have benefited from foreign investment perform well. But allocative efficiency has been declining since 2011. Within firm productivity growth, much of which was driven by large firms, has helped offset declining allocative efficiency. The largest firms on the other hand have experienced a slight decline in TFP growth, which may be due to capital deepening.

(ii) **Growing but low productivity construction sector that is suffering from allocative inefficiency:** The sector expanded rapidly over the past decade, which coincided with falling productivity. A sector characterized by low skill intensity, with little scope for learning-by-doing and innovation**.**

(iii) **Services experiencing declining allocative efficiency and within sector productivity growth:** Services are dominated by less knowledge intensive, low productivity sectors. Allocative inefficiencies have risen rapidly since 2009, which is exacerbated by declining within firm productivity.

(iv) **A few sectors stand out as having potential for acting as growth escalators, but progress is needed on competitiveness, capabilities, and connectedness:** Basic pharmaceuticals, chemicals, motor vehicles and transport equipment tend to have the greatest scope for productivity growth, innovation and tradability. Except pharmaceuticals, they also have potential for employment creation.

Issues	Policy options
Manufacturing sector productivity is weighed down by resource misallocation. This is partially offset by productivity gains within large manufacturing firms.	Review and address constraints to growth of large manufacturing firms. Strengthen their links to local and international value chains including SMEs. Wind down supply subsidies that keep inefficient SMEs in business and prevent reallocation of resources to more productive firms. Review quality of capital deepening by large manufacturing firms to promote productive investments.
Construction sector is absorbing increasing amount of resources though productivity levels are low.	Reduce incentives and credit for expansion of construction activities
The services sector will need a significant boost if Turkey is to contain risks of disruption, particularly in more sophisticated manufacturing sectors.	Liberalize foreign investment regime for services sector (Chapters 3, 6)

Chapter 3

Economic integration and productivity

III. Economic integration and productivity

1. **With increased global integration, the scope for productivity growth also increased.** Evidence suggests that open economies tend to grow faster than closed ones. There are three channels linking integration and growth. First, integration leads to increased competition from abroad, which shrinks margins and benefit consumers through higher purchasing power – the *pro-competitive* effect of integration. The second is a *selection* effect: as profits shrink, only the most productive survive or grow, while the least productive shrink or exit the market. That increases aggregate productivity. The third, is the *innovation and learning* effect: more integration increases the returns to innovation investment and increases exposure to better management practices and know-how, increasing the scope for learning, and, leading to productivity gains.

2. **Turkey has embraced global integration and gained from it.** Turkey is strategically located, serving as a link between 'Factory Europe' – in which a cluster of sophisticated firms connected through international production networks operate, and 'Factory Asia', the most dynamic region in recent years. In this context, this chapter looks at three important issues: (i) the evolution of Turkey's global integration since the early 2000s, and its outcomes in terms of exports and participation of Turkish firms in Global Value Chains (GVCs); (ii) evidence on whether global integration has led to higher productivity within firms and sectors; and (iii) factors that can help accelerate within-firm productivity gains arising out of global integration. The chapter ends with policy implications for further deepening Turkey's global integration.

Global integration deepened Turkey's participation in GVCs enabling more and better exports

(a) Two phases of export growth in Turkey: Turn of the Century and post-GFC

3. **Turkey's integration into the world economy accelerated in the late 1990s.** The set-up of the EU-Turkey Customs Union in 1995 was followed by the EU decision to start accession talks with Turkey in 2004. This, in turn, was accompanied by large inflows of foreign capital. The import regime in Turkey had become subject to radical reforms earlier, in around 1984 when, besides tariff reductions, quantitative restrictions were rapidly phased out and several commodities could be imported without prior permission (Taymaz and Yilmaz, 2006). While the Customs Union increased Turkey's integration especially with the EU's value chains, the update of the Customs Union is expected to further increase this integration through extending the EU-Turkey bilateral economic and commercial relations to new areas, including trade in services and public procurement.

4. **Turkey has a network of 20 FTAs and accompanying rules of origin that enable Turkey to become integrated within the region and an important production hub.** These FTAs are important in developing Turkey's foreign trade with the neighbouring countries, ensuring its exporters to compete at more advantageous terms in comparison to other countries' exporters and increasing mutual investments. According to the figures in 2018, Turkey's export to its FTA partners was approximately US$ 19 billion. For the same year, FTAs' share in total exports and imports of Turkey were 11.6 percent and 8.5 percent respectively..

5. **In line with global trends, Turkey has been including services and investment chapters in its FTAs**. This has been achieved either through negotiation of new generation FTAs or through revising the scope of the existing agreements. Trade in services and investment provisions aim to create legal certainty and predictability which is vital for service providers and investors and elimination of discrimination against foreign companies. Moreover, given the increased share of services in global value chains, as well as the "servicification" trends, the inclusion enables to offer a complete set of rules applicable to all trade between parties.

(i) With the objective to provide an efficient business environment for the global value chains, Turkey has finalized negotiations with EFTA, Serbia, Bosnia-Herzegovina and Montenegro to extend the scope of the agreements, negotiating with Georgia and Malaysia to do so. The negotiations with Ukraine covering services in addition to trade in goods is about to be finalized while the ongoing negotiations with Japan, Mexico and Peru have trade in services and investment chapters as well.

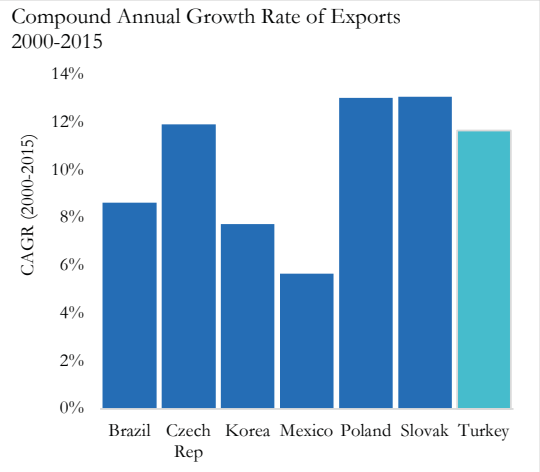
(ii) Turkey has already included services and investment provisions under its FTAs with Korea and Singapore; agreements signed in 2015. The Qatar TEPA, signed in September 4th 2018, also covers services.

(iii) Once the negotiations on the modernization of the EU-Turkey Customs Union commence, though the modalities have not been determined yet, freedom to provide services and the right of establishment will be a part of the package.

6. **Turkey has experienced, on average, relatively fast export growth.** Over the last 15 years, Turkish merchandise exports grew at a rate of almost 12 percent (2000-2015, Figure 49). This is comparable to what is observed in new EU accession countries, such as Poland and the Slovak Republic, while above the performance of other emerging economies such as Mexico, Korea and Brazil.

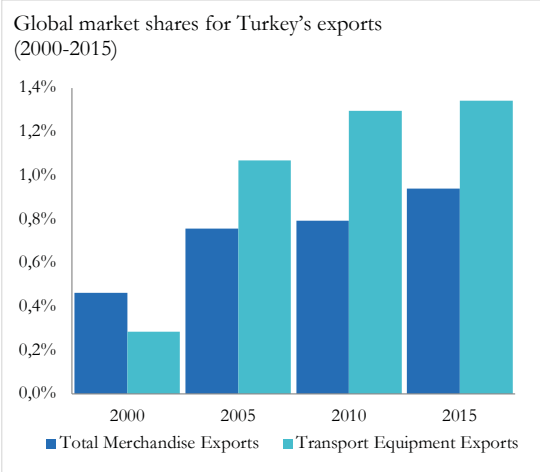
7. **Growth experienced two phases: a fast catch up period at the turn of the century, and a sluggish one after the crisis.** Examining market shares allows us to compare Turkish export performance with the world's. How much of global imports were served by Turkish firms? Turkey's overall market share has grown rapidly during the period 2000-2005, but has since then remained stable. The Turkish export market share in transport equipment also grew substantially (even more) during the first period, from less than 3 dollars/1000 US$ in 2000 to 11 in 2005, to remain at around 11-12 dollars during the following ten years (Figure 50).

Figure 49: Turkey's merchandise exports grew relatively fast in the period 2000-2015



Sources: UN Comtrade. CAGR stands for compound annual growth rate that is used to measure growth over a 15-year period using a compounding formula.

Figure 50: Export growth experienced fast catch-up in the early period and sluggish growth after the GFC



Sources: UN Comtrade, WB Staff estimates.

(b) Diversified export growth

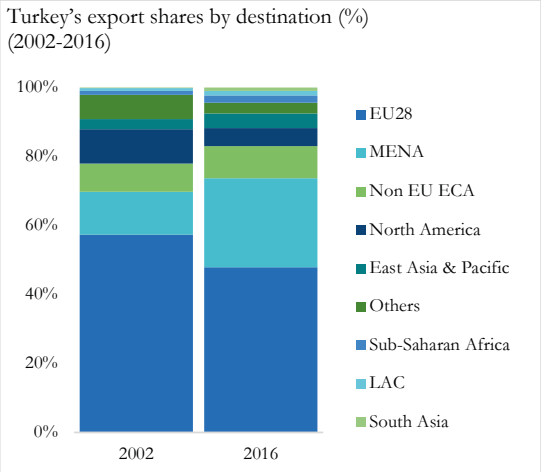
8. **Turkish exports are highly diversified along the destination dimension.** Exporters reach almost all countries in the world, although exports tend to be concentrated within the EU and the Middle East and North Africa (MENA) regions. The share of exports towards the MENA region has increased while the share of exports toward the EU has decreased (Figure 51).[49] Overall, Turkey's exporters have been diversifying markets. They reached 220 destinations in 2016,[50] which is comparable with the country reach of export-oriented economies such as South Korea and Malaysia, and well above the 163 destinations reached by Tunisia, and the 199 reached by the Russian exporters (Figure 52).

9. **At the product level, export concentration is relatively low and slightly decreasing over time.** The top 5 products exported explain about 15 percent of export revenues in 2016, substantially less than what is observed in Malaysia, Brazil, and South Korea (Figure 53). This means that Turkish export earnings face lower vulnerability to product-specific shocks. In addition, the product scope has been slightly increasing over time. The number of product varieties exported is up to 3680 products in 2016,[51] comparable with the level of diversification experienced by South Korea, and well above that of Tunisia and Hungary (Figure 54).

[49] In recent years, the share of EU in Turkish exports gradually increased and reached 50.4 percent as of 2018, fueled by strong demand from the EU, increasing price competitiveness due to a depreciation of the Turkish Lira, and the normalization of the relationship in 2016.
[50] Based on Comtrade data; according to TURKSTAT data, number of destinations reached in 2016 was 242.
[51] Based no Comtrade data; according to TURKSTAT data, number of product varieties exported is up to 4,620 products (HS6).

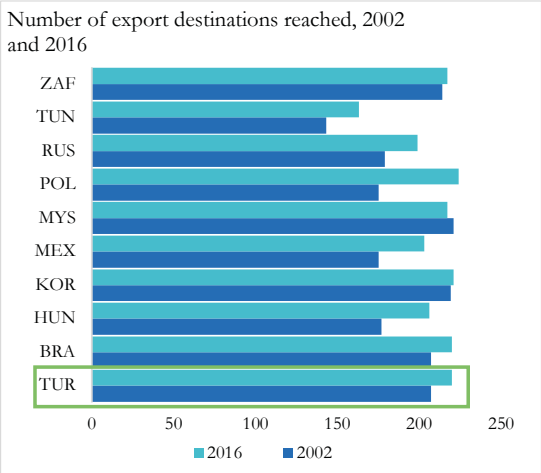
10. **The growth of exports is in part driven by an increase in the number of firms that make it to export status.** Administrative data reveals that the number of exporters has increased by 70 percent over the period 2006-2016,[52] while the number of importers, mostly of intermediates, has increased by 41.5 percent. Export entry has been heterogeneous across sectors. In 2016, the pharmaceutical sector displays the largest share, and increase, of exporters (almost 60 percent), followed by the chemicals and machinery sectors, where 45 percent of firms participate in the export market. The share of exporting firms increased in almost all sectors except for low-tech manufacturing such as food, furniture, and wood (Figure 55).

Figure 51: MENA share of exports has increased whilst EU share has decreased



Sources: UN Comtrade. CAGR stands for compound annual growth rate that is used to measure growth over a 15-year period using a compounding formula.

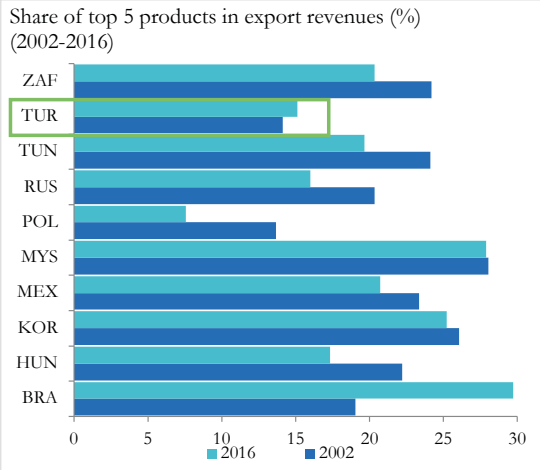
Figure 52: Turkish exporters reach almost all countries in the world



Sources: UN Comtrade, WB Staff estimates.

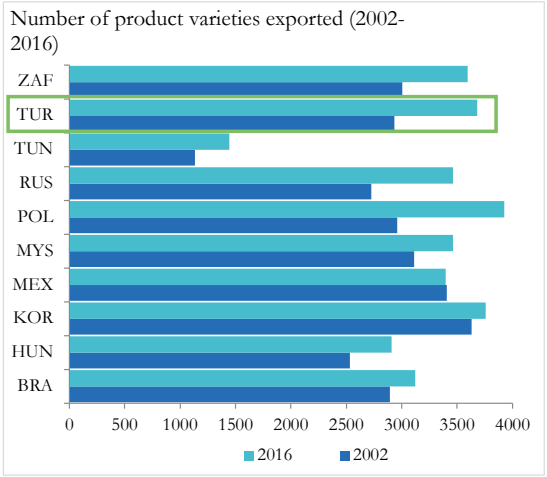
[52] Based on sample from EIS data; according to TURKSTAT data, the number of exporters increased by 52 percent from 2006 to 2016.

Figure 53: Export concentration is low and decreasing over time



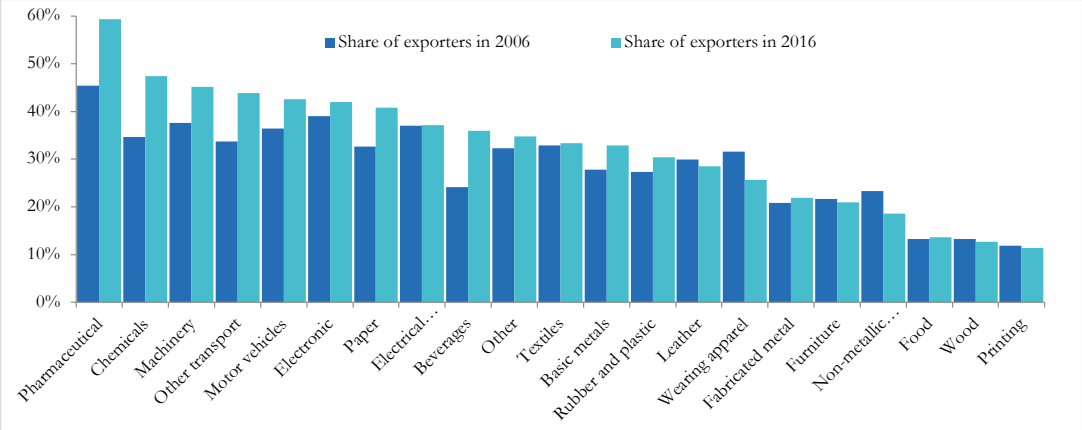
Sources: UN Comtrade, WB Staff estimates. Graph shows export share of top 5 products. We excluded oil and oil products for Russia as they account for about 60 to 70 percent of the total value of exports.

Figure 54: Turkish exports are highly diversified in terms of products



Sources: UN Comtrade, WB Staff estimates. Graph shows number of product exported. A product corresponds to a 6-digit code using the HS classification.

Figure 55: The number of firms entering the export market has increased over time



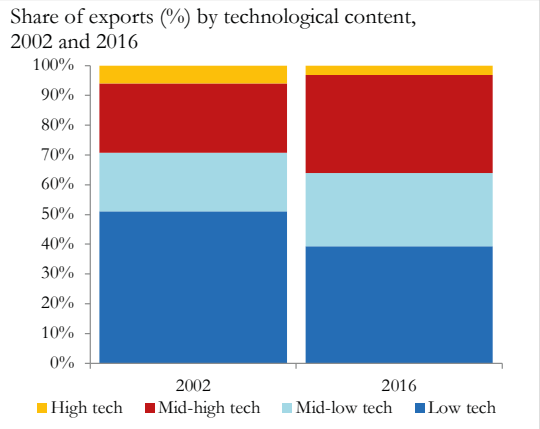
Sources: EIS, WB Staff estimates.

(c) Increasingly sophisticated exports

11. **Turkish exports show a gradual substitution of low-tech for mid-tech products while imports continue being concentrated in more tech-intensive sectors.** Exports and imports have increased across all sectors but not at the same pace (Figures 56, 57). Over the period 2002-2016, a moderate change in the technological composition of exports is observed. The share of exports with middle levels of R&D intensity continues growing, to the detriment of low tech, and to a lesser extent high tech, exports. Interestingly, this is

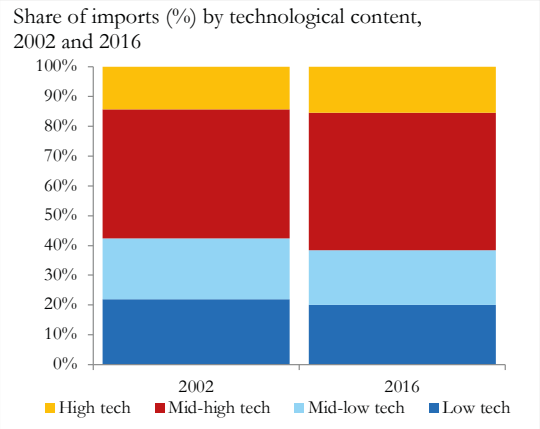
matched with firms in these mid-tech sectors becoming more productive: that is, the increase in importance of these sectors reflects their increased productivity.

Figure 56: Turkish exports show a gradual substitution of low-tech for mid-tech exports



Sources: OECD Stat data, WB Staff estimates.

Figure 57: Turkish imports continue being concentrated in more tech-intensive sectors



Sources: OECD Stat data, WB Staff estimates.

(d) Integration on the back of GVCs

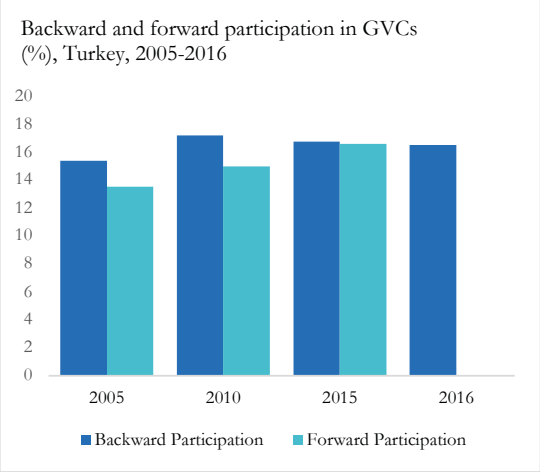
12. **Turkey's integration into the world economy happened on the back of global value chains.** Turkish and foreign firms today are more interdependent than they used to be two decades ago. This is evidenced by an increase in the importance of foreign value added to produce Turkish exports, as well as by an increasing presence of multinational companies operating in Turkey.

13. **Turkey integrates into GVCs as a buyer and as a seller.** Turkey's backward participation into GVCs – measured as the portion of import content in Turkey's exports - has increased mildly between 2005 and 2016. In 2005, every 100 US$ exported by Turkish firms had 15.4 US$ of import content. In 2016, this increased to 16.5 US$.[53] Forward participation – measured as the portion of Turkish content in other country's exports - has also increased. In 2005, of every 100 US$ exported, 13.5 ended up in the exports of other countries, while in 2015 14.6 US$ did (Figure 58).[54] Turkish firms participate in GVCs by buying intermediates and producing final goods. To be sure, while import content of exports has increased, the domestic value added in exports has doubled since 2005 (Figure 59).

[53] An earlier data release from OECD's Trade in Value Added (TIVA) dataset that covers 1995 and 2000 shows a dramatic increase in the share of import content in Turkey's exports from US$ 8.9 in every US$ 100 of exports in 1995 to US$ 13 in every US$ 100 in 2000.

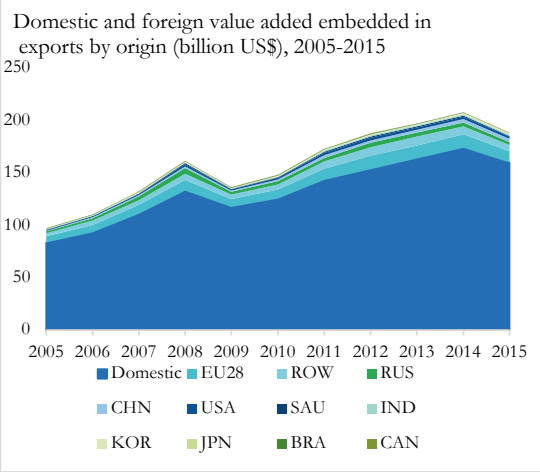
[54] Data on forward participation indicators for 2016 are not available.

Figure 58: Turkey's participation into GVCs both as a buyer and seller has increased since early 2005



Sources: OECD Stat data, WB Staff estimates Note: Latest available data from OECD is for 2014.

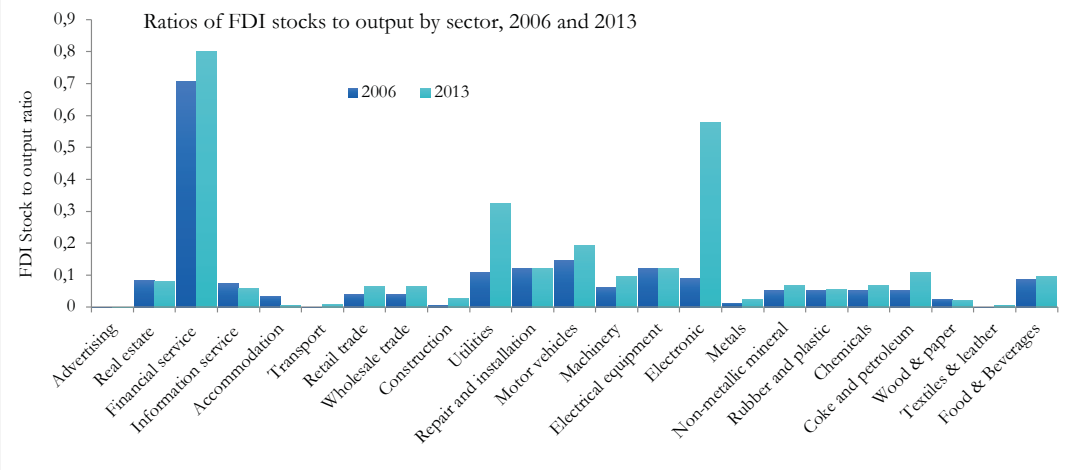
Figure 59: Foreign value added is increasingly more important to produce Turkish export products



Sources: OECD Stat data, WB Staff estimates Note: Latest available data from OECD is for 2011.

14. **Turkey maintains a liberal FDI regime when compared to countries such as Brazil, Poland and Mexico.** Turkey has decreased FDI restrictions in virtually all sectors and, consequently, FDI stocks have increased across almost all sectors (Figure 60). The largest increase has been experienced by far by the electronic sector.

Figure 60: FDI stocks have increased across all sectors



Sources: OECD, WB Staff estimates.

More integrated firms and sectors tend to be more productive

(a) Empirical literature points to strong link between integration and productivity

15. **International evidence tends to confirm that firms exposed to the global marketplace are exceptional performers.** Causality works in both directions. Within industries, integrated firms – exporters and/or importers of intermediates – tend to be more productive and more innovative, pay higher wages, use more skills and capital, and are less likely to exit. On the one hand, firms that participate in the international market are better at facing the high fixed costs associated with searching for clients abroad, learning about their tastes, quality and safety standards, and adapting their products to match them. This suggests a process of selection into exporting.

16. **There is also increasing evidence on integration (exporting and importing) improving firms' productivity**. 'Learning by exporting', for example, has been linked to productivity gains associated with exposure to demanding clients, or to highly productive competitors. 'Learning by importing' has been identified when access to a wider variety of intermediates and capital goods relax technological constraints of firms allowing them to produce in better conditions.[55] Exposure to multinationals - that typically display greater productivity levels – through FDI, has also been linked with learning and with increased incentives to innovate (The evidence on openness and productivity for Turkish firms is reviewed in Box 6).

17. **Empirical evidence has validated the channels and mechanisms identified in the theoretical literature.** For example, Amiti and Konings (2007) focus on the 'learning by importing' channel. They use data on Indonesia, estimate the productivity gains from reducing tariffs on final goods and from reducing tariffs on intermediate inputs, and find that, (a) lower output tariffs increase productivity by inducing tougher import competition, and (b) cheaper imported inputs also raise productivity via learning, variety, and quality effects. This latter effect is substantially stronger than the former. Similar results are found by Yu (2014) for China. Focusing on the FDI channel, there is some consensus on the positive spillover effects on productivity downstream, associated with increased participation of multinationals in upstream sectors. For example, Arnold et al. (2012) found sizable effects on productivity of increased foreign entry into upstream services in India, Fernandes and Paunov (2012) in Chile, and Duggan et al. (2013) for Indonesia.

18. **Yet, the effects of openness on productivity are far from being automatic or inevitable, and gains accrue heterogeneously to different types of firms.**[56] The extent to which these channels are at work depends on local characteristics, such as, market structure, the overall investment climate, or the rigidities that may exist in labor and capital markets to facilitate or impede structural adjustments.[57] Firms' absorptive capabilities, often measured by human capital and R&D investment, are also key determinants of whether a firm can benefit from increased exposure to multinationals and international trade.

[55] See for example, Pavcnik, 2002; Amiti and Konings, 2007; Brandt, Van Biesebroeck, Wang, Zhang, 2017, Atkins et al., 2017.
[56] In Lithuania, Javorcik (2004) provides evidence of positive productivity spillovers from FDI taking place through interactions between foreign affiliates and their local suppliers in upstream sectors. The same author finds evidence of vertical spillovers through backward linkages also in the cases of Czech Republic and Latvia through multiple channels.
[57]See, for example, Blalock and Simon (2009). The authors show that firms' absorptive capabilities (i.e.: better trained workers, more investments in R&D) are key determinants of whether firms can benefit from FDI spillovers.

Box 6: Literature on the effects of integration on productivity in Turkey

Exporting and productivity gains: Yasar et al. (2007b), provides a comprehensive analysis of international linkages, including FDI, exports, imports and licensing, for two Turkish manufacturing sectors—the textile and apparel and the motor vehicle and parts industries. They find that plants with international linkages have higher productivity levels, are larger, invest more, pay more, and hire more administrative and technical workers. Results also show that internal plant characteristics, such as the share of skilled labor, enhance the productive role of international linkages. Finally, they find that engaging in a range of multiple international activities (e.g. FDI and exporting) further enhance productivity. This is also confirmed in Dalgic et al. (2005) for the entire manufacturing sector in Turkey. The authors find that firms engaging in both exporting and importing perform better than those involved only in one side of trade.

There is evidence of both a selection and a learning mechanism when considering the participation of Turkish firms into the export market. On one hand, Dalgic et al. (2005) find a self-selection effect for exporting since engaging in international trade is associated with ex-ante superior performance and entry sunk costs among Turkish firms. In another study on the same sectors mentioned above, Yasar et al. (2007a) and Yasar et al. (2005) find evidence of stronger learning- by-exporting effects in the textile and apparel industry. This was not the case for the motor vehicle industry. It is suggested that because this industry is more likely to be using cutting-edge technology and skills, given the larger presence of foreign ownership and intensive competition, there is less knowledge to be gained by exporting. Maggioni (2012) finds evidence of both self-selection into exporting and learning-by-exporting and highlights a link between export and import activity.

Finally, Cebeci (2016) investigates the relevance of export destinations in affecting productivity, and also employment, and wages in Turkey. In particular, the author compares firms that export to low-income destinations and high-income destinations and finds that participation in the export market has a positive effect on firm TFP only when firms export to high-income destinations.

Importing and productivity gains: The evidence on the effects of participation in the import market is more limited. Taymaz and Yilmaz (2006) study a period of substantial tariff reduction in Turkey (1984-200). The authors analyze the impact of import penetration from the EU and find a positive association with productivity in import competing industries. Yasar et al. (2007b) evaluate the relationship between productivity and imports of capital goods for Turkish manufacturing plants in the apparel, textiles, and motor vehicles industries. They find that firms acquiring capital goods in the international market (machinery and equipment) increases productivity but the effects are smaller than those from entering the export market. A 10 percent higher asset import share is associated with 0.6 percent greater productivity (1.5 percent in the case of exports). Dalgic et al. (2005) find higher sunk costs for importing activity than for exporting and show that diversification of imports (either in terms of numbers of products or countries) has a bigger impact on firm performance than diversification in terms of exporting.

Foreign direct investment and productivity gains: Benli (2016) finds that Turkish firms can benefit from both horizontal and vertical FDI spillovers but benefits are conditional to firms' absorptive capacity, measured by the gap in TFP. In addition, he also finds that gains accrue especially to firms that have medium and high TFP growth rates. This is also found in an earlier paper by Köymen Özer et al. (2012) that looks at the role played by human capital, technology gap and export status, in favoring the realization of productivity spillovers from horizontal and vertical FDI. They find that both measures of absorptive capacity are associated to greater productivity gains from FDI. Yasar et al. (2007b) evaluate the relationships between productivity and FDI in the Turkish apparel, textile, and motor vehicles industries and find that plants with a foreign ownership share are the most productive,

followed by plants that export. This is especially evident for larger plants and plants with more skilled labor.

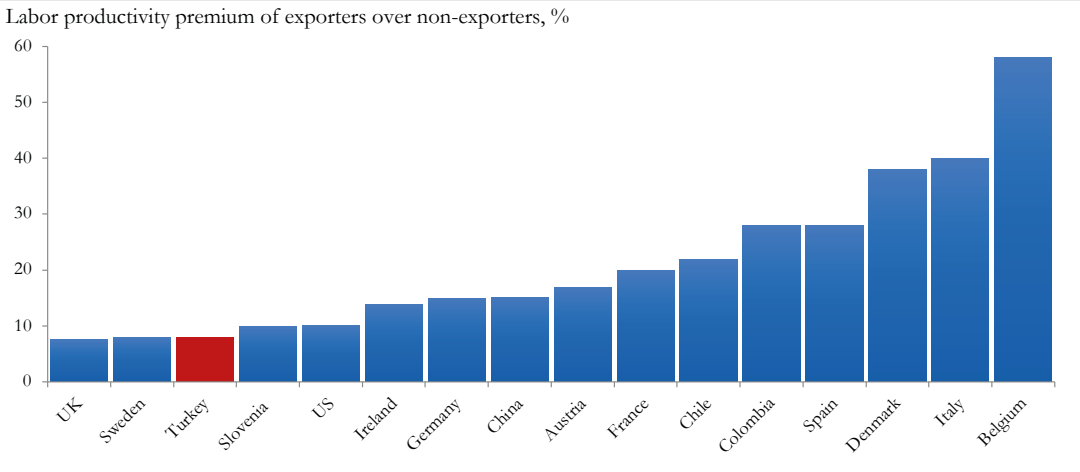
Source: Author's elaboration.

(b) Integrated firms in Turkey tend to be more productive

19. **Turkish exporters enjoy a productivity premium comparable to what is observed in advanced economies such as the UK, US, and Germany**. In Turkey, exporters are on average 7.5 percent more productive than non-exporters (Figure 61). This compares to the exporting premium that firms in the UK, Sweden, Slovenia and the USA display, although it is lower than that observed among firms in Spain, Denmark, Italy or Belgium.

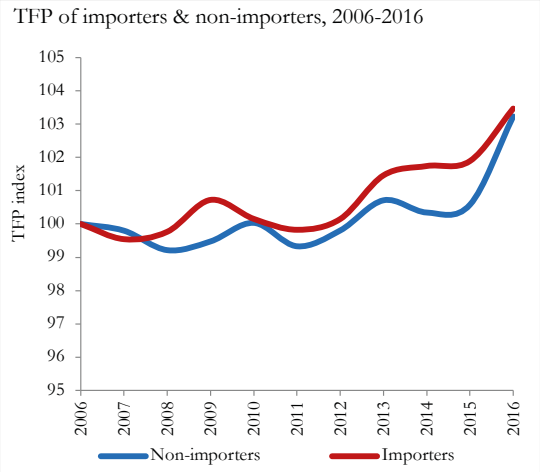
20. **Turkish importers and exporters show higher productivity growth than non-importers or non-exporters.** Average total factor productivity of importers has grown by more than 4 percent over the period 2006-2016 compared to 3 percent for non-importers (Figure 62). This was driven by a rapid increase in TFP in the second part of the period (since 2012), while the post financial crisis period was associated with stable or even declining TFP particularly for non-importers. A similar pattern is also observed for exporters as compared to non-exporters (Figure 63).

Figure 61: Turkish exporters enjoy a productivity premium comparable to advanced economies'



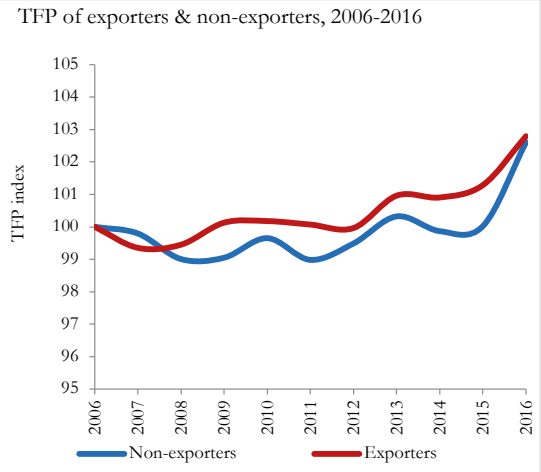
Source: for United States Bernard, Jensen, Redding, and Schott (2007) and for other 14 countries International Study Group on Exports and Productivity (2008); for Turkey: EIS data, year 2008. The estimate is obtained by regression an export dummy on labor productivity controlling for sector and year fixed effects.

Figure 62: Turkish importers show higher productivity growth rates than non-importers



Sources: WB Staff calculations based on EIS data. TFP index with base 2006. Manufacturing firms only.

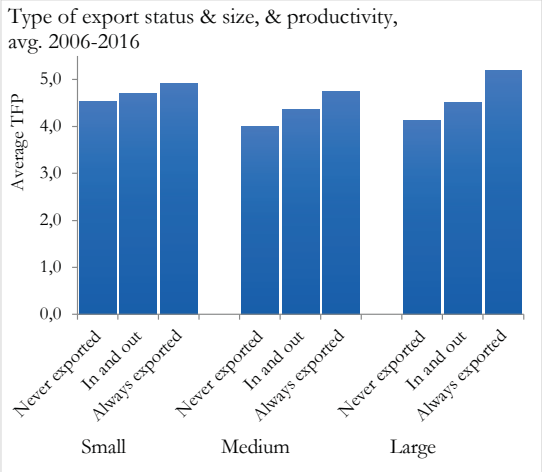
Figure 63: Turkish exporters show higher productivity growth rates than non-exporters



Sources: WB Staff calculations based on EIS data. Manufacturing firms only.

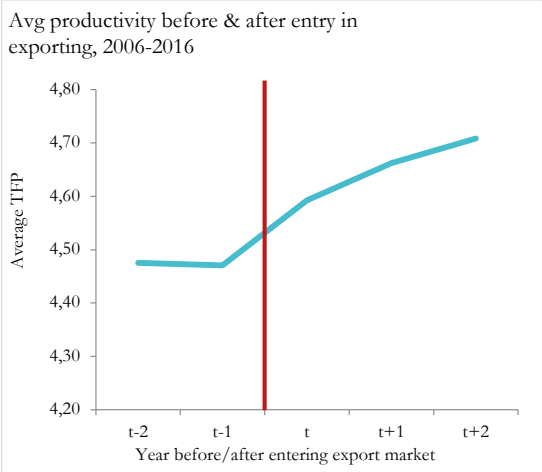
21. **Exporters are more productive in the first place, but their productivity further increases after entering the export market.** Just like observed in the rest of the world, in Turkey, firms that export tend to be more productive (Figure 64). The gap is larger for large firms. A large exporter is 25 percent more productive than a large firm that has never entered the export market. The gap is of 8 percent among small firms. But in addition to this selection effect (most productive Turkish firms are those that export), in Turkey, there is also evidence of learning by exporting among firms. Average productivity of firms increases by about 3 percent after entering the export market (Figure 65). The benefits are larger for the pharmaceutical, paper, basic metal and motor vehicle sectors.

Figure 64: Exporters are more productive independently of their size



Sources: EIS.
Notes: Small firms have less than 10 employees, medium firms have between 10 and 50 employees and large firms have 50 or more employees.

Figure 65: Firms' productivity increases after entering the export market



Sources: EIS.
Notes: Consider only manufacturing firms. The plot shows average TFP of first-time exporters in the year preceding and following the entrance to the export market. This refers to the first time a firm start exporting in the period 2006-2016. Averages are obtained from about 30,000 firms. The number of observations vary over periods since not all firms are observed in all years preceding and following their first entry into the export market.

22. **An increasing number of smaller firms are entering the merchandise export market.** The median employment of firms entering the export market has been decreasing over time (Figure 66). A similar pattern is observed also when considering the average size of new exporters. This suggests that the fixed costs associated with exporting have decreased over time. The trend has been more prominent in the pharmaceutical, electrical equipment, and motor vehicle sectors. For services, the evidence suggests that the median employment of firms entering export markets is mildly increasing.

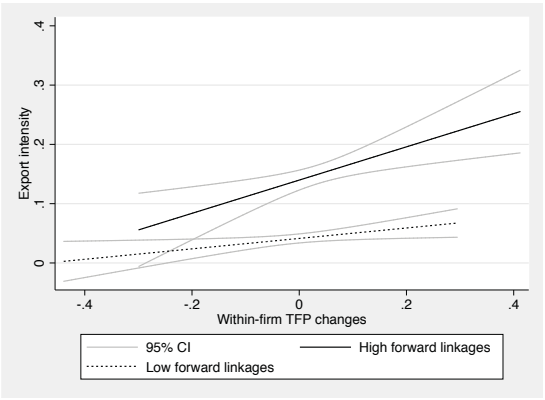
23. **Firms' productivity grows faster in export and import-intensive sectors *when* that intensity is linked to GVC participation.** The link between productivity and import and export status is at work through GVC integration. When considering the correlation between TFP growth and export intensity, and distinguishing sectors with high forward linkages (those that sell to companies abroad that in turn use those products to produce and export something else), it shows a strong link only for these sectors (Figure 67). Similarly, the link between import intensity and TFP growth is stronger for sectors that are highly integrated backwards in GVCs (those that use foreign inputs to produce their export products, Figure 68).

Figure 66: The size of first-time manufacturing exporters decreasing over time

Sources: EIS, WB Staff estimates.

Figure 67: Export intensity and backward linkages linked to within-firm productivity growth

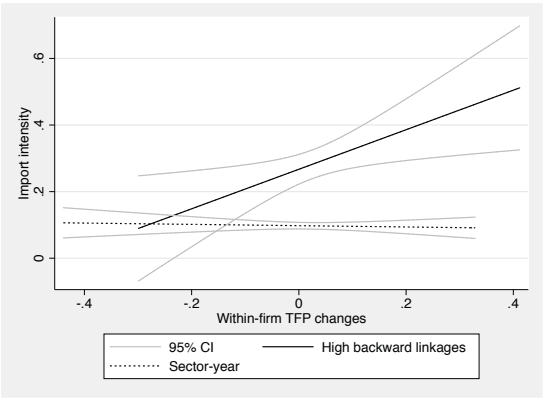
Chart: Linear best fit for sector export intensity & TFP growth, high and low forward linkages, 2006-2016



Sources: EIS data for TFP, OECD data to measure forward linkages and export intensity.
Notes: Outliers are excluded and are defined as those observations with a standardized residual above 3.

Figure 68: Import intensity and backward linkages linked to within-firm productivity growth

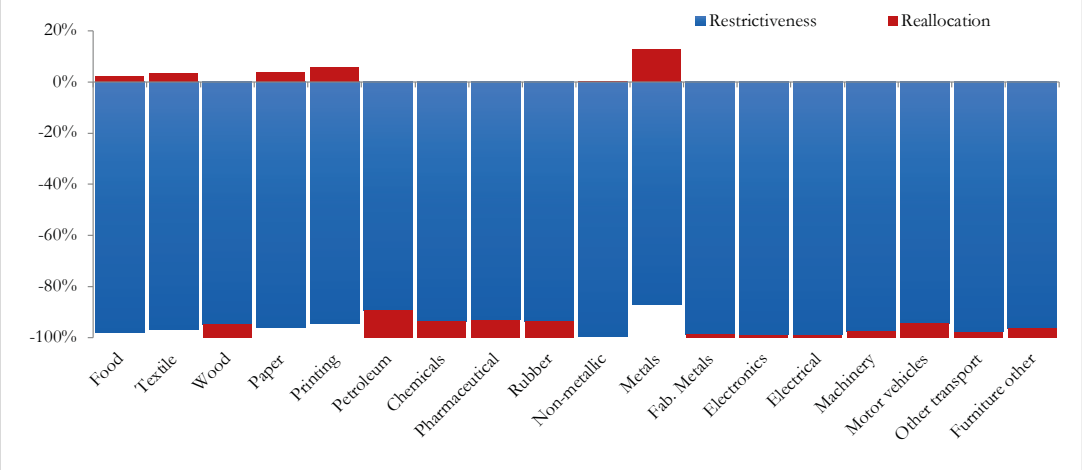
Chart: Linear best fit for sector import intensity & TFP growth, high and low backward linkages, 2006-2016



Sources: EIS data for TFP, OECD data to measure forward linkages and export intensity.
Notes: Outliers are excluded and are defined as those observations with a standardized residual above 3.

24. **Restrictions to integration, for example restrictions to FDI in upstream sectors, make firms downstream alter their input choices, and demand more from more open sectors**. When we decompose the reduction in FDI restrictions upstream into a pure policy change and a re-allocation component into less restrictive activities (that is, if negative it implies that firm moved to sectors with lower restrictions), we observe that both played a role, i.e. integration make firms alter their optimal decisions (Figure 69).

Figure 69: Less FDI restrictions induced reallocation of inputs to less restricted sectors



Sources: WB Staff estimates based on OECD and TURKSTAT Input-Output tables. The graph shows the change in the overall FDI restrictiveness of upstream sectors between 2003 and 2012. The overall restrictiveness is given by the weighted average of the restrictiveness of each upstream sector, where weights are represented by input-output (technical) coefficients. The change over the period is decomposed into a decrease in screening and approval restrictions on FDI in upstream sectors (the blue bars) and a change in weights. A negative light blue bar indicates that upstream sectors with lower FDI restrictiveness increased their weights.

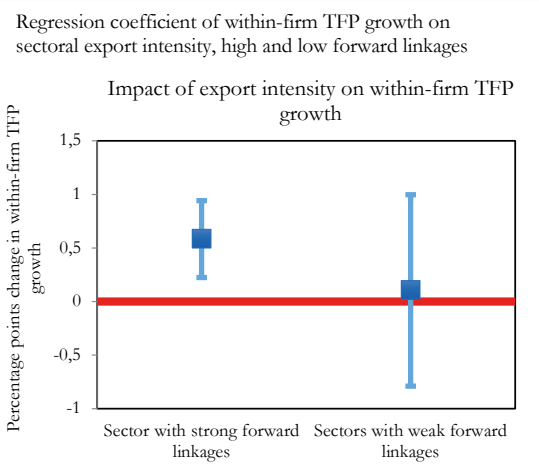
(c) Better integrated sectors through GVCs experience within-firm productivity growth

25. **Sectors that are better integrated in the global marketplace through GVCs, experience positive within-firm growth in productivity.** As discussed in chapter 2, aggregate TFP growth can be decomposed into how much productivity grows at the firm-level, holding market shares constant (within-firm component), and into how much the more productive firms manage to secure greater market shares – holding firm level productivity constant (between-firm component).[58] In the case of Turkey, over the period of analysis, most of TFP growth is accounted for by within-firm growth, while between-firm productivity growth has been negative (Chapter 2). Sectors with faster within-firm productivity growth have been those more exposed to trade, particularly those that display stronger GVC integration through forward and backward linkages (Figures 70, 71).

[58] Other relevant components are those associated with entry and exit.

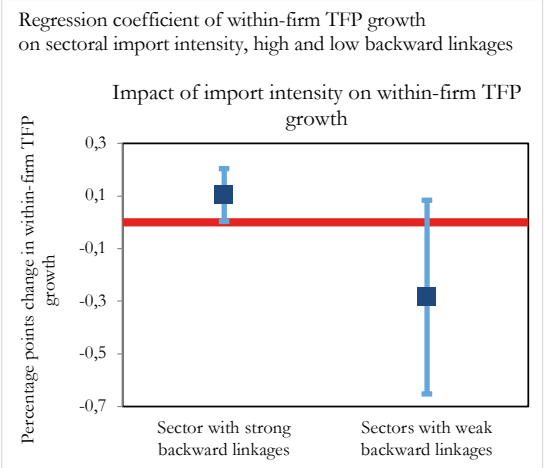
26. **There is also some evidence to suggest integration in the global market place also induces a more efficient allocation of resources, mainly operating through tariffs**. This is observed by regressing the two components of sectorial TFP growth, within and between-firm annual TFP growth, on a set of trade-related variables: export intensity, import intensity, tariffs and FDI inflows at the sector-level.[59] Results show an overall positive effect of openness (in terms of export intensity and lower tariffs) on within-firm TFP growth. When the results are further inspected we observe that the gains from greater participation in the import and export market accrue mainly to sectors that are integrated in GVCs through high forward and backward linkages (Figures 70, 71). The results pertaining to between-firm TFP growth show the beneficial effect of tariff reductions, as they allow the most efficient firms to thrive and grow. Moreover, in sectors with high forward linkages, more productive firms also benefit from an increase in export participation. We find instead a negative effect of export participation in sectors with weak forward linkages (Figure 70).

Figure 70: Sectors with stronger forward linkages show a greater response of within-firm TFP growth to increased liberalization



Sources: EIS.
Notes: The estimates shown in the graph are obtained from sector-level regressions excluding year fixed effects. The bar indicates 95% confidence interval. A one-percentage point increase in export intensity at the sector level increases within-firm TFP growth by 0.5 percentage points in sectors with strong forward linkages. No significant effect is observed for sector with weak forward linkages.

Figure 71: Sectors with stronger backward linkages show a greater response of within-firm TFP growth to increased liberalization from the import side



Sources: EIS.
Notes: The estimates shown in the graph are obtained from sector-level regressions excluding year fixed effects. The bar indicates 95% confidence interval. A one-percentage point increase in import intensity at the sector level increases within-firm TFP growth by 0.1 percentage points in sector with strong backward linkages. No significant effect is observed for sector with weak forward linkages.

Accelerating within firm productivity: Trade costs and vertical FDI spillovers

27. **Given the above findings at the sectorial level, how does exposure to foreign intermediates and investment impact on productivity growth in Turkey, through firm-level lenses?** Productivity gains of firms operating downstream are associated with reduced trade and investment costs in upstream sectors. The section below tests for the presence of vertical spillovers by relating firm-level total factor

[59] By including sector fixed-effects we can observe how TFP growth evolves over time in relation to changes in export and import participation without the confounding effect of sector-specific structural characteristics.

productivity to upstream measures of: (i) trade costs, and (ii) FDI. The analysis also looks at whether the effects vary by firm size and degree of absorptive capacity. Details on the estimation techniques are discussed in Box 7 below.

Box 7: Estimating the vertical spillovers from reduced trade costs and increased FDI

In this section we describe the empirical approach used to investigate the presence of vertical spillover due to greater integration of upstream sectors. We consider both FDI inflows and imports in upstream sectors.

Vertical spillovers from reduced trade costs in upstream sectors

To establish whether there exists a causal relationship between firm performance and a reduction in trade costs in upstream sectors, we follow Amiti and Konings (2007) and regress a measure of total factor productivity of Turkish firms on a constructed measure of upstream import tariffs. Formally, we estimate the following equation:

$$tfp_{ist} = \beta T_{st}^{UP} + \gamma X_{it} + v_t + u_i + \varepsilon_{ist}. \quad (1)$$

where TFP is the measure of productivity used in this report (described in the Technical Appendix of this report) and upstream trade costs (T^{UP}) are proxied by a weighted average of tariffs in upstream sectors where the weights are cost shares as described below. All our specifications include firm- and time-fixed effects. We also include some additional controls such as the tariff in the own sector, share of exports, sector-level Herfindahl-Hirschman Index, and sector-level time trends. The model is estimated as with standard linear fixed effects estimator where standard errors are clustered at sector level. We also provide quantile regression results to test for the presence of heterogenous effect along the distribution of productivity. To explore additional heterogenous effects and the role played by absorptive capacity we also interact T^{UP} with indicators of export status, size and participation in R&D expenditure.

Vertical spillovers from increased FDI in upstream sectors

To establish whether there exists a causal relationship between firm performance and FDI in upstream sectors, we regress the productivity of Turkish firms on measures of FDI in upstream sectors that are described below. Formally, we estimate the following equation:

$$tfp_{ist} = \beta FDI_{st}^{UP} + \gamma X_{it} + v_t + u_i + \varepsilon_{ist}. \quad (2)$$

where FDI in upstream sector (T^{UP}) is measured by a weighted average of the FDI Stock and FDI restrictiveness of upstream sectors as described below. All our specifications include firm- and time-fixed effects. We also include some additional controls such as the FDI in the own sector, and sector-level time trends. As above, the model is estimated as with standard linear fixed effects estimator where standard errors are clustered at sector level. We also provide quantile regression results to test for the presence of heterogenous effect along the distribution of productivity. To explore additional heterogenous effects and the role played by absorptive capacity we also interact FDI^{UP} with indicators of export status, size and participation in R&D expenditure.

We run all specifications using alternative lag structures. The reported specification is the one maximizing the goodness of fit.

Data sources

For the empirical analysis that follows we combined plant-level data with sector-level measures of upstream trade costs and FDI. Plant level data are from the Entrepreneur Information System (EIS), which is compiled and administered by the Ministry of Industry and Technology (MOIT). To measure the restrictiveness of policies towards foreign direct investment we rely on the OECD's FDI restrictiveness index over the 2006-2013 period. We also constructed a measure of FDI position in upstream sectors, described below, by considering the ratio of FDI over sector-level output, both obtained from the OECD. Finally, we obtained MFN tariffs from UNCTAD. The weights used to construct upstream measures of trade costs and FDI are obtained from Turkish input-output tables provided by TURKSTAT.

Upstream policy variables

We look at vertical spillovers from *integration* through forward linkages by constructing weighted averages of conditions in all upstream sectors. Input-output tables are used to get a sense of the importance that each upstream sector has in terms of input costs. Hence, weights are based on input-output coefficients and are combined with measures of integration as shown in equation (1):

$$X_{it}^{UP} = \sum_{j} w_{ij} X_{j}$$

where X^{UP} is a generic index of openness of upstream sectors and the weights, w, are given by, input-output coefficients, i.e. the share in the total input bill of a given manufacturing sector 's' accounted for the upstream sector ' j.' Coefficients are fixed over time and obtained as the average IO coefficients (2002-2012).

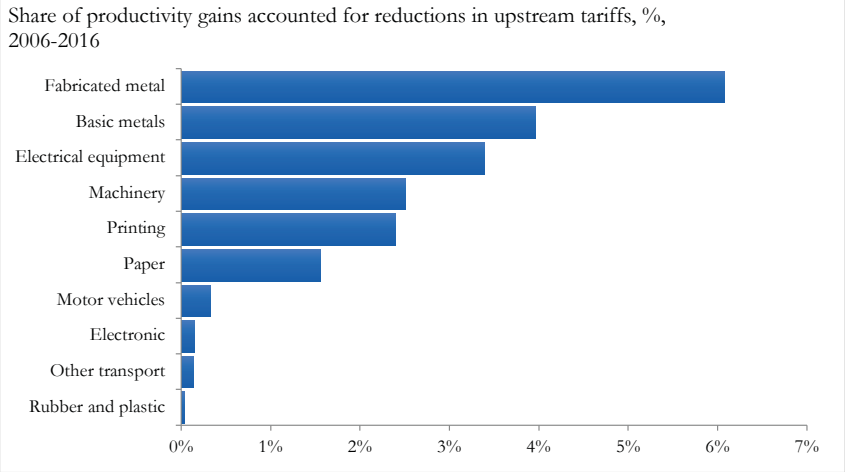
We consider two main drivers of integration into the global marketplace of upstream sectors: low trade costs and a liberal FDI regime. Trade costs are measured by import tariffs (MFN) and FDI spillovers are captured in two alternative ways: using a policy variable – a policy restrictiveness measure of FDI inflows in the form of equity restrictions, restrictions to hiring personnel, screening and discriminatory business licensing (as done in Duggan et al. 2013), and by using an outcome variable – the stock of FDI in each relevant sector.

Source: WB Staff.

(a) Productivity gains downstream from reduced trade costs in upstream sectors

28. **Reduced trade costs – in the form of lower tariffs - upstream have resulted in productivity increases in manufacturing firms downstream.** Using plant level data, we tested the effect of reducing tariffs upstream – effectively a reduction in upstream trade costs - on the productivity of firms operating downstream. There is a significant and negative effect of upstream tariffs on the productivity of manufacturing plants downstream (Figure 72). The effects are not only statistically significant, but also economically significant: a one-percentage point reduction in upstream tariffs increases productivity by 3 percent. The result is robust to the inclusion of additional controls, and to the inclusion of sector-time trends (although the magnitude of the coefficient is substantially reduced). This is likely related to the fact that reduced tariffs upstream relax technological constraints that firms operating downstream face, and therefore allows them to gain efficiency. Turkish firms also benefit from a fall in output tariffs and the gains are similar to those from a reduction in tariffs in upstream sectors. This effect, can be attributed to increased competition from abroad, that induces firms to reduce X-inefficiencies.

Figure 72: Productivity gains from reduced trade costs vary across sectors



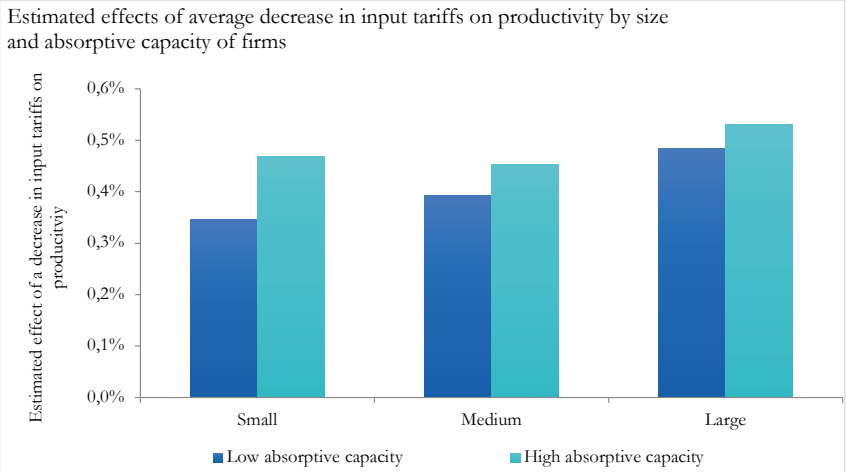
Sources: EIS, WB Staff estimates.

29. **Reduced tariffs in upstream sectors account for a reasonable share of productivity gains observed during the period of analysis.** A back of the envelope calculation based on the estimated coefficients, the evolution of productivity by sector over the period, and the evolution of tariffs in upstream sectors shows some heterogeneity in the effects (Figure 72). In the fabricated metals sector, reduced input tariffs explain about 6 percent of total TFP gains. This is because it is in the manufacturing sector experiencing the largest decrease in upstream tariffs. Gains have also been substantial in the basic metals, and electrical equipment sectors.

30. **Results reveal substantial potential for productivity gains through reduced trade costs.** The analysis carried out here uses tariffs as a main indicator of trade cost. Because tariffs have been relatively low to start with, and determined by the EU's CET, the reduction observed during the sample is limited, which results in a limited productivity gain through the upstream openness channel. However, tariffs are proxying for trade costs, and there are other sources of trade costs besides tariffs, such as trade defense instruments (TDIs) that have been widely used by Turkey. Hence, our results point to substantial scope for further productivity gains were these TDIs to be gradually phased out (Box 8).

31. **Productivity gains from reduced upstream tariffs do not accrue equally to all firms. Gains have been larger for firms with greater absorptive capacity.** We measure absorptive capacity by whether a firm engages in R&D investment and assess the role of absorptive capacity for firms of different size (Figure 73). First, we observe that large manufacturing firms benefit the most from access to foreign intermediates than medium and small-size firms. Second, firms that engage in R&D investment are better positioned to benefit from reduced upstream tariffs than those who do not invest, in particular if they are small.

Figure 73: Productivity gains from reduced trade costs are higher for larger firms and firms with greater absorptive capacity



Source: Authors' calculations. The plot shows the effect on productivity of a decrease in upstream tariffs corresponding to the average annual decrease observed over the period of analysis (-0.15 percentage points). Small firms have less than 10 employees, medium firms have between 10 and 50 employees and large firms have 50 or more employees. High absorptive capacity firms are those that have undertaken R&D investment.

Box 8: The use of Trade Defense Instruments in Turkey

Although tariffs have been largely reduced after Turkey joined the Custom Union, other forms of protection have been adopted. The number of antidumping measures imposed by Turkey has increased over time (Table 10). These measures mostly involve chemical products but are also increasingly used in the rubber and plastic and metal sectors, and are typically in the form of ad valorem duties. Most antidumping measures are imposed on China, Malaysia, South Korea, Taiwan and Thailand. However, more recently antidumping measures have also been imposed on some EU members, mainly on Germany and Romania (Table 11). There are only very few countervailing duties in place against China.

Table 10: Antidumping measures imposed by Turkey have been increasing over time. *(Number of antidumping duties by year and sector)*

Sector	2002	2006	2010	2016
Textiles	2	10	12	33
Wearing apparel	2	2	2	4
Wood	0	0	21	25
Paper	0	0	0	3
Chemicals	376	391	417	476
Rubber and plastic	0	42	59	60
Non-metallic	0	1	7	20
Metals	21	42	31	49
Electronic	1	1	2	1
Electrical	0	9	10	4
Machinery	0	0	1	6
Motor vehicles	0	2	2	2
Other	4	9	9	9
Total	406	509	573	692

Note: The Table reports the number of antidumping measures in place at the year reported in the header. Changes over time are the results of new measures been introduced and some measures been revoked. Source: Bown, Chad P. (2016) "Global Antidumping Database," The World Bank, available at http://econ.worldbank.org/ttbd/gad/.

Table 11: Most antidumping measures are against East and Southeast Asian countries but more recently also against some EU members. (*Number of antidumping duties by year and targeted country*)

Country	2002	2006	2010	2016
Belarus	1	1	0	0
Brazil	1	1	1	1
Canada	0	0	3	3
China	86	150	1	282
EU member	0	8	4	9
Hong Kong	0	0	0	1
India	1	5	14	15
Indonesia	1	1	16	16
Israel	0	1	0	2
Malaysia	73	74	80	84
Moldova	6	6	0	0
Pakistan	0	0	0	4
Russia	6	12	6	6
Saudi Arabia	0	0	1	0
Serbia	0	0	1	1
South Korea	76	77	78	75
Sri Lanka	0	2	2	2
Taiwan	76	81	82	84
Thailand	73	78	81	84
USA	0	1	4	7
Ukraine	6	7	1	1
Vietnam	0	4	11	15

Note: The Table reports the number of antidumping measures by targeted country. Changes over time are the results of new measures been introduced and some measures been revoked. Source: Bown, Chad P. (2016) "Global Antidumping Database," The World Bank, available at http://econ.worldbank.org/ttbd/gad/ EU members refer to Belgium, Bulgaria, Finland, Germany, Greece, Hungary, Italy, Netherlands and Romania.

Source: WB Staff calculations based on Bown, Chad (2016) "Global Antidumping Database".

32. **Productivity gains from reduced upstream tariffs are larger for firms with a smaller "technology gap".** A firm's technology gap, considered as the distance between its technology level and that of imported products, could affect a firm's ability to absorb foreign technology. The relationship could go both ways: the larger the gap, the more scope for learning. However, it is also plausible that the larger the gap, the lower the absorptive capabilities of the firm. Ultimately, it is an empirical question which mechanism predominates. When we estimate the impact of reduced trade costs by quartile of the productivity distributions we find larger effects for firms at higher levels of productivity (Table 12). In line with our previous findings, we expect these firms to be technically proficient and have greater capacity to absorb the foreign technology embodied in imported inputs. Firms with a large technology gap, at the lower end of the productivity distribution, could lack the technical competency needed to absorb external knowledge.

Table 12: Productivity gains from reduced upstream tariffs by quartile of the productivity distribution

	Manufacturing sector		
	Lowest quartile	Median	Upper quartile
Dep. Var.: log of TFP	**(1)**	**(2)**	**(3)**
Upstream tariffs	-0.019***	-0.017***	-0.020***
	(0.001)	(0.000)	(0.001)
Output tariff	-0.030***	-0.031***	-0.033***
	(0.002)	(0.002)	(0.002)
Year FE	Yes	Yes	Yes
Observations	515,902		
Plants	108,275		

Note: The table reports the estimates of quantile regressions where all variables have been demeaned. Standard errors clustered at the sector level are reported in parenthesis. Data on TFP and R&D are from EIS, upstream tariffs are obtained combining UNCTAD data on tariffs with IO coefficients from TURKSTAT IO tables.

(b) Vertical FDI spillovers among Turkish firms

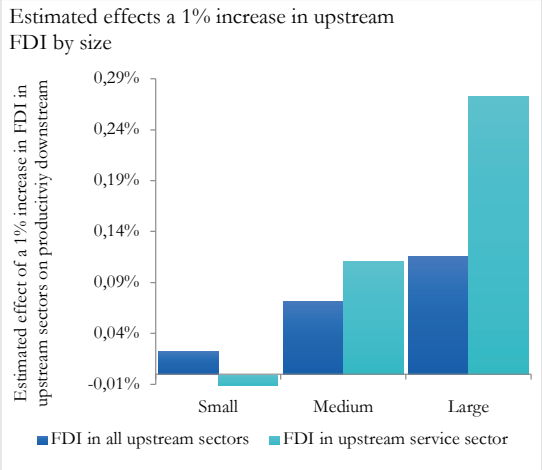
33. **FDI provides another channel through which the integration of Turkey into the global economy may have contributed to firms' increased productivity.** As mentioned above, international evidence points to the domestic firms' productivity positively responding to increased FDI in upstream sectors (vertical spillovers).[60] This section presents the evidence on vertical spillovers from FDI for the case of Turkish firms.

34. **Turkish firms have gained from FDI in upstream sectors but the benefits do not accrue equally to all firms.** The increase in FDI in upstream sectors has led to an increase in productivity in sectors downstream. Vertical spillovers through forward linkages differ between service and manufacturing firms so we will consider them separately. We also observe considerable differences across firms in terms of size, export participation and absorptive capacity.

[60] The evidence for horizontal spillovers, that is, domestic firms' productivity increasing when there in increased FDI in the same sector is less conclusive.

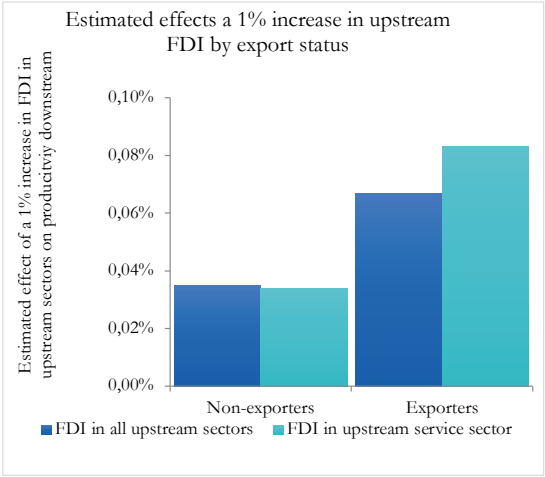
35. **Manufacturing firms benefit mostly from FDI in upstream service sectors and the benefits accrue mainly to medium and larger firms.** Unconditional on firm capabilities we find no effects of upstream FDI on productivity. This is because the effects accrue only to medium and large firms that are better positioned to benefit from FDI in upstream sectors. The benefits mainly accrue from FDI in upstream service sectors. A 1 percent increase in the FDI stock to output ratio in upstream service sector increases the productivity of large firms by almost 0.3 percent (Figure 74). This is in line with the findings of Fernandes and Paunov (2012) in Chile and suggests that manufacturing firms can benefit from the interaction with foreign services suppliers and gain managerial, organizational, marketing, and technological knowledge.

Figure 74: Manufacturing sector: productivity gains from FDI in upstream sectors are greater for medium and large firms. Firms gain mostly from FDI in upstream service sectors



Note: The estimates shown in the graph are obtained from plant-level regressions of TFP on upstream FDI stocks, by firm size. The impact of overall FDI is not statistically different for zero. The same applied to the impact on small firms.

Figure 75: Manufacturing sector: productivity gains from FDI in upstream sectors are greater for exporters



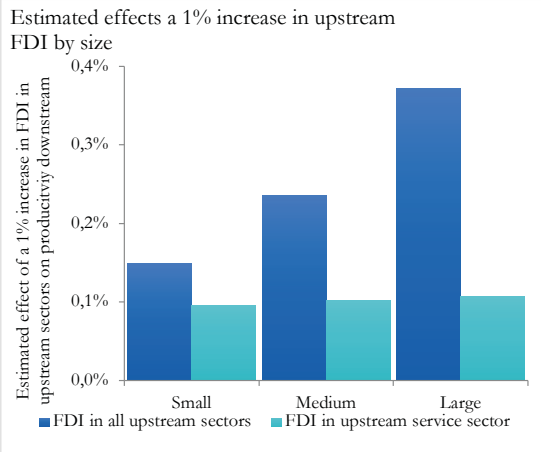
Note: The estimates shown in the graph are obtained from the plant-level regressions of TFP on upstream FDI stocks, by export status. The impact of overall FDI is not statistically different for zero. The same applied to the impact on exporters.

36. **Manufacturing exporters gain more from FDI in upstream services sectors than non-exporters, independently of their size.** Our results show that manufacturing firms that participate in the export market experienced twice as big gains from FDI in services sectors than firms that do not, independently of their size (Figure 75). Firms that engage in the export markets are more likely to have built absorptive capacities to be able to adapt to international quality and standards, and are more likely to demand high quality services inputs, for which FDI presence upstream, may have proven useful.

37. **Firms in the services sector benefit mostly from FDI in upstream non-service sectors and the benefits are greater for medium and larger firms.** Medium and large firms are better positioned to benefit from FDI in upstream sectors. The benefits mainly accrue from FDI in upstream manufacturing sectors. A 1 percent increase in the FDI stock to output ratio in upstream sector increases the productivity of large service firms by almost 0.4 percent (Figure 76). The effects are also larger for firms that participate in the export market (Figure 77).

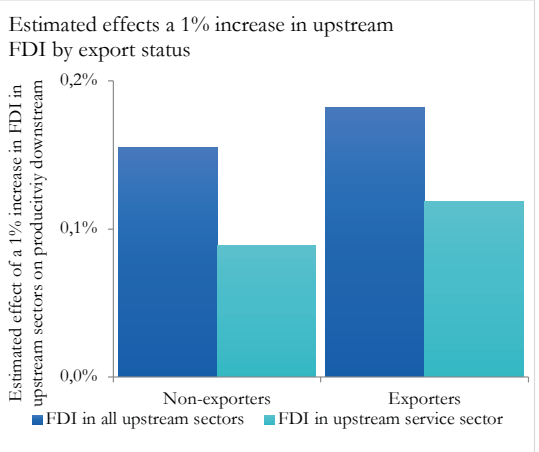
38. **Overall productivity gains from upstream FDI have been larger for firms with greater absorptive capacity.** The above results point towards important differences in terms of firms' ability to benefit from vertical spillovers. A firm size and export status are important indicators of a firm ability to absorb external knowledge. When we measure absorptive capacity more directly by considering whether a firm engages in R&D investment we obtain similar results. Firms that engage in R&D investment are better positioned to benefit from increased FDI in upstream sectors.

Figure 76: Services: productivity gains from FDI in upstream sectors are greater for medium and large firms. Firms gain mostly from FDI in upstream non-service sectors



Note: The estimates shown in the graph are obtained from plant-level regressions of TFP on upstream FDI stocks by firm size. The impact of service FDI is not statistically different from zero.

Figure 77: Service sector: productivity gains from FDI in upstream sectors are greater for exporters.



Note: The estimates shown in the graph are obtained from the plant-level regressions of TFP on upstream TFP stocks by export status. The impact of service FDI is not statistically different from zero.

39. **Another way of identifying vertical FDI spillovers through forward linkages is to focus on how restrictive policies have been towards FDI in upstream sectors, rather than on the actual stock of FDI in upstream sectors.** In Turkey, restrictiveness toward FDI has been falling over time. At the beginning of 2000 all Turkish sectors had some limited restrictions for FDI. A more open regime has been associated with an increased stock of FDI across all sectors of the economy. In this analysis we focus on screening restrictions that affected foreign investment in both manufacturing and service sector, as opposed to equity and personnel restrictions that were only applied to multinationals operating in the services sector. By 2016, all screening and approval restrictions have been eliminated. Some equity and personnel restrictions remain and affect only the service sector, in particular in the communication, business and transport sectors.

40. **The reduction of restrictiveness to FDI in upstream sectors has positively impacted firms' productivity.** The effects are spread out across both manufacturing and service firms and accrue from liberalization in both manufacturing and service upstream sectors. The reduction has benefitted mostly firms that participate in the export market and larger firms.

41. **Turkish manufacturing firms that have a large "technology gap", benefit more from reduced FDI restrictions than firms with higher levels of productivity.** We observe this by estimating quantile regressions that estimate the effect of upstream FDI for firms at different levels of the productivity distribution. We find that least productive firms have gained the most from reduced FDI restrictiveness in upstream sectors. These findings are in line with those from Blalock and Gertler (2009) on Indonesia and suggest that the marginal return to new knowledge is greater for firms that have more room to "catch up" than it is for already competitive firms. Manufacturing firms with low initial technology are more likely to encounter new processes that yield high returns at low cost.

Conclusion and policy options

42. **The main messages that emerge from the empirical analysis on economic integration and productivity are as follows**:

44. **Turkish firms have gradually become key players in global markets.** Turkish firms' market shares have grown internationally, as have their interdependence with foreign firms: the import content of their production has increased substantially, but so has its domestic value added. More firms – including small ones - have become internationalized, with an overall increase in the level of sophistication of exports.

45. **Productivity of Turkish firms has grown thanks to increased integration.** Specifically, firms have become more productive by gaining increased access to foreign intermediates, and by interacting with more multinational companies upstream.

46. **Gains from integration have not accrued equally to all firms.** The absorptive capacity of firms matters in determining how much they gain from increased exposure to foreign intermediates, or from the presence of multinationals upstream. Larger, more R&D intensive firms tend to benefit more than smaller, less innovative ones.

47. **Increased integration on the back of GVCs helped markets allocate resources more efficiently.** In addition to the effects at the firm-level, evidence shows that in Turkey, the reduction in trade barriers improved selection, contributing to the shrinking and eventual exit of inefficient firms, and allowing the most efficient to thrive and grow.

43. **Several policy implications emerge from these results.** Turkey's Customs Union with the EU mean that for a wide set of products, prevailing tariffs are governed by the CET, within policy control of the EU, there is ample space for policies to increase integration. Some are related to improving the way in which the CU works, and some are related to areas not covered by the CU. In addition, because absorptive capabilities matter to gain from integration, policies in these areas are also relevant.

Issues	Policy options
Within the Customs Union	
Agriculture and services are key sectors in their dual role of producers of final goods and services and of inputs into other activities. Yet, both sectors remain highly protected.	Widen CU to cover agriculture and services: • In agriculture, matching the EU's CET would reduce import protection and could stimulate productivity in the same sector as well as downstream.

Issues	Policy options
Within the Customs Union	
Agriculture and services are key sectors in their dual role of producers of final goods and services and of inputs into other activities. Yet, both sectors remain highly protected.	Widen CU to cover agriculture and services: • In agriculture, matching the EU's CET would reduce import protection and could stimulate productivity in the same sector as well as downstream.
Issues	**Policy options**
	• For services, increased integration, is also potentially productivity enhancing, as results reported here reveal. In this area, the establishment of an FTA with GATS+ type of agreement would help secure market access and national treatment commitments.
It is important for Turkey to participate in EU committees to improve bilateral dialogue between parties for the design of a common commercial policy. Because of the way the CU is designed, the EU can negotiate FTAs with third parties without consultation, and then Turkey is required to provide duty free access to products from EU's FTA partners without reciprocity.	Work towards the formalized structures for appropriate consultations: • Parallel track negotiations mirroring the main EU negotiations with third countries will help both the EU and Turkey start and conclude negotiations with potential FTA partners within a similar time frame. Currently, this is an obstacle for Turkey, that has struggle to complete negotiations with several of the EU's FTA partners, eroding Turkish firms' trade preferences.
Bilateral and transit road quotas imposed by the EU countries restrain free movement of goods between the EU and Turkey and impede development of the EU-Turkey trade relations.	Work towards the removal of bilateral and transit quotas, so that Turkey and the EU can benefit from the full potential of the Customs Union.
Beyond the Customs Union	
TDI such as antidumping, safeguards and countervailing duties are used to prevent or to remedy injury on the domestic industry that stems from imports. While TDIs are not intended to undermine bilateral trade, they introduce uncertainty to firms that export these products (when these TDIs are imposed by trading partners) and firms that use them as inputs (when they are imposed by Turkey). Most of the TDIs have targeted China and Asia.	Carefully assess the criteria for the use of trade defence instruments (TDI): • To reduce the impact of TDIs on trade, and thus to reduce the costs that firms face of securing the best possible intermediate input, a reduction of the stock of TDIs is needed, particularly those that have been in place for a long time.
Over time, FDI restrictions have been reduced substantially in Turkey. However, some equity and personnel restrictions remain and affect mainly the service sector in the communication, business and transport sectors.	Reduce barriers to FDI: • These are crucial inputs into production, where, as results reveal here, increased competition and sophistication of suppliers will likely benefit downstream firms using these services intensively.
Firms' capabilities	
Not all firms equally benefited from the spillovers that integration offered. Those with stronger absorptive capacities – the ones with a greater stock of knowledge, able to learn from interaction with more sophisticated suppliers, or to incorporate cutting edge intermediates or capital goods in their	Support firms in building up absorptive capabilities: • For smaller, less sophisticated firms, support to connect to multinationals, for example, through well-designed suppliers-development programs, that incorporate monitor and evaluation mechanisms can be helpful.

Issues	Policy options
production processes fared better. The spillover from increased openness may warrant public policy interventions (to help internalize the externality).	• For more sophisticated firms, support to investment in research and development, also with monitoring and evaluation mechanisms attached, could help widening the range of firms that benefit from productivity spillovers through openness.

Chapter 4

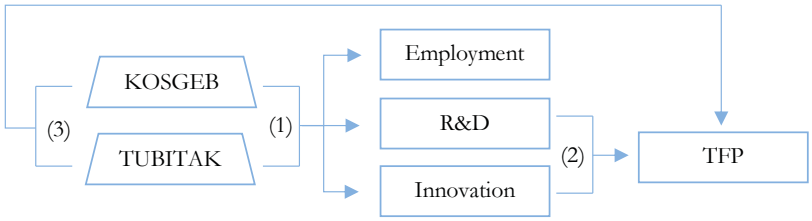
Innovation support and firm performance

IV. Innovation support and firm performance

1. **Firms' ability to adapt and innovate is a big determinant of within firm productivity growth.** This is influenced in big part by the investment climate. Adaptation and innovation entail risks including large fixed costs, long gestation periods, and uncertain returns. A conducive investment climate can mitigate those risks through lower administrative burden on businesses, an efficient tax system, access to long-term finance, and agglomeration economies. In addition, public incentive programs can support firms directly to invest in technology, spend on R&D, and innovate. Incentives can be in the form of tax breaks, preferential credit, targeted public procurement, and direct grants. They can help overcome market failures for productivity enhancing investments; or can distort markets that lead to allocative inefficiencies.

2. **This chapter assesses the impact of two large public incentive programs in Turkey on firm performance and productivity.** The programs are delivered to firms in the form of grants through two leading public institutions: KOSGEB and TUBITAK. Together they are the largest providers of grants for business support, including for investments in R&D and innovation. The chapter does not cover other forms of public incentives relating to tax, credit and procurement, which may have similar objectives. The chapter starts with an overview innovation in Turkey. It then analyzes (Figure 78): (i) the impact of KOSGEB and TUBITAK grants on firm performance in terms of employment creation, R&D investment, and innovation; and (ii) how R&D investment, innovation, and KOSGEB and TUBITAK grants, impact on TFP growth.

Figure 78: Outline of innovation support and firm performance analysis



(1) Impact of KOSGEB and TUBITAK support on employment creation, R&D investment and innovation
(2) Impact of R&D investment and innovation on TFP growth
(3) Impact of KOSGEB and TUBITAK support on TFP growth

Closing Turkey's innovation gap and the roles of KOSGEB and TUBITAK

3. **Innovation is a key driver of productivity growth**. It can improve firms' production efficiency, enable product differentiation, and extend product lines. Innovation, however, is a process that has a partially stochastic nature and can be influenced, to some degree, by R&D investment. The evidence on the linkages between R&D and innovation or productivity is mostly positive (e.g. Lee and Kang, 2007; Hegde and Shapira, 2007; Jefferson et al., 2006; Crespi and Zuniga, 2012), while in some cases, the effect occurs with a lag (e.g. Alvarez et al., 2010).[61]

[61]There is a large literature on whether public R&D crowds out private R&D investments. David et al. (2000) provide a critical view on the robustness of empirical results. Correa et al. (2013) find in general that public support does not crowd out private R&D investments. Görg and Strobl (2007) suggest that for domestic plants, small grants increase private R&D spending, while large grants may crowd out private R&D. For foreign establishments, public grants cause neither additionality nor crowding out effects.
[62] For a more details on the allocation of R&D across different segments of the economy see link: TURKSTAT.

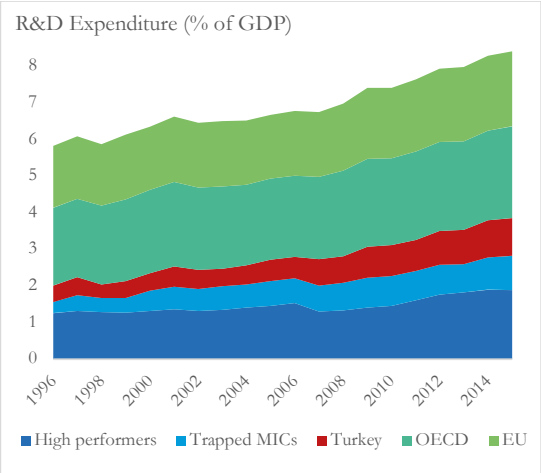
4. **R&D investment is an important source of innovation and productivity growth**. Besides having a significant influence on firms' innovation performance, investing in R&D also facilitates learning and adopting more advanced technologies that are already in use by competitors. In countries like Turkey that are not located close the world's technology frontier, one would expect higher returns to productivity from learning by exporting and adaptation of existing technologies. Despite of these higher returns to productivity, the share of investments in productivity enhancing activities in the GDP is generally low for developing countries; a fact that is known as the innovation paradox (Cirera and Maloney, 2017).

5. **Evidence from Turkey also points to R&D and innovation impacting positively on firm productivity**. In their analysis of Turkish manufacturing firms (2003-2007), Dayar and Pamukçu (2014) find that R&D has a positive and significant effect on labor productivity. For a selection of OECD countries including Turkey, Erdil et al. (2013) show that the impact of R&D on labor productivity is positive in the longgrun.gKılıçaslangetgal.'s (2015) analysis of Turkish manufacturing firms (2003-2010) find that investment in Information and Communication Technology (ICT) has a positive impact on productivity that is around 25 to 50 percent greater than investment in conventional capital. The World Bank (2010, 2014) also finds a close association between investment in innovation capabilities, TFP levels, and firm level productivity.

6. **Turkey has prioritized R&D spending and is gradually catching up with its peers.** R&D expenditure grew rapidly from a low base, nearly doubling between 2005 and 2010 standing at just over 1 percent of GDP (Figure 79). This is the average for Trapped MICs today, and the average for high performers during their transition from UMIC to HIC, though understandably below the average for HICs. Turkey's Tenth National Development Plan (2014-2018) targeted R&D expenditures to reach 1.8 percent of GDP by 2018, which is the average for High Performers today (Figure 80). It also aimed to raise the private sector's share in R&D expenditure to 60 percent, which it was already close to achieving in 2015.[62] The scale up in R&D expenditure has sharply increased demand for researchers, particularly in manufacturing and industry (Taymaz and Üçdoğruk, 2013). Starting from a low base, annually-averaged number of researchers per million employees has more than doubled over the period 2005-2014 in comparison to the period 1996-2004 (Figure 81).

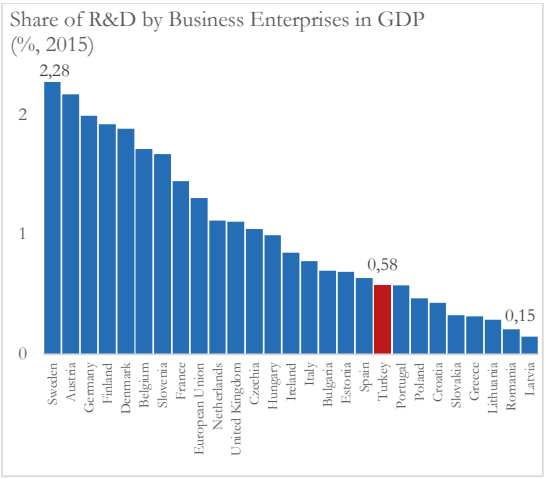
7. **The boost in R&D spending has been associated with intellectual property applications, though also from a low base.** In general, applications to the European Patent Office (EPO) in the 2013-2017 period has declined relative to 2008-2012 (Figure 82). Though this also applies to Turkey, the pace of applications has been greater than some European countries – not controlling for GDP or population size – in recent years. The gap between the largest applicants to the EPO – US, Germany, Japan – and the rest is very large. They are big sources of innovation that can help shift the global technology frontier. Intellectual charges for use of intellectual property rights (IPR) are however very low for Turkey even compared to Trapped MICs (Figure 83); both in terms of receipts for Turkish IPR, but also payments for foreign IPR.

Figure 79: Turkey's R&D expenditures are catching up with those of peers



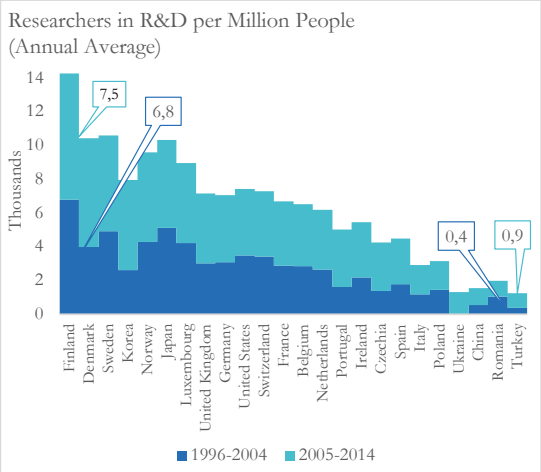
Sources: WDI, WB Staff estimates.
Notes: High Performers include Chile; Czech Republic; Korea, Rep; Poland. Trapped MICs include Argentina, Brazil, Malaysia, Mexico, South Africa.

Figure 80: The private sector's share of R&D expenditure is close to the 10th NDP target



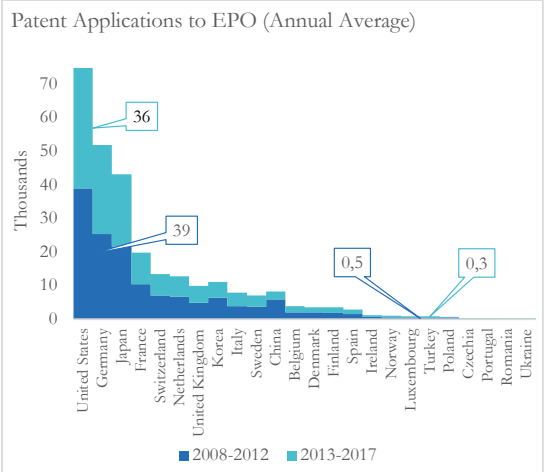
Sources: EUROSTAT, TURKSTAT and WDI.

Figure 81: The boost in R&D spending has increased demand for researchers in Turkey



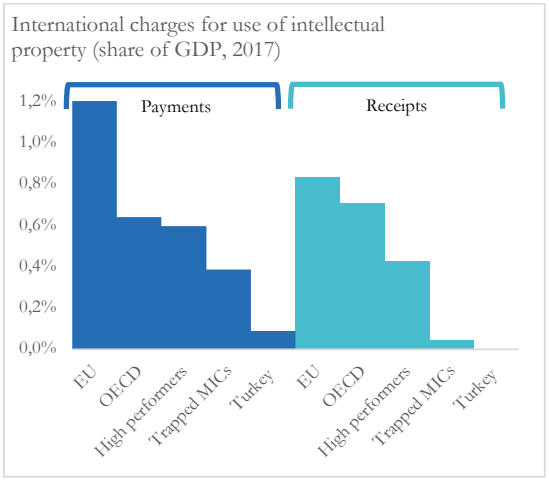
Sources: WDI, WB Staff estimates.

Figure 82: Patent applications remain strong, though like elsewhere have slowed down post GFC



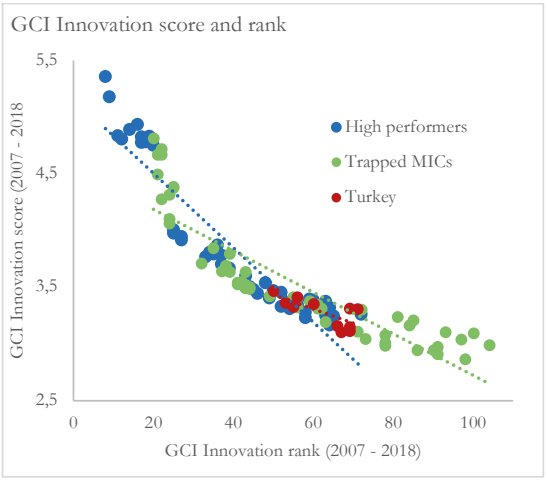
Sources: EPO, World Bank.

Figure 83: IP use charges for Turkey are low



Sources: WDI, WB Staff estimates.

Figure 84: Innovation performance on declining trend

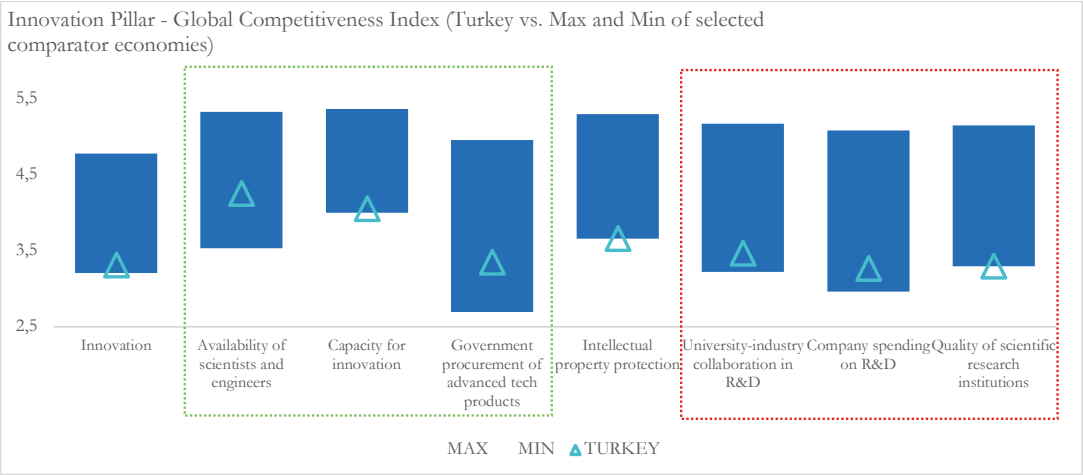


Sources: World Economic Forum, Global Competitiveness Index.

8. **Beyond R&D spending and IP application, Turkey has important gaps in innovation capacity relative to comparators**. In general, Turkey and its comparators were not the best innovators in the past ten years (Figure 84). Turkey's innovation gaps relative to its comparators are greatest in the areas of university-company collaboration in R&D, private R&D spending, and the quality of research institutions (Figure 85). These gaps are reflected in Turkish firms' ability to introduce new products/services and processes relative to firms in peer countries (Table 13). The EU's Innovation Union Scoreboard 2016 classifies Turkey as a moderate innovator, better than modest innovators such as Bulgaria, Romania and Ukraine, but worse among moderate innovators. Despite these innovation gaps, Turkey still has a lot of "efficiency driving" reforms,[63] which impact innovation capacity; and innovation will be as much about absorbing existing technology as developing new ones.

[63] The World Economic Forum's GCI groups economies into three categories based on per capita GDP and natural resource dependence: (i) factor driven; (ii) efficiency driven; and (iii) innovation driven. At each stage, the relative importance of different reforms will vary. Turkey is classified as transitioning from efficiency to innovation driven though it still faces challenges in efficiency enhancing areas of reform as discussed in this report including well-functioning labor markets, developed financial markets. For more detail: GCI methodology.

Figure 85: Largest innovation gaps relative to peers include university-company collaboration in R&D, private R&D spending, and quality of research institutions



Source: World Economic Forum, Global Competitiveness Index (2017-2018).
Notes: The figure omits the sub-indicator on "Patent Cooperation Treaty patents applications" because of outliers. Country comparators include the High Performers and Trapped MICs listed above.

Table 13: Selected innovation indicators from Enterprise Survey

	Chile 2010	Poland 2013	Turkey 2013	Argentina 2017	Malaysia 2015
Percent of firms that spend on R&D	46.1	19.1	8	23.3	22.3
Firms that introduced a new product/service	59.9	44.5	13.5	51.7	8.3
Firms whose new product/service new to market	56.6	72.3	63.7	61.7	47.2
Firms that introduced a process innovation	58.8	34.7	12.6	43.2	58.6

Source: WB Enterprise Surveys.

9. **TUBITAK and KOSGEB are two leading public institutions that aim to accelerate R&D and innovation in Turkey**. TUBITAK is the Scientific and Technological Research Council of Turkey, whilst KOSGEB is Department of SME Development and Support. Besides these two institutions that are specifically established to support firm performance, as of 2016, there were several other government bodies that provide different support mechanisms to firms operating in Turkey such as the Ministry of Industry and Technology, the Ministry of Development, the Ministry of Economy, the Ministry of Treasury and Finance, the Ministry of Energy and TURKPATENT. Of the 58 programs listed by TUBITAK[64], 35 are financed through direct grants; other forms of support include technical assistance and subsidized credit. In terms of program beneficiaries: 36 percent are universities and research centers, as well as individual research projects; 25 percent are individuals with commercial projects, Non-Governmental Organizations (NGOs) and non-academic public institutions; and 39 percent are private companies.

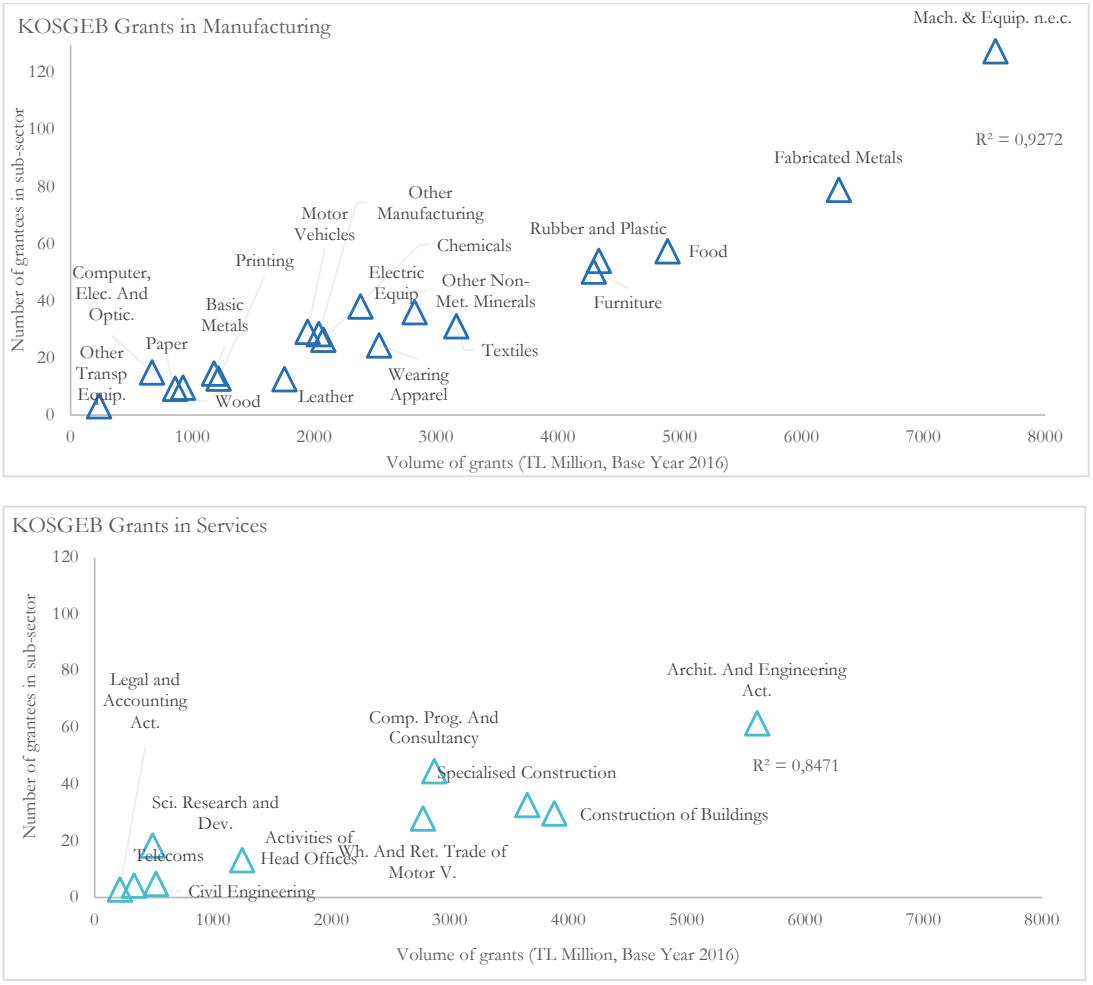
[64] An overview of the public R&D, innovation, entrepreneurship and commercialization support programs in Turkey is published online by TUBITAK as an appendix at http://www.tubitak.gov.tr/_sites/default/files/ek_10_destekler_dagilimi.pdf (accessed on 26 Dec. 2017).

10. **KOSGEB provides grants to SMEs not only for R&D and innovation, but also a broader range of business support services that could also accelerate within firm productivity.** The Entrepreneur Information System (EIS) database used for the analysis in this chapter (Box 3) and report lists 13 different support programs beyond R&D and innovation. Under each main program title, there are multiple sub-program titles, and under each sub-program title, there is a large set of eligible expenditures for projects and specific cost items. KOSGEB programs can also cover expenses that arise from projects with specific targets, for instance, raising energy efficiency. As of 2017, KOSGEB grants had an upper limit of TL 5 million for any one firm and therefore not designed for large scale projects.

11. **KOSGEB grants are relatively evenly distributed across firms regardless of which sub-sectors they operate in within manufacturing or services**. In other words, the size of a KOSGEB grant for a wood manufacturing firm may not be very different to a firm operating in motor vehicles. This is likely due to the relatively small size of the grants, suggesting that probably most successful applicants apply for and receive the maximum grant. This can be seen by the high correlation between the number of grant recipients in a sub-sector and the volume of grants to that sub-sector (Figures 86). For example, although the machinery and equipment sub-sector receives the largest volume of grants within manufacturing, it also has the largest number of grantees (Figure 86).

12. **TUBITAK Programs on the other hand are more targeted to specific projects or firm level upgrades.** TUBITAK's National Science, Technology and Innovation Strategy 2010-2016 shifted focus from research to innovation. It also identified several priority sectors for support, namely automotive, ICT, defense, space, health, energy, water, food, machinery and production technologies. TUBITAK's Department of Technology and Innovation Support Programs (TEY-DEB) provides the largest portion of the R&D and innovation grants. Although firms in different size categories are eligible for TUBITAK grants, there are TUBITAK programs that target specific firm groups such as SMEs and start-ups. TUBITAK also targets industries that have stronger links with international markets. Contrary to KOSGEB programs, TUBITAK provides support primarily to technology intensive industries. TUBITAK also supports large-scale projects in manufacturing and in services and construction sector (Figure 87).

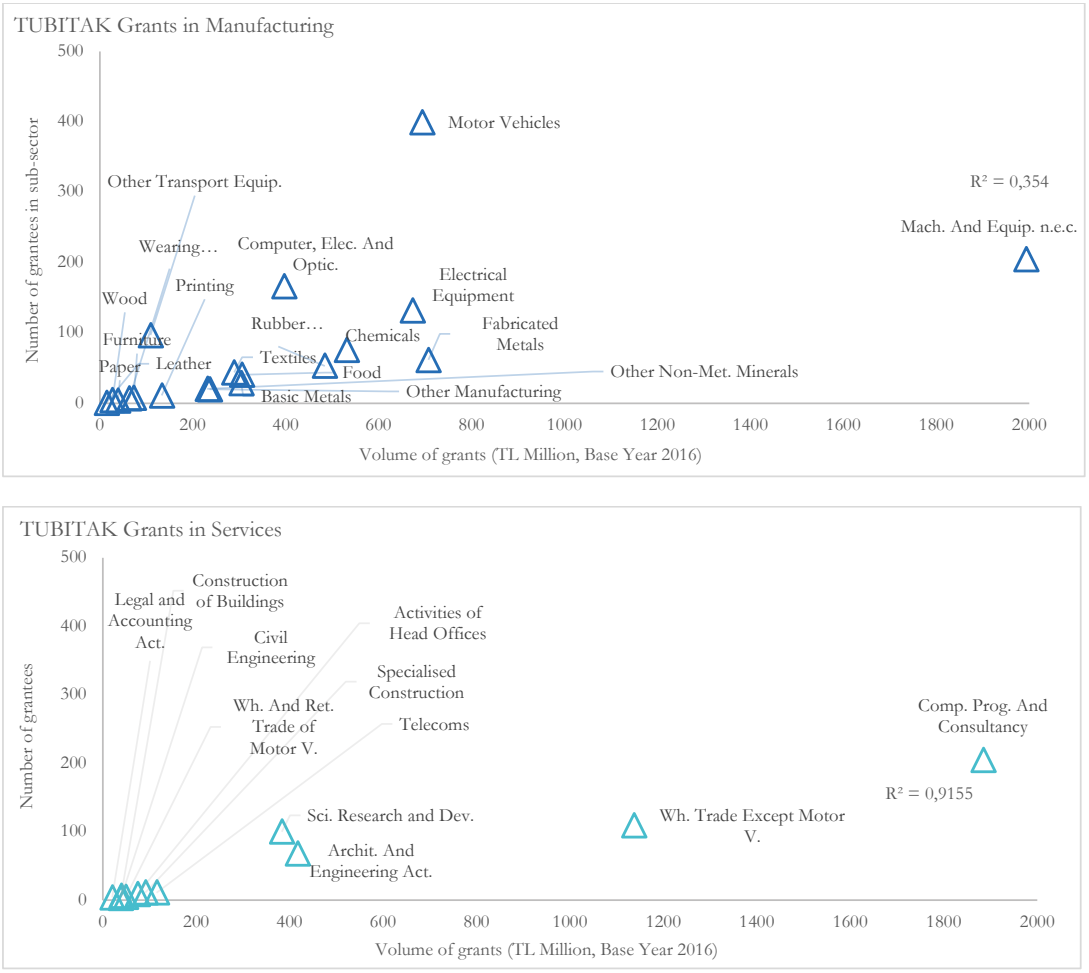
Figure 86: KOSGEB grants in evenly distributed across firms regardless of sub-sector



Sources: EIS, WB Staff estimates.
Notes: Wholesale trade except motor vehicles is an outlier with 22,600 grantees and around TL 225 million in grants.

13. **TUBITAK grants are as a result less evenly distributed across firms and industries within manufacturing than KOSGEB grants**. Industries within manufacturing that are considered less technology intensive (e.g. leather, wood and paper) receive a smaller share of TUBITAK grants. Conversely, more technology intensive industries (e.g. motor vehicles, machinery and equipment and computer, electronic and optical products) receive a relatively largely share of TUBITAK grants. The variance in grant size across firms is bigger than in the case of KOSGEB. For three industries in particular – motor vehicles; computer, electronic and optical products; and other transport equipment – the number of grantees is relatively low, whilst the total volume of grants is large. The findings indicate that for the TUBITAK programs, priority sectors within manufacturing are more prominent and there are some larger scale projects supported in certain high-tech industries. This pattern is less evident in services; architectural and engineering services, and scientific research and development receive proportionately more grants but overall grants are low.

Figure 87: TUBITAK grants within manufacturing are more targeted to technology intensive industries



Sources: EIS, WB Staff estimates.

14. **In addition to average grant size and sector distribution, the success of TUBITAK and KOSGEB will also depend on whether firms with high growth potential are grant recipients.** Studies find that firms' growth potential can be a function of their size, age and innovativeness; in general, younger firms regardless of size tend to have higher growth potential, which is linked to their innovativeness (Box 9).

15. **In Turkey also the youngest firms exhibit significantly higher innovativeness** – as measured by the total patent, trademark, model and design applications divided by the total number of employees (Figure 88). Trademark applications make up the bulk for youngest firms. The second youngest firm group (5-10 years) account for most patent applications (Figure 89); these are new firms that survive the start-up period. Taymaz and Üçdoğruk (2009) find that smaller firms that overcome the first obstacle of conducting R&D tend to invest more in R&D than other firms in Turkey. Though patent applications for older firms picked up by the end of the sample period, they generally performed worse than younger firms.

Box 9: Firm characteristics and growth potential

Firm size and growth: Gibrat's Law suggests that a firm's growth rate is independent of its size. Several studies however (e.g. Birch, 1981; Van Biesebroeck, 2005; Neumark et al., 2011) find that the law does not hold especially for the smallest firms which tend to grow faster than their larger counterparts (Evans, 1987b; Hall, 1987; Dunne and Hughes, 1994; Lotti et al., 2009).

Firm age and growth: Jovanovic (1982) suggests that firm growth decreases with age holding the size constant. Fizaine (1968), Evans (1987a,b), Geroski (1999) and Yasuda (2005) show that firm age is negatively associated with growth, while Fizaine (1968) and Evans (1987a,b) suggest that firm growth rates are more dispersed within the younger firm groups.

Firm age and growth, controlling for size: Firm age and size can have some degree of collinearity when treated in the same regression. Fizaine (1968) and Evans (1987b) suggest that if age is taken into account, the effect of size on firm growth vanishes. Davis et al. (1996) and Haltiwanger et al. (2013) find that firm age, and not size, is a valid determinant of job creation. Based on a cross-country micro-data analysis, the OECD (2017) find that among SMEs, young firms play a central role in creating jobs, enhancing growth and innovation.

Firm innovativeness and growth: Evidence of an inverse link between firm age and growth has prompted research on the connection between firm age and growth drivers such as innovation. Howitt and Aghion (2006) argue that new firms are generally more flexible, can easily adopt new technologies and accelerate long-run productivity growth. Veugelers (2008) and Schneider and Veugelers (2010) suggest that small and young firms tend to engage in innovative activities more intensively. Correa and Iootty (2010) show that young firms are more innovative and exhibit faster growth, but they are also more prone to economic crisis than older firms

Figure 88: Youngest firms exhibit significantly higher innovation performance

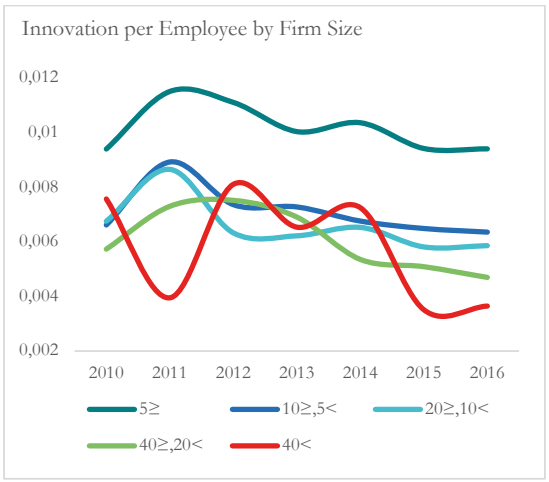
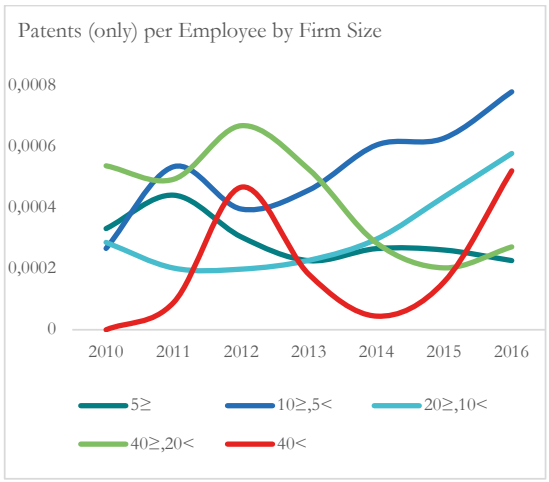


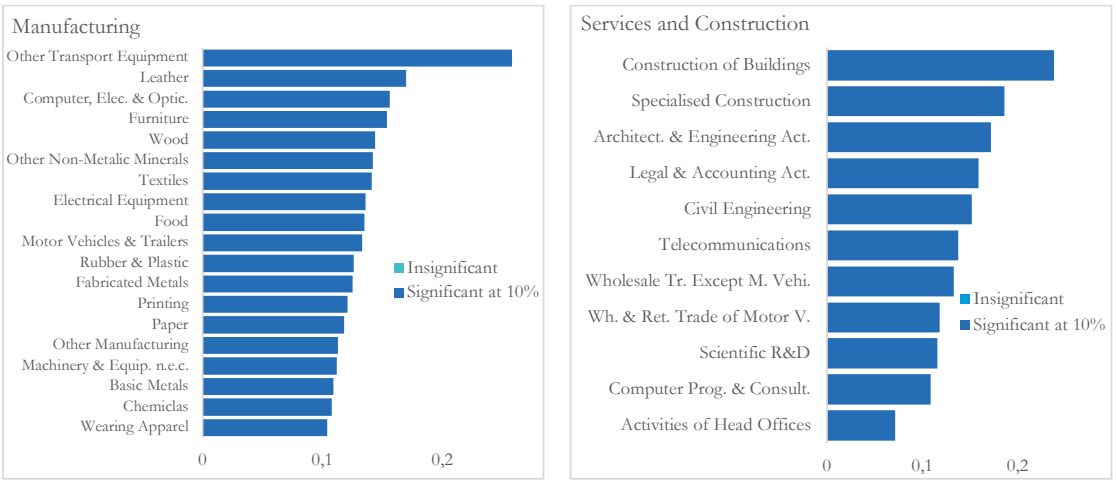
Figure 89: Young firms that survive the start-up period tend to be more innovative than other firms



Sources: EIS, WB Staff estimates.

16. **Turkey's innovative firms in turn display higher employment growth than non-innovative firms across services and manufacturing** (Figure 90). This is consistent with evidence from elsewhere (Box 9, Van Reenen 1997). The type of innovation matters – product innovation generally creates more jobs, whilst process innovation may not (e.g. Pianta, 2005; Harrison et al., 2014). The innovation proxy in this chapter (Box 9) would mostly reflect product type innovation. The results below are based on the PSM-DiD analysis (Box 9). The length of the bars in the figures reflect the estimated value of the treatment effect (in Figure 90 below, it is the effect of innovation on employment). The values are the average employment growth rate differences between the innovating firms and the non-innovators in the matched sample. A blue bar indicates that the estimated effect is significant at 10 percent or lower level; a green bar indicates that the estimation is insignificant.

Figure 90: Innovative firms in both manufacturing and services display higher employment growth



Sources: EIS, WB Staff estimates.

17. **What is therefore the likelihood that younger firms that display higher innovativeness will receive TUBITAK and KOSGEB grants?** This is estimated for every 2-digit industry using three different probit specifications that regress firm characteristics (age, size, productivity, capital intensity) against:[65] (i) innovativeness (as measured by patent, trademark, model and design applications); (ii) receipt of a KOSGEB grant; and (iii) receipt of a TUBITAK grant. In other words, how do firms' age and size affect innovativeness and receipt of grants through TUBITAK and KOSGEB.

[65] The propensity score in a difference-in-difference approach used to compare firms whilst controlling for their initial characteristics is discussed further in Box 10 below.

18. **In the manufacturing sector, the results of the estimation show that** (Table 14):[66, 67]:

(i) **Younger and larger firms tend to be more innovative:** This is consistent with the result above (Figures 88, 89). Young firms tend to be more innovative in all except the manufacturing of other transport equipment where the estimated coefficient is insignificant. The results also show that large firms rather than SMEs are more innovative in manufacturing.

(ii) **But younger firms are not more likely to receive TUBITAK grants, though larger firms are**: In 6 out of 19 manufacturing industries, a younger firm has a higher chance to receive a TUBITAK grant; in three industries, older firms are more likely to receive a grant; while in all other manufacturing industries the estimated link is insignificant. On the contrary, firm size seems affects the probability of receiving a TUBITAK grant even after controlling for productivity. Except in six industries, larger firms are found to have higher probability of receiving a TUBITAK grant.

(iii) **Whilst younger firms, albeit SMEs, are more likely to receive KOSGEB grants**: The probability of receiving a KOSGEB grant decreases with firm age in all except three manufacturing industries. Both firm size (i.e. among SMEs) and firm age affect firms' success in receiving a KOSGEB grant. Moreover, there is some degree of evidence that the KOSGEB targets young establishments that are generally more innovative, while this is not always the case for the TUBITAK grants.

19. **In the services and construction sectors, the results of the estimation show that** (Table 15):

(i) **Younger and larger firms tend to be more innovative:** This is consistent with Seker and Correa (2010) who find that SMEs in Turkey grow at a slower pace than those in several comparator countries in Eastern Europe and Central Asia.

(ii) **Larger firms are more likely to receive TUBITAK grants, but age does not matter:** Larger firms are more likely to receive TUBITAK grants in six out of 11 service and construction industries. But firm age does not affect the probability of receiving a TUBITAK grant.

(iii) **The probability of receiving a KOSGEB grant decreases as firms get older:** This is the case in most service sectors, including the largest such as wholesale and retail. The change of receiving a KOSGEB grant increases with firm size (i.e. among SMEs) in all except three sectors.

[66] Tables 14 and 15 shows results of the three probit estimations. The plus and minus signs represent the link between firm age or size, and the probability of making innovation or receiving support after controlling for labor productivity and capital intensity. Not the magnitude but the sign of the coefficients of the probit estimation are meaningful, so that the two tables below display only the direction of the relationship. When a plus or minus sign is missing, this indicates that the estimated effect is not significant at the 10 % level).

[67] The probit estimation includes quadratic terms in size and age in order to take into account possible non-linearities in the relationship. Based on the average marginal effects, the size and age thresholds where the sign of the relationship changes are computed to be larger than the maximum age or size values observed in each sample, so that the sings of the linear terms are concluded to be sufficient to understand the direction of the relationship.

Table 14: Manufacturing firm characteristics vs. innovativeness and public support

	Innovation		TUBITAK		KOSGEB	
Industry	**age**	**size**	**age**	**size**	**age**	**size**
Food	-	+	-	+	-	+
Textiles	-	+	-		-	+
Wearing Apparel	-	+			-	+
Leather	-	+		+	-	+
Wood	-	+			-	+
Paper	-	+		+	-	+
Printing	-	+	+	+	-	+
Chemicals	-	+	+	+	-	+
Rubber and Plastic	-	+		+	-	+
Other Non-Metallic Minerals	-	+				+
Basic Metals	-	+		+	-	+
Fabricated Metals	-	+		+	-	+
Computer, Elec. and Optical	-	+				+
Electrical Equipment		+	-	+	-	+
Machinery and Equipment	-	+	-	+	-	+
Motor Vehicles and Trailers	-	+	-	+	-	+
Other Transport Equipment		+	-		-	+
Furniture	-	+		+	-	+
Other Manufacturing	-	+	-	+		+

Table 15: Service and construction firm characteristics vs. innovativeness and public support

	Innovation		TUBITAK		KOSGEB	
Industry	age	size	age	size	age	size
Construction of Buildings	-	+			-	+
Civil Engineering	-	+				+
Specialized Construction	-	+	+	+	-	+
Wh. & Retail Trade of MV.	-	+		+	-	+
Wholesale Tr. Ex. MV.	-	+		+	-	+
Telecommunications						
Comp. Program. and Consult.	-	+	-	+	-	+
Legal and Accounting Act.	-	+		+		
Activities of Head Offices	-	+				+
Archit. and Engineering Act.	-	+			-	+
Scientific R&D	-					+

TUBITAK and KOSGEB impact positively on firm performance

20. **They key question is what impacts have TUBITAK and KOSGEB had on firm performance and productivity?** How has the distribution of grants across industries and firm types impacted on employment, R&D, innovation and productivity growth? Do the impacts differ across the two programs and why? This section and the next look at these issues using firm level data (Box 10). They apply two types of micro-econometric methods to capture: (i) the impact of public support programs on firm innovativeness, employment and R&D expenditures; and (ii) the effects of innovation, R&D and public support on TFP (Box 10).

Box 10: Data and methodology for assessing the impacts of TUBITAK and KOSGEB

Firm level data: The analysis uses a sub-sample of firms from the EIS database that have at least 2 employees and operated for at least 2 consecutive years within the sample period. The sample covers a selection of 2-digit industries in the manufacturing, construction and private and non-agricultural service sectors where an outlier cleaning procedure is applied for each industry that results in deleting approximately 3.5 percent of all observations. The balance sheets and the business register are merged with other datasets depending on the research question or estimation methodology.

KOSGEB and TUBITAK intervention: The EIS contains observations for KOSGEB (2011-2016) and TUBITAK grants (2008-2016).[68] KOSGEB and TUBITAK grants reimburse firms' eligible expenditures. The time of reimbursement (i.e. grant disbursement) is recorded in the data but not the time of investment. This study assumes that the treatment (policy intervention) occurs one year before the firm receives the grant/reimbursement. This roughly corresponds to the period in which the firm learns about the result of its application and starts implementing its project. This assumption is necessary, because otherwise firms' pre-treatment characteristics, according to which the matching is conducted, would be already affected by the treatment (see below).

Measure of innovation: The EIS database contains data for firms' patent, trademark. model and design applications for the period from 2010 to 2016, which is provided by TURKPATENT and is used as a proxy for firm-level innovation.

Price deflator: Nominal values are price-adjusted using price indices from TURKSTAT's online database. The PPI indices that are reported either at the 3-or 4-digit industry-level are used to deflate gross sales and total amount of grants, while economy-wide price indices specific to capital goods and materials are utilized while adjusting nominal intermediate inputs and investment series to prices.

Capital stock: Proxied using a version of perpetual inventory method at the firm-level where firms' fixed assets in their first years in the sample are taken as the initial capital values.

Impact of programs on firm performance: The propensity score matching in a difference-in-difference framework (PSM-DiD) is used to assess the impact of policy intervention. The PSM-DiD methodology compares the supported and unsupported firms' performances, while controlling for initial characteristics of both. This can help avoid bias from reverse causality whereby more productive firms are able to access grants, and therefore productivity is not related to policy intervention.

[68] The aggregate statistics on the KOSGEB and TUBITAK programs (e.g. total grants allocated to each industry) do not necessarily reflect the actuals allocated by the two institutions. The statistics in this chapter are based on the micro sample from the EIS database described above, which does not contain observations for all firms in every industry.

The PSM-DiD method applies a matching procedure where, for instance, supported and unsupported firms with initially (pre-treatment) similar productivity levels are compared to each other. Therefore, the initial productivity levels of firms can be used as a cofactor to understand the impact of the treatment (receiving a grant) on firm performance.

Treatment and control variables, and firm performance measures used in the application of the PSM-DiD method are listed below. The set of cofactors – the initial firm characteristics used in matching – are the same in every specification. Each specification is set to estimate the effect of a single treatment variable on a single firm performance measure.

Treatment Variables
Receiving KOSGEB grant
Receiving TUBITAK grant
Innovation measured by firms' patenting activities
Cofactors
Firm age
Employment
Labor productivity
Capital Intensity
Firm performance indicators
Firm employment
R&D expenditures
Innovation

Innovation is used both as a treatment and as a performance measure to understand not only the effect of public support on innovation but also to capture, for instance, the impact of innovating on firm employment. The timing of the variables is critical to assess the impact of policies robustly, so that $t-2$ values of cofactors are taken into account to control for the effects before the treatment. The treatment is received in $t-1$ and its effects on the firm performance indicator is measured as the difference between the t and $t-2$ values

Total Factor Productivity: One way to assess the direct effects of the support programs on TFP would to use an index for the TFP in the PSM-DiD approach. TFP is not directly observable from the data but is generally recovered from production function estimations. This poses two concerns. First, using an outcome of an estimation in another estimation as a dependent variable causes issues in the econometric specification. Second, the structural setup used for the estimation of the TFP and for regressing the TFP on a set of policy variables can contradict each other, if the two structural models are constructed independently.

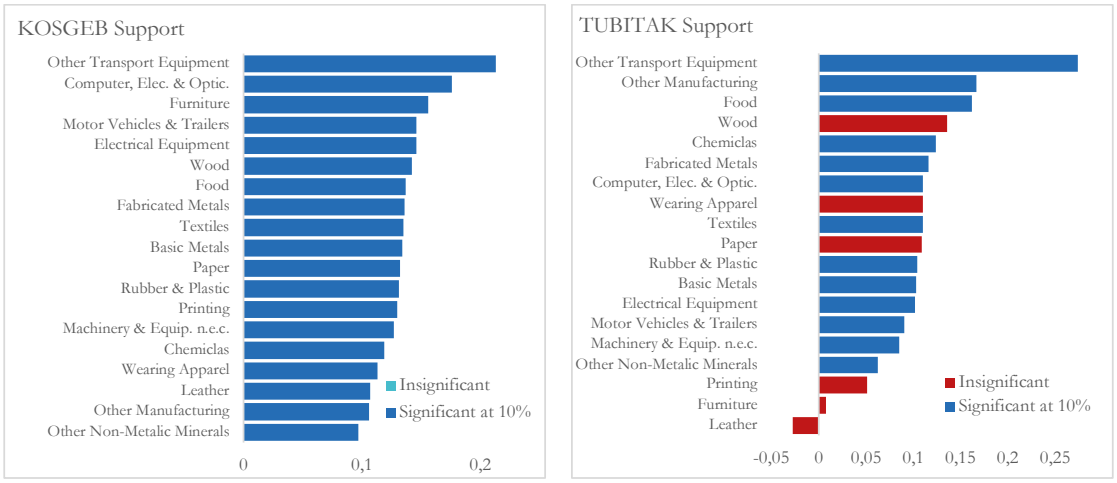
For this reason, the two steps of the analysis that are recovering a TFP index from the production function estimation and the regression of the TFP on policy variables are combined, which would increase the efficiency in the estimation and provide the opportunity to establish a consistent structural setup. The production function estimation method used in this chapter controls for the endogeneity of production factors to the unobserved productivity.

Source: WB Staff.

(a) KOSGEB employment impact is relatively larger than TUBITAK's

21. **In manufacturing, both TUBITAK and KOSGEB support have led to employment growth, though the effect is larger in the case of KOSGEB** (Figure 91). KOSGEB support has a significantly positive impact on employment growth across all industries within manufacturing relative to firms that receive no support (Figure 91 – bars reflect the average difference between employment growth rates of supported and unsupported firms). Moreover, excluding the manufacturing of machinery and equipment, KOSGEB support seems to have larger effect on employment in the high-tech industries. TUBITAK grants on the other hand do not have a significant effect on employment in 6 out of 19 manufacturing industries. These 6 industries, however, receive a relatively small share of TUBITAK (Figure 91). In the industries receiving the largest share of TUBITAK grants – motor vehicles and of machinery and equipment – the employment effects of the TUBITAK grants are significantly positive.

Figure 91: KOSGEB has a relatively large positive employment impact in manufacturing

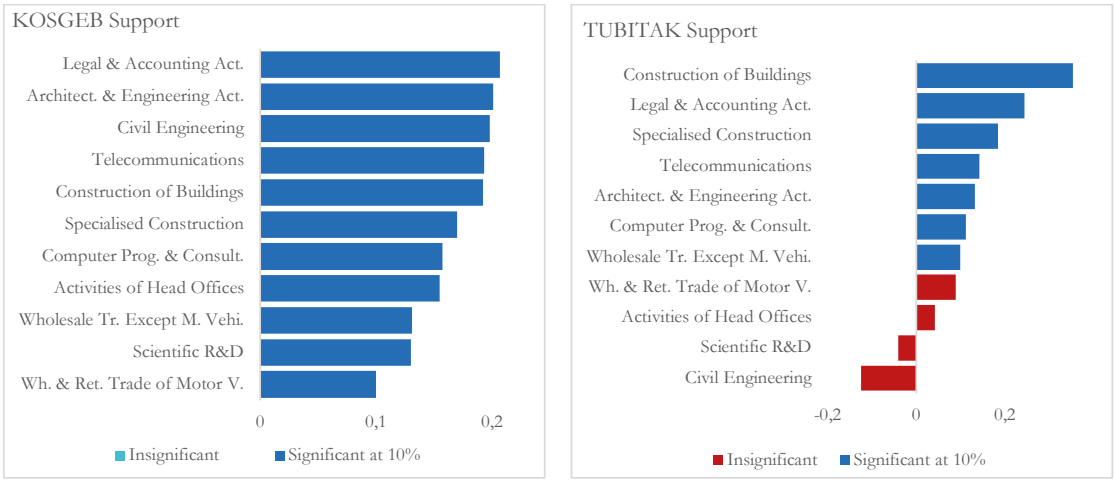


Sources: EIS, WB Staff estimates.

22. **The relatively larger positive employment impacts of KOSGEB across more industries is likely related to the nature of the two programs**. TUBITAK grants are not necessarily aimed at increasing the firm size but innovation, while the KOSGEB grants are mainly targeted to accelerate the growth of the SMEs. Since the sample of firms used in the estimations for the KOSGEB and TUBITAK grants are different, a direct comparison of the impacts of the two institutions' support programs on firm performance may be, to some degree, misleading. Nevertheless, comparing of the signs of the impacts of the two institutions' support programs is meaningful regardless of the differences in the sample size.

23. **Results are similar in the services sector.** KOSGEB support impact on employment is significantly positive in every service or construction industry, while the TUBITAK support does not have a significant effect on employment in 4 out of 11 industries (Figure 92). The computer programming and consultancy and the wholesale trade except motor vehicles sectors, which receive the largest portions of the grants, the employment effects are significantly positive but relatively low in comparison to other industries where the TUBITAK effect is significant. In scientific research and development, which receives the third largest portion of the TUBITAK grants, the effect of grants on employment is insignificant and negative

Figure 92: KOSGEB employment impact is also strong in services



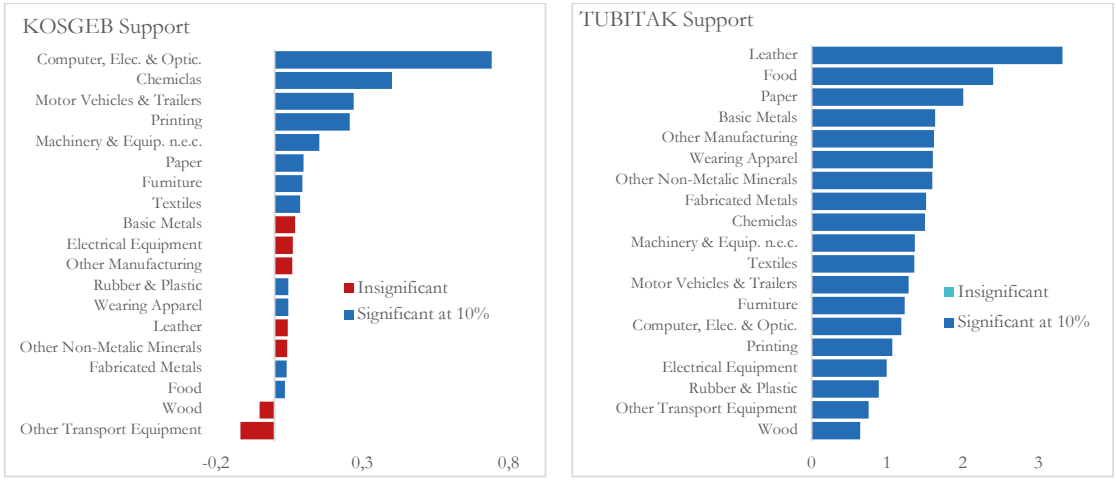
Sources: EIS, WB Staff estimates.

(b) TUBITAK's impact on R&D investment is relatively larger than KOSGEB's

24. **In manufacturing, TUBITAK has bigger impact on firm investment in R&D than KOSGEB**. KOSGEB support does not have a significant impact on R&D in 7 manufacturing industries (Figure 93). For the other 12 industries, the effect is significantly positive but the magnitude varies a lot. In fabricated metals and food, the number of firms that receive KOSGEB grants is relatively high but the overall impact of those grants on R&D is rather small. TUBITAK on the other hand has a positive and significant impact on R&D across all manufacturing industries. The industries where the effect of the TUBITAK support on R&D is largest (e.g. leather, food and paper) and the industries where the effect is lowest (e.g. wood and other transport equipment) are those that receive relatively low amounts of TUBITAK support. In the remaining industries, the estimated coefficient values for the impact of TUBITAK grants are close to each other.

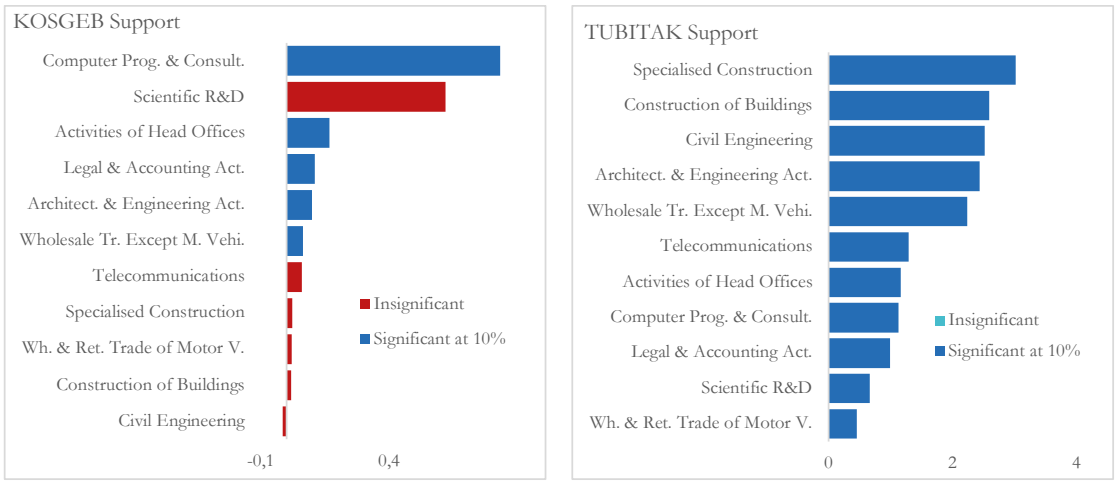
25. **A similar pattern emerges in the services sector where TUBITAK has a relatively large and significant impact on R&D, contrary to KOSGEB support** (Figure 94). KOSGEB grants do not have any significant effect on R&D in 6 out of 11 service and construction industries. Excluding the computer programming and consultancy, the estimated difference between the R&D growth rates of supported and unsupported firms is either insignificant or small in services and construction. For TUBITAK on the other hand, the estimated impact is significantly positive across all service and construction industries. The impact of TUBITAK support on R&D is particularly large in the construction industries.

Figure 93: TUBITAK has a large and significant impact on R&D across manufacturing



Sources: EIS, WB Staff estimates.

Figure 94: TUBITAK also impacts on R&D in services, whereas KOSGEB support is less significant



Sources: EIS, WB Staff estimates.

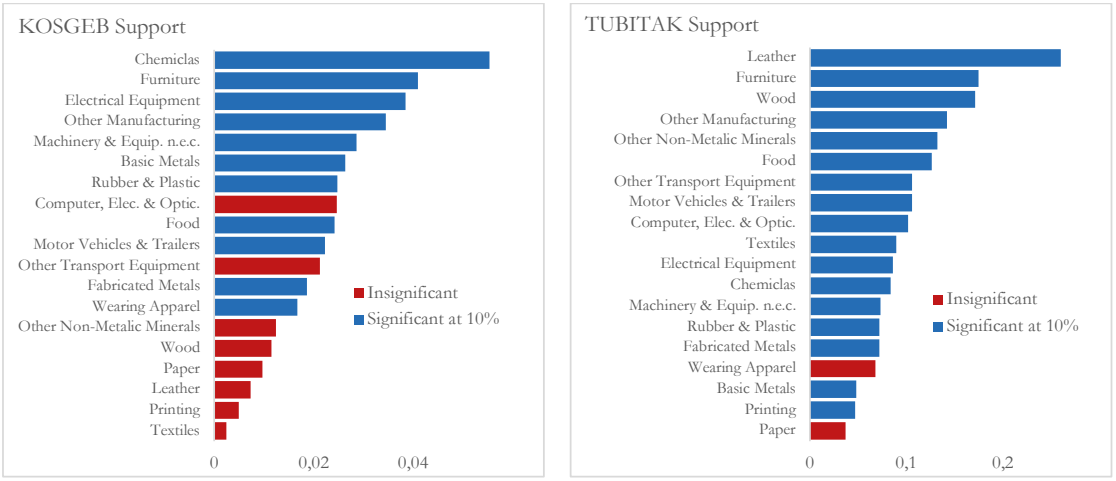
(c) TUBITAK has a greater impact than KOSGEB on innovation particularly in manufacturing

26. **Measuring the impact of public policy on innovation is a challenge, partly because innovation is difficult to measure.** Firms' R&D expenditures are often used as a proxy, but this is not always correlated with innovation. There is also survey data with firms' own assessments of their innovativeness, but this is constrained by respondents' knowledge and interests. The survey type innovation data such as the Community Innovation Survey for Turkey often lacks the time dimension which restricts a dynamic analysis to capture firms' innovation performance over time.

27. **The innovation measure adopted in this study (Box 10) addresses some of the weaknesses of other approaches though also has its own shortcomings.** The innovation measure based on firms' patenting activities can be considered as more reliable than firms' self-assessment of their innovativeness, mainly because firms incur costs and spend time to make an application to TURKPATENT. This way of measuring innovation, however, does not fully account for some types of innovative activities such as process innovation that constitutes an important part of innovative activities. Patenting activities only capture innovations that are new, but not the adaptation of existing technologies that are not new to the market but new to the adopting firms.

28. **The impact of TUBITAK support on innovation in the manufacturing sector is larger and significant in more industries than the impact of KOSGEB** (Figure 95). Except for two industries – wearing apparel and paper – which receive a small share of total TUBITAK grants, the impact of TUBITAK support on innovation is significantly positive. The estimated effect is highest in low-tech industries such as leather, furniture and wood. The impact of KOSGEB grants on the other hand is not significant in 5 industries, and is negative and significant for the activities of head offices and management consultancy.

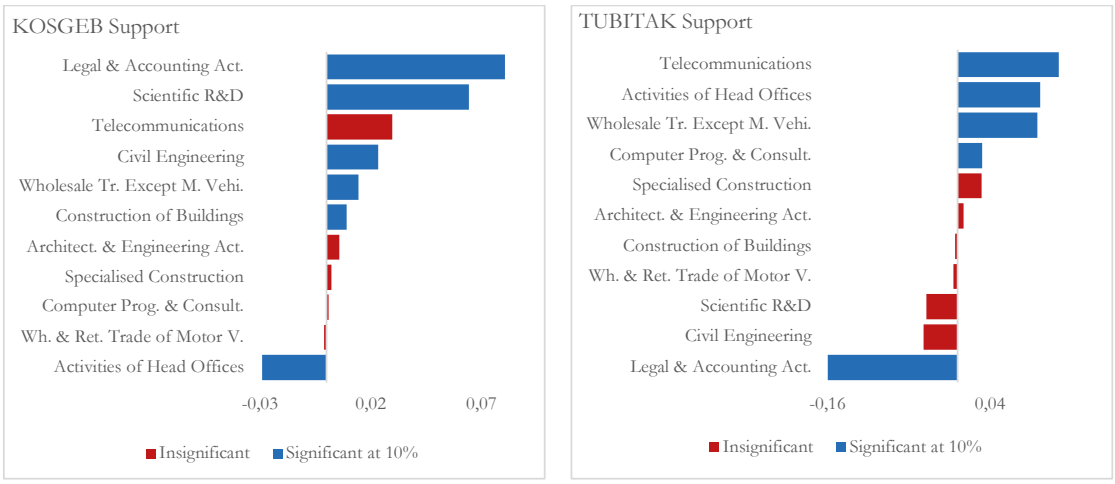
Figure 95: TUBITAK has a relatively large and significant impact on innovation in manufacturing



Sources: EIS, WB Staff estimates.

29. **The impact of both TUBITAK and KOSGEB on innovation in the services sector is more variable** (Figure 96). TUBITAK support is significantly positive in 4 industries, which includes the largest industry – wholesale trade except motor vehicles. The results for the service industries is sensitive to the type of innovation measure used. As mentioned earlier, firms' applications to TURKPATENT do not reflect process innovation adequately which can be an important component of innovation in the service sector. This may explain the observed weak link of public support programs with innovation in services.

Figure 96: Impact of public support on innovation in services is small and not very significant



Sources: EIS, WB Staff estimates.

R&D, Innovation and public support programs impact positively on TFP

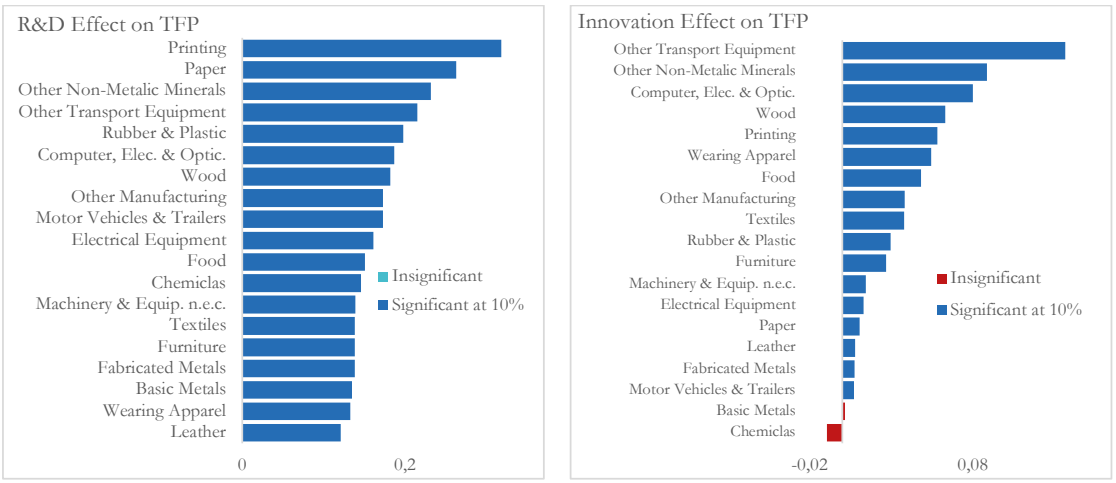
(a) R&D and Innovation impact positively on TFP in manufacturing and to some extent services

30. **The impact of R&D and innovation on TFP is estimated jointly to assess their relative importance**. R&D and innovation indicators are introduced into the TFP estimation as the mean shifters for the dynamic first order Markov process that is assumed to represent the evaluation of TFP over time. Unlike in the previous parts, the R&D variable used in this estimation is an indicator variable that takes the value of 1 if the firm makes any R&D investments in that year and 0 otherwise. Using an indicator variable for R&D makes the coefficients of innovation and R&D more easily comparable, since the innovation is also proxied by an indicator variable.

31. **The impact of R&D on TFP in the manufacturing is significantly positive across all industries.** Unlike in the previous section, the coefficient estimates in this section represent the percentage change in the TFP following innovation or investment in R&D in the previous period. There is some degree of heterogeneity in the productivity gains from R&D across the manufacturing industries, but this heterogeneity does not seem to be linked with the technology intensity of the industries. In some low-tech industries such as the manufacturing of printing and paper, the R&D effect is the largest, but in some other low-tech industries such as the manufacturing of wearing apparel and leather, the R&D impact on the TFP is the smallest. The estimated impact of the R&D is rather similar across the high-tech industries.

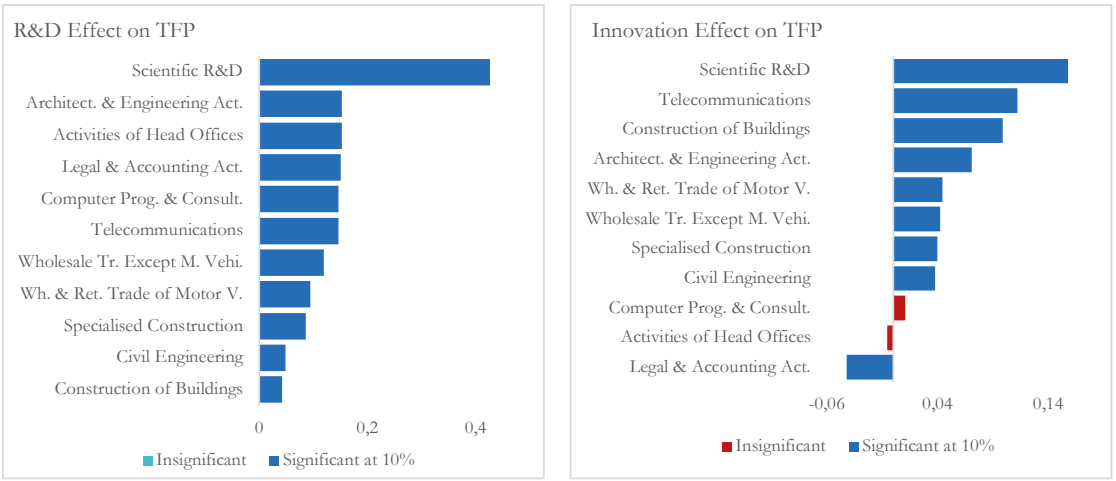
32. **The impact of innovation on the TFP is significant and positive in all except two manufacturing industries** (Figure 97). It is worth mentioning that the joint estimation of the coefficients of the R&D and innovation may suffer, to some degree, from multicollinearity and the estimates can be downwards biased. Interpreting the two sides of the graph jointly reveals that in 4 manufacturing industries – namely other non-metallic minerals; other transport equipment; computer, electronics and optical equipment; and wood – there are larger returns to productivity from R&D and innovation.

Figure 97: R&D and innovation have a positive and significant impact on TFP in manufacturing



Sources: EIS, WB Staff estimates.

Figure 98: The impact of R&D and innovation on service firms' TFP is also significant



Sources: EIS, WB Staff estimates.

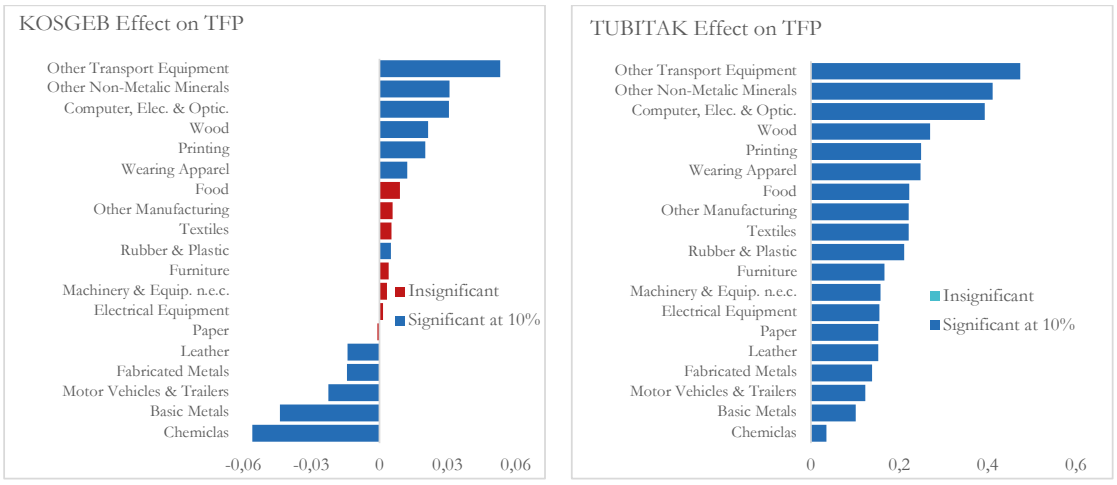
33. **In the services sector, both R&D and innovation have positive TFP effects across most industries** (Figure 98). The impact of R&D on the TFP is positive and significant in every service industry. The effect of innovation, however, is not positive or significant in 3 service industries. This may be due to the innovation measure used in this study that does not capture all types of innovative activities in services. In addition, some of the innovation effect on the TFP may be captured by R&D which would explain non-positive effects observed in some service industries. Overall, the results indicate strong links between R&D or innovation and the TFP of firms in the main sectors of Turkey.

(b) TUBITAK has a strong and significant impact on TFP relative to KOSGEB

34. **The impact of KOSGEB support on TFP in manufacturing is neither large nor significant**. KOSGEB support does not have any significant effect on the TFP in seven of the manufacturing industries (Figure 99). These industries include the manufacturing of machinery and equipment, rubber and plastic and food that receive large portions of the KOSGEB support. Besides the industries where the effect is insignificant, in five 2-digit manufacturing industries, the effect of the KOSGEB support on the TFP is significantly negative. Consistent with findings in the earlier section, KOSGEB grants are effective in job creation, but those new jobs do not contribute disproportionately to value addition. As a result, while the denominator of the productivity ratio rises, the numerator does not increase at a higher rate which causes the estimated effect on productivity to be either insignificant or negative across manufacturing industries.

35. **On the other hand, the impact of TUBITAK on TFP in manufacturing has been positive and strong across manufacturing** (Figure 99). The effect is relatively low in the manufacturing of leather, but the share of the TUBITAK support allocated to this industry is also low. In the manufacturing of motor vehicles and machinery and equipment, where large portions of the TUBITAK grants are allocated, receiving a TUBITAK grant leads to, on average, more than 10 percent TFP growth in the next period.

Figure 99: TUBITAK impacts significantly on manufacturing TFP, unlike KOSGEB



Sources: EIS, WB Staff estimates.

36. **A similar pattern in the services sector**. For KOSGEB, the impact on TFP in four service industries is either insignificantly low or negative. In the largest 2-digit industry, the wholesale trade except the motor vehicles, which also receives the largest share of KOSGEB support in services, the impact of KOSGEB support is significantly positive. For TUBITAK, the impact is particularly large in the legal and accounting service, though the amounts allocated as well as the number of supported firms are low. In the two industries that receive the largest shares of the TUBITAK grants in services (computer programing and consultancy, and wholesale trade except the motor vehicles) the TFP effects of the TUBITAK programs are significant; TUBITAK grant lead to a 20 percent increase in firm productivity in the consecutive year. The impact on the TFP is even larger in the architectural and engineering activities and in the scientific research and development which are the two sectors that receive relatively large shares of the TUBITAK grants.

Conclusions and policy implications

37. **The main messages that emerge from the analysis on innovation support and firm performance in Turkey are as follows**:

(i) **Turkey has prioritized R&D spending though has important gaps in innovation capacity relative to peers**: Boost in R&D spending is associated with a big increase in intellectual property applications and demand for researchers. Turkey's innovation gaps are greatest in university-company collaboration, private R&D spending, and quality of research institutions.

(ii) **KOSGEB impact is stronger on employment than TFP:** KOSGEB impact on employment is stronger than that of TUBITAK. Although the effects of KOSGEB grants on innovation and R&D is positive, the estimated impact on TFP is mostly non-positive.

(iii) **TUBITAK has a strong and positive impact on R&D, innovation and TFP:** The impact is particularly strong in the manufacturing sector. R&D and innovation impact positively on TFP in manufacturing and to some extent in services.

(iv) **Improved targeting of TUBITAK and KOSGEB grants could potentially improve impact**: Though younger firms are likely to be more innovative, they are not more likely to received TUBITAK grants.

Issues	Policy options
Young firms exhibit stronger capacity to innovate and become more productive. But being young does not improve chances of receiving a TUBITAK grant in 10 out of 11 services sectors, and for KOSGEB grant in 5 out of 11. Being young does not improve the chance of receiving a TUBITAK grant in 13 out of 19 manufacturing industries. In 4 industries, being young significantly decreases the probability of receiving a TUBITAK grant.	To enhance the positive impact on productivity and innovation, TUBITAK programs should target firms with high growth potential and support their R&D related activities. Shifting the focus of public support programs, particularly TUBITAK ones, in service industries, from the SMEs towards start-ups or young firms would be more successful in accelerating and sustaining productivity growth. Targeting young firms would also lead to more number of entries which in turn enhances competitive pressure on incumbents and can motivate them to be more innovative and efficient
KOSGEB programs have been successful in employment creation. But KOSGEB support does not always impact TFP positively. Therefore, employment creation may be temporary i.e. supported firm is likely to shrink back to its pre-support size. Alternatively, grants are sustaining less productive firms that would otherwise go out of business.	KOSGEB eligibility criteria should include productivity enhancing interventions. Grant allocation mechanism to take productivity as criteria to avoid poorly productive firm to be supported and protected from exiting
Support to SMEs can indirectly help newly created establishments to survive during the fragile start-up period. SME support programs can motivate entry, because new firms tend to be small and eligible for the funds allocated to the SMEs. The group of SMEs, however, does not only contain young firms. They include old firms that could not grow. So long as there is no significant obstacle to firm growth, the older SMEs generally stay small and exhibit poor productivity performances due to low managerial quality, lack of incentives to innovate or inefficient organizational structure.	Support to SMEs should distinguishing between young and/or high growth potential firms from older/lower growth potential firms. The evidence in this chapter shows that young firms generally have higher potential to grow and innovate.
The impact of public support on firm performance vary considerably across industries in Turkey. This study provides some insights into how to detect those industries where there are limited or no effect.	Research into the underlying reasons behind policy failures in the specific industries could help design more effective interventions.
There are large returns to productivity from R&D in Turkey. This is an area that received priority over the past 10 years.	The authorities should sustain and grow budget allocations for incentive programs to support firms' R&D related activities. The impact of alternative financing mechanisms (credits, grants and tax incentives) should also be reviewed.

Chapter 5

Human capital and productivity

V. Human capital and productivity

1. **New technologies and business lines from economic integration and innovation discussed in chapters 3 and 4 can create new and better jobs that will require human capital**. New technologies and business lines boost the demand for more capable workers, that in turn enhance firms' absorptive and technical capacities. These factors work together to accelerate within firm productivity growth. Investing only in new technologies and business lines without human capital would create unutilized, excess capacity; whilst investing only in human capital without new technologies and business lines would create an excess supply of workers with redundant qualifications. Both outcomes are inefficient and will not accelerate productivity.

2. **Building on the above, this chapter analyzes labor market supply and demand dynamics in understanding the challenges to accelerating within firm productivity growth** (i.e. is firm productivity constrained more by the lack of supply of qualified workers or is demand for qualified workers not keeping pace with supply?) This has implications for education policy and the participation of industry in building human capital. The analysis includes: (i) a review of labor supply in terms of its educational attainments, skills, and gender, and its absorption in the labor market; (ii) the types of skills most demanded in the labor market, which can guide policy and enable labor markets to clear effectively; and (iii) the relationship between the skills composition of the workforce and firms' job creation and productivity.

More education not always translating into better jobs

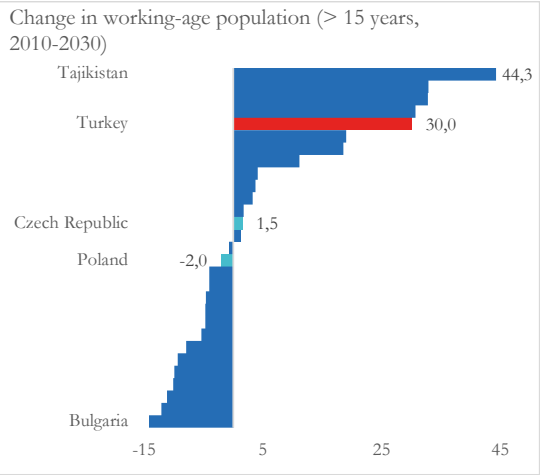
(a) Increased labor supply in the coming decade

3. **Turkey's relatively young population can support growth through further factor accumulation.** This will generate a high growth rate in working age population over the next decade (Figure 100). Turkey will also have a relatively low age-dependency ratio until 2025 (i.e. total number of children and elderly in the population over the population in working age (15-64)) (Figure 101). A higher dependency ratio means relatively less working people in the economy to support those that are dependent (i.e. out of the labor force), and therefore more pressure on working people. Age-dependency in Turkey, currently at 50 percent (i.e. two working adults for each dependent, either elderly or child), is lower compared to other OECD economies.

4. **With increasing labor supply and an eventual rise in age-dependency, each worker will need to produce more if improvements in living standards across the economy are to be sustained**. Between now and 2035, Turkey will experience a large inflow of highly-educated workers into the labor market (Lutz et al.., 2014)[69]. In many countries there is an intense debate on the disconnect between the education and skills available in the labor market, and those needed to participate productively in the global economy. Therefore, it is essential that the influx of new workers in Turkey's labor market is equipped with the qualifications and skills needed to boost productivity and growth.

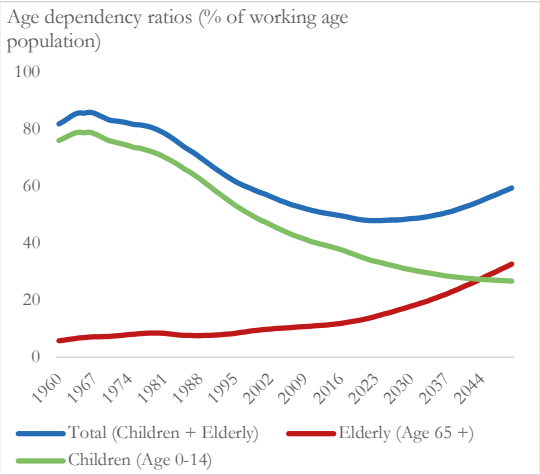
[69] Lutz, W., Wutz, W. P, and KC, S. (2014) World Population and Human Capital in the 21st Century. Oxford University Press.

Figure 100: Turkey has a rapidly growing working-age population



Sources: Arias et al. (2014).

Figure 101: And relatively low age-dependency, which will last till 2025



Sources: UN Population projects, WB Staff estimates.

(b) Educational attainment outpacing labor market's ability to absorb more educated workers

5. **There are signs of a gradual improvement in the education profile of the labor force in recent years thanks to high employment growth among the more educated, including women.** While employment increased by 5 percent overall (2014-2016) for the population aged 25 years and over, employment grew more quickly for those with tertiary education (19.4 percent) (Figures 102, 103). Those with primary education or lower experienced the slowest growth rate. This is in part a base effect given the large share of employed with relatively low education. But for both men and women, those with university education were the biggest drivers of employment growth between 2014 and 2016. This may therefore reflect an increased demand for more qualified workers, met by increased supply from recent progress in improving educational attainments of workers.

6. **At the same time, however, the share of unemployed workers with vocational and university education is relatively large, particularly among women.** For men, around 27 percent of those unemployed have higher qualifications (i.e. vocational and university); for women it is just over 40 percent (Figure 104, 105). These figures show that unemployed women are more educated than men, and that – in addition to being exposed to higher unemployment risk than men for childbearing – they might suffer more severely from the mismatch problem between skills demanded and supplied

7. **In addition, unemployment among the more educated is also growing very quickly, particularly among women.** Between 2014 and 2016, there was a big increase in the number of unemployed with lower-secondary and university education. This could be because new university graduates are being more selective about taking up their first job (the so-called phenomenon of "wait unemployment"). From the labor demand perspective, this could also signal a mismatch between the skills acquired at university and the skills demanded by employers (see below).

Figure 102: Share of workers with low education attainment remains high

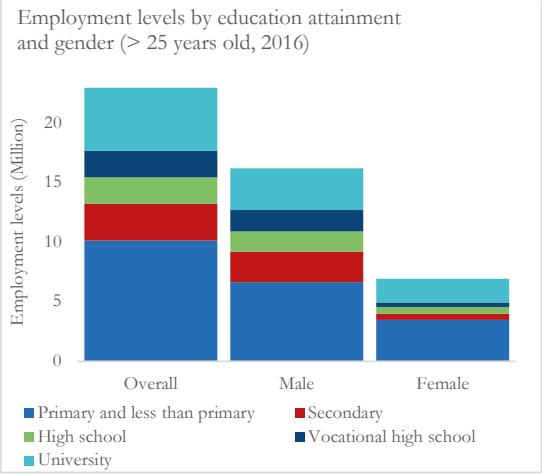
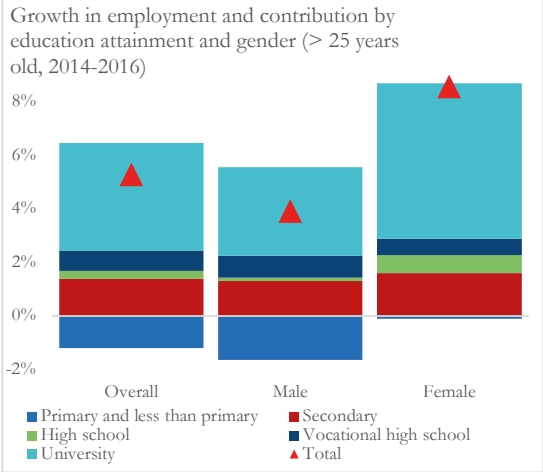


Figure 103: Some rebalancing recently through high employment growth among more educated



Sources: LFS 2014 and 2016, WB Staff estimates.

Figure 104: Unemployment across levels of education is relatively broad based

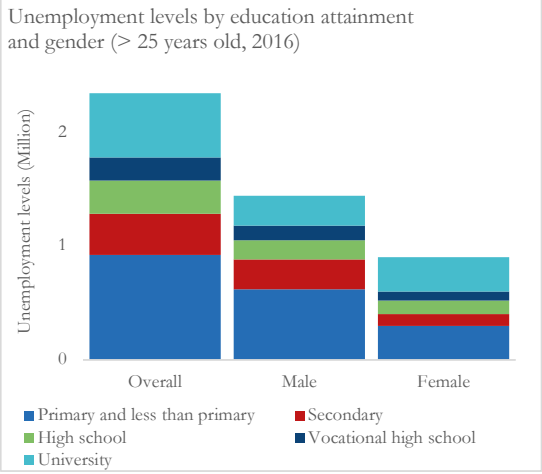
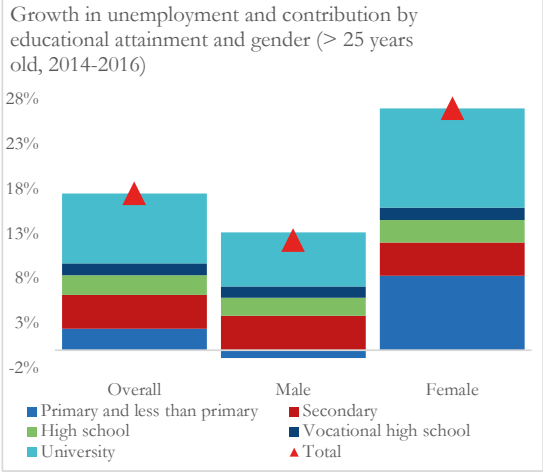


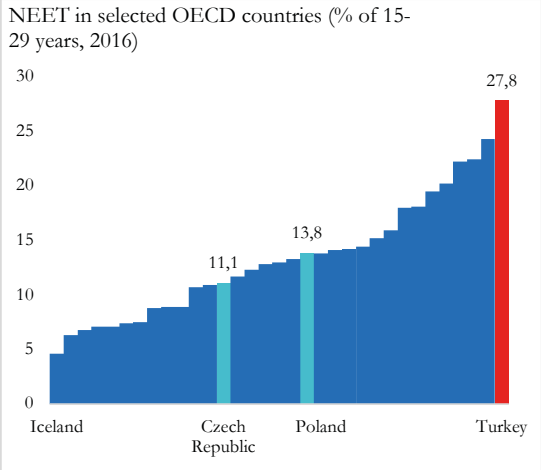
Figure 105: But unemployment among more educated workers is growing more rapidly



Sources: LFS 2014 and 2016, WB Staff estimates.

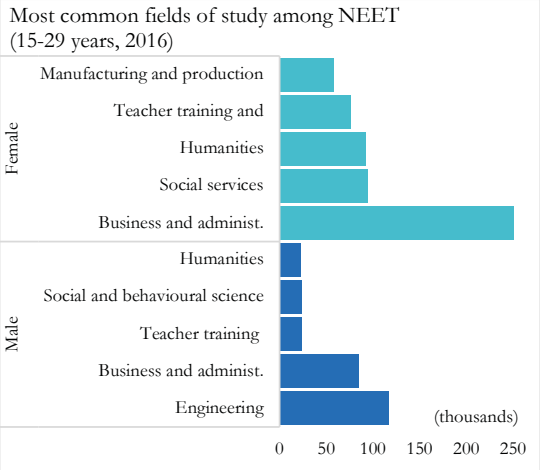
8. **Another concern for the education and skills mix of the labor force is the large share of people not in employment, education, or training (NEET) particularly among the young**. In 2016 the NEET rate among the 15–24 age group was 24 percent and 28 percent among the 15–29 age group (Figure 106). This is almost double the average NEET rate in OECD countries (13.9 percent), indicating that a significant share of the Turkish labor force is not contributing to the economy, or undergoing any training to be able to contribute to the economy in the future.

Figure 106: A large share of 15-29-year-olds are not in employment, education or training



Sources: OECD, WB Staff estimates.

Figure 107: Most common field of study among NEET include more technical subjects



Sources: LFS 2016, WB Staff estimates.

9. **The NEET rate among university graduates in 2016 was high at 11 percent, and a large number among them are graduates of more technical subjects**. Among university/vocational graduates, engineering subjects are most common among NEET males in 2016. Business and administration is the most common field of study among NEET females (Figure 107). It is concern that students from these fields of study, which are relatively more demanding and skill intensive, may risk losing their skills quickly if they are unable to apply and improve them through work.

10. **These developments suggest that although the supply of educated workers has increased in recent years, the demand for those more educated workers has not kept pace**. This is reflected in growing unemployment and NEET rates among the more educated. These developments of course could reflect short-term cyclical factors, given the difficulties faced by the Turkish economy between 2014 and 2106, rather than longer-term structural problems. Nevertheless, the challenge of absorbing more educated workers is consistent with the overall findings of this report in relation to the expansion of low skills intensive sectors.

11. **Therefore, cyclical factors aside, there could be a variety of structural reasons that explain why the demand for more educated workers has not accelerated more rapidly**. The first could be an excess supply of more educated workers. This could be linked to the relatively low levels of FDI and innovation discussed in chapters 3 and 4, which can boost demand for more educated and skilled workers in a way that domestic investment only cannot. The second could be due to labor market rigidities and other market failures discussed in chapter 1. These can prevent labor from being efficiently reallocated to more productive areas. Thirdly, it could reflect a lack of skills that cannot be offset by higher educational attainment only. This can create a mismatch between the supply and demand for skills, which is discussed further in the next section. In recent years, the government has undertaken various initiatives to tackle the issues described above, detailed in the New Economic Program (2019-2021) and in the Annual Program (2019). These initiatives aim to increase the flexibility in the labor market in order to ease the insertion of younger cohorts, and to improve the information available on the skills and occupational profiles most in demand in the labor market. It will be important, in the next years, to monitor to which extent these policy actions had an impact on improving the employability of unemployed workers, especially youth and NEET.

(c) Higher educational attainments need to be complemented with skills enhancements

12. **Education alone is not sufficient to develop the skills needed for a worker to be productive.** Skills refer to "competencies, attitudes, beliefs, and behaviors that are malleable (modifiable) across an individual's development and can be learned and improved through specific programs and policies" (Guerra, Modecki, and Cunningham 2014). Data on skills are difficult to obtain in Turkey. There are however assessments that highlight the skills challenge in Turkey, which are reviewed below: (i) the OECD Survey of Adult Skills (PIAAC); (ii) the OECD Program for International Student Assessment (PISA); and (iii) the US National Center for Education Statistics' Trends in International Mathematics and Science Study (TIMMS).

13. **The OECD PIAAC surveys people aged 16-65 to provide a picture of adults' proficiency in three key information-processing skills, namely:** (i) literacy; (ii) numeracy; and (iii) problem-solving skills in a technology-rich environment.[70] According to the survey (known as the PIAAC), adults in Turkey show below-average proficiency in all three domains assessed, relative to the OECD. Turkey has the third-lowest average score in literacy and numeracy among the 33 countries assessed.[71] Other important results include:

(i) **Literacy:** 46 percent of adults in Turkey attain only Level 1 or below in literacy, compared to 19 percent among OECD countries.

(ii) **Numeracy:** 50 percent of all adults attain Level 1 or below in numeracy, compared to 23 percent among OECD countries.

(iii) **Problem-solving in technology-rich environments:** Only 8 percent of adults in Turkey attain one of the two highest proficiency levels. Almost 40 percent of adults reported no computer experience or failed the information and communication technology (ICT) core test.

(iv) **Gender:** Turkey has one of the largest gender gaps among all participant countries across all three domains (i.e. men have higher levels of skills than women). The gender gap is narrower among younger adults (16–24 years) than older ones, which is likely due to improved educational attainment of young women. This could explain the narrower proficiency gap between young adults in Turkey and the OECD compared to older adults (Figure 108).

(v) **Proficiency across the age distribution**: Proficiency is flat between people ages 16 through 30, and declining after 30. Low formal education participation rates after the age of 16 and/or lower quality of education after the compulsory education years might be reasons for the declining proficiency (OECD 2016).

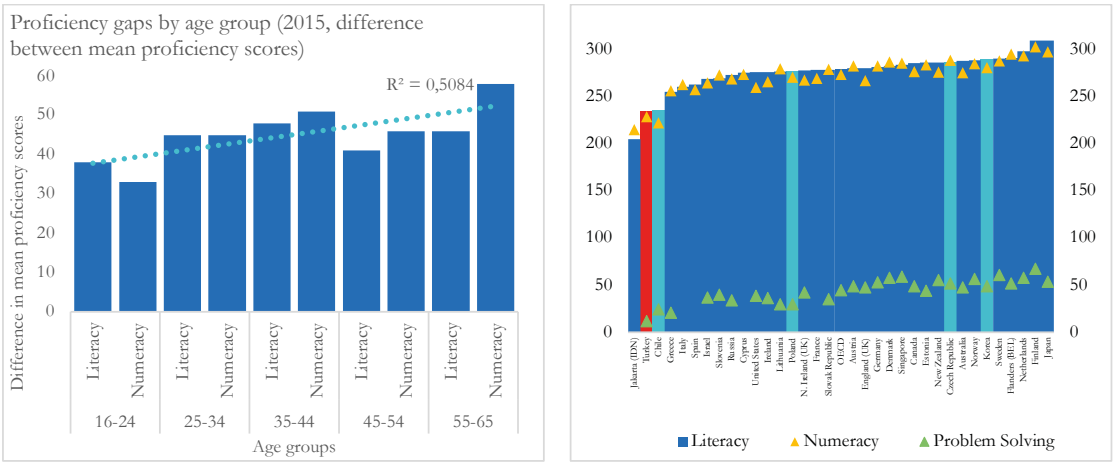
(vi) **User of information processing and generic skills at work:** Adults in Turkey are noticeably less likely to read, write, work with mathematics, solve problems, and use computers in their jobs

[70] Survey of Adult Skills is a product of the OECD PIAAC. Proficiency is described on a scale of 500 points divided into levels. Each level summarizes what a person with a particular score can do. Six proficiency levels are defined for literacy and numeracy (Levels 1 through 5 plus below Level 1) and four are defined for problem-solving in technology-rich environments (Levels 1 through 3 plus below Level 1).

[71] Beside the 28 OECD countries, Cyprus, Jakarta (Indonesia), Lithuania, the Russian Federation, and Singapore are included in the data set. The Survey of Adult Skills was conducted in Turkey from April 1, 2014, to March 31, 2015. Some 5,277 adults ages 16–65 were surveyed.

and in everyday life, compared to workers in other OECD countries. Many of the jobs in Turkey are in low- and medium-value-added occupations, thus they do not require high levels of literacy or numeracy skills (Del Carpio et al., 2018).

Figure 108: Proficiency gaps between Turkey and OECD are smaller among young adults



Sources: Survey of Adult Skills 2015, OECD.

14. **The OECD PISA assesses 15-year old students near the end of their compulsory education on science, reading and mathematics.**[72] Turkey experienced a steady improvement in its PISA scores since 2003, though its performance dropped sharply in 2015 (Figure 109). Though Turkey lags other OECD countries on PISA (and PIAAC), OECD scores are also stretch targets given the overall development gap between Turkey and OECD countries. When controlling for per capita GDP, Turkey's performance on the PISA reading scale seems to be in line the general trend; the scores of the High Performer comparators used in this report on the other hand seems below the trend (Figure 110).

[72] Students' proficiency in an innovative domain is also assessed (in 2015, this domain was collaborative problem-solving).

Figure 109: Steady improvement in PISA scores, but sharp drop in 2015

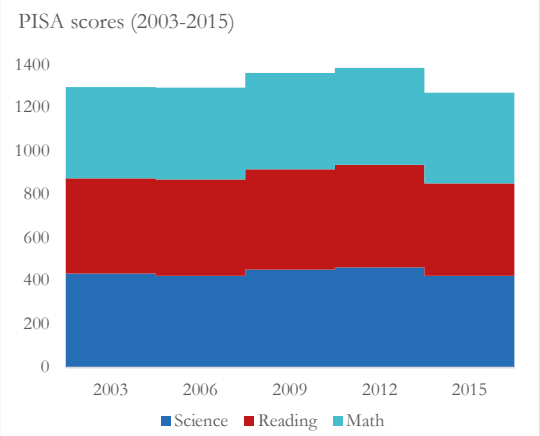
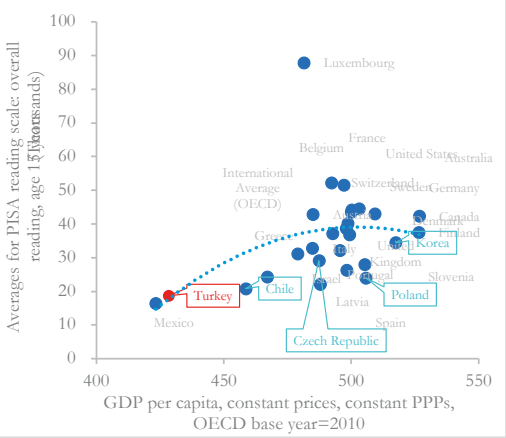


Figure 110: Performance on reading scale low but in line with trend when controlling for per capita GDP



Sources: OECD PISA, WB Staff estimates.

15. **The US NCES TIMSS is used to measure the mathematics and science knowledge and skills of 4th and8th graders over time.** In mathematics, Turkey's scores have improved for both 4th and 8th graders between 2011 and 2015, but not as quickly as scores for other countries, which has meant a slight drop in rankings (Figure 111). In science, Turkey's scores have improved for both 4th and 8th graders over the same period, whilst its rankings for each grade has remained the same (Figure 112). Turkey's results in mathematics and science for 8th graders remain below the OECD average.

16. **Notwithstanding current levels of development, the skills gap between Turkey and OECD countries, coupled with labor supply issues discussed earlier, confirm that this is a priority if Turkey is to convert its demographic opportunity into a demographic dividend.** Building skills starts with better-designed curriculums that are aligned with labor market needs. But skills are also built over the work life cycle of a person. Therefore, employers also play a major role. Firms must develop and adapt to technological developments discussed in chapters 1 and 2, and prepare their workers through training and skills upgrading. These issues are discussed in the following section.

Figure 111: TIMSS math scores have improved but Turkey's ranking has fallen

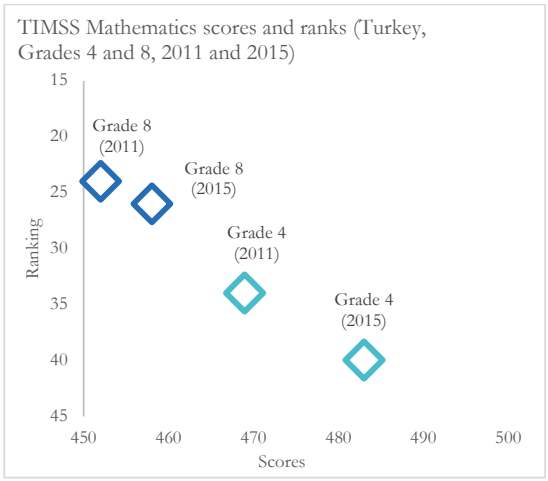
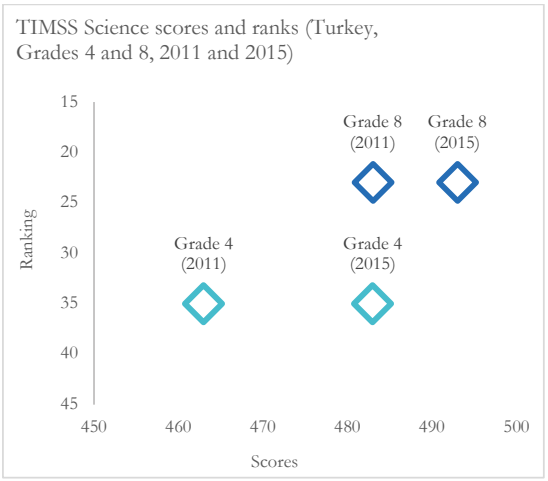


Figure 112: TIMSS science scores have improved whilst Turkey's ranking has remained the same



Sources: TIMMS data accessible at TIMSS, WB Staff elaboration.

Demand side factors relative to supply side factors deter deepening of skills

(a) Steady but slow increase in the demand for more skilled workers

17. **The demand for cognitive skills that are associated with better quality jobs is gradually increasing in Turkey.** Building on the skills assessment above, it is possible to look in more detail at the skills content of the economy to measure whether jobs in Turkey are moving towards or away from a knowledge-based economy.[73] A knowledge-based economy is one where cognitive and technical skills are common features of most occupations. The economy is increasing its use of cognitive skills associated with better quality of jobs compared to the manual skills associated with lower quality jobs; the reliance on lower level manual skills is declining over time.

18. **Breaking this down further, two distinct patterns are observed.** First, for the national sample, both non-routine manual physical and routine manual skills are becoming less dominant, a sign of decreasing dependence on the type of manual skills which are typical in lesser quality jobs (Figures 113, 114). Non-routine cognitive (analytical and interpersonal) and routine cognitive skills are dominant, which is expected in an economy with relatively high levels of good jobs, but jobs intense in routine cognitive skills have seen the largest increase in the last years. These include jobs such as those performed by bookkeepers or call center operators. Unfortunately, these jobs are at high risk of automation. Second, for workers with low education levels, employment is predominantly in occupations with high levels of routine tasks. This indicates that in the medium or longer term this segment of the population is at risk of losing jobs to automation.

[73] In the methodology, first, ISCO 88 2-digit occupations were converted to ISCO 08, and then each occupation was assigned with an average per skill (e.g., Non-routine cognitive: Analytical), which is associated with a scale such as importance. Each scale has a minimum and maximum value (e.g., Importance: 1 – 5). Then, to get standard values, z-scores were computed by year and skill.

Figure 113: Non-routine manual physical and routine manual skills are becoming less dominant

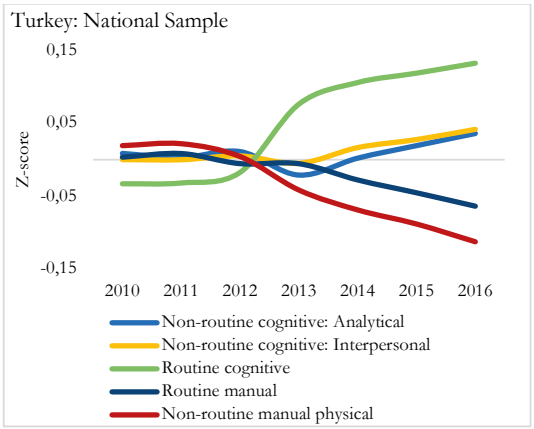
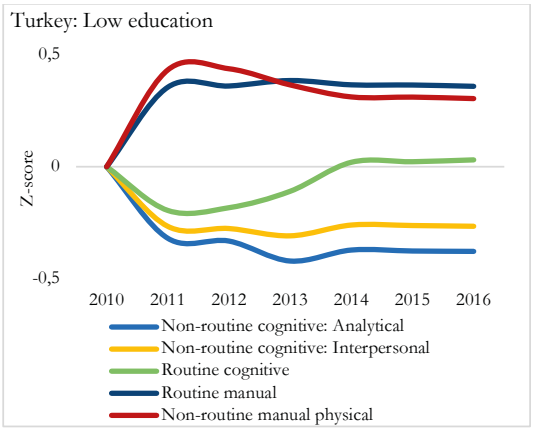


Figure 114: Among less educated, employment mostly in routine tasks at risk of mechanization



Source: WB Staff estimates.
Note: Skills classification follows Autor (2014).

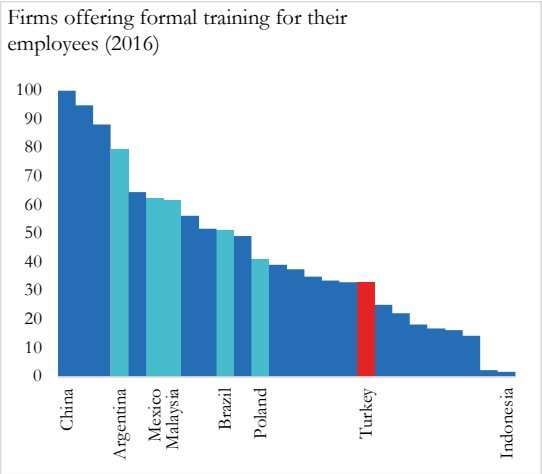
19. **Inadequacy of skills is often cited as a constraint to doing business in Turkey**.[74] Around 7 percent of firms perceive inadequately educated labor force as an obstacle; this is regarded as the biggest obstacle for firms located in the western parts of Turkey. Firms in large labor markets such as Istanbul, Ankara, and Izmir find the inadequacy of education in the labor force as a top constraint. These provinces have relatively diversified economies, indicating that this obstacle is encountered by firms across sectors. For firms in surrounding sub-regions (Manisa-Afyonkarahisar-Kutahya-Usak and Denizli-Aydin-Mugla) where wholesale and retail, and services in general dominate the economy, this obstacle is listed as a top constraint as well.

20. **Though firms can play a big role in developing workers' skills, firms in Turkey invest relatively less on this compared to countries at similar levels of income** (Figure 115). On-the-job learning is an investment that can increase workers' productivity and wages through the accumulation of skills (Becker 1964; Heckman 1976; Mincer 1962, 1968). Both High Performer and Trapped MIC comparators have a larger share of firms offering formal training programs for their permanent, full-time employees. Turkey ranks 63rd out of 94 countries in this dimension.

21. **The Turkish Employment Agency (ISKUR) provides training to support people to find jobs more quickly**. It has many Active Labor Market Policies (ALMPs) aimed at enhancing the skills of the working-age population and increasing their employability. This is a priority that has been matched with an increase in budget allocations; the number of programs and beneficiaries has also increased substantially in recent years. Many of the programs are skills training and on-the-job training programs. While nearly 393 million Turkish Lira was spent for 212,000 beneficiaries in 2010, the number of beneficiaries increased to 593,633 and expenditures rose to TL 5.3 billion in 2016 (Republic of Turkey Ministry of Development 2017).

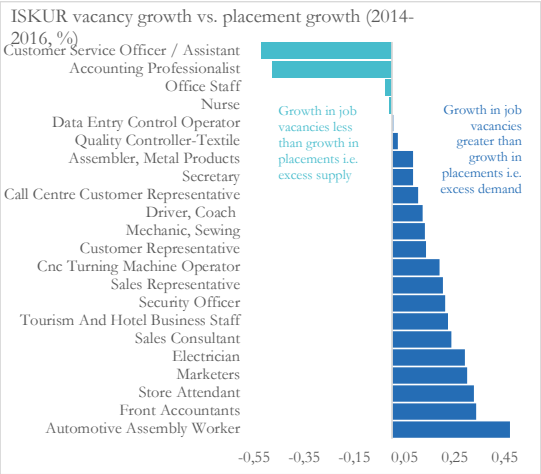
[74] WBG Enterprise Survey (2015). This is the fifth biggest obstacle: others are tax rates, access to finance, informal competitors and political instability.

Figure 115: The proportion of firms offering training in Turkey is relatively low



Source: Global Innovation Index.

Figure 116: The nature of demand and supply mismatches across sectors highly heterogeneous



Sources: ISKUR, WB Staff estimates.

22. **Most of the jobs listed in the ISKUR portal are low- and medium-skill-demanding jobs; like in many countries, higher-skill-demanding jobs are usually more commonly available in private job portals**. The difference between the growth in job vacancies and the growth in job placements reflects a mismatch between vacancies and job seekers with the relevant skills (Figure 116). A positive difference means that the growth in job vacancies has been greater than the growth in job placements – so demand for workers exceeded the supply with the relevant skills. This was particularly the case in areas such as automotive assembly workers, front accountants, electricians, but also somewhat surprisingly store attendants and sales representatives. This may therefore not only reflect skills mismatch but also the desirability of some jobs. A negative difference – where the growth in job vacancies was below the growth in placements – suggests the supply of workers exceeded demand. This was more prevalent among customer services, accounting, office staff, and nurses.

23. **With technological developments and their impacts on the labor market, the main actor ISKUR focuses its attention on rendering policies especially for the employment of students and white-collar personnel by diversifying its services**. Creating modern mobile applications and web interfaces, establishing internship matching systems, giving introductory information to the students about Agency's services and labor market under ISKUR Kampüste link and by this way making closer contacts with the students. These are some of the measures taken on ensuring harmonization of supply and demand sides of the labor in the last period.

24. **In sum, though there is a steady increase in the demand for skills needed to deepen technological capacity and accelerate productivity, progress is relatively slow.** The relative importance of supply side factors (i.e. workers not having appropriate skills) and demand side factors (i.e. employers not seeking higher skills) is difficult to assess. The public sector through ISKUR is working on improving the matching between the demand and the supply of skills, by providing better services through its web interface, and by promoting career days and job market fairs. Further, the Vocational Qualifications Authority assessed and certified the skills of almost 600,000 persons as of April 2019. However, the role of the private sector in

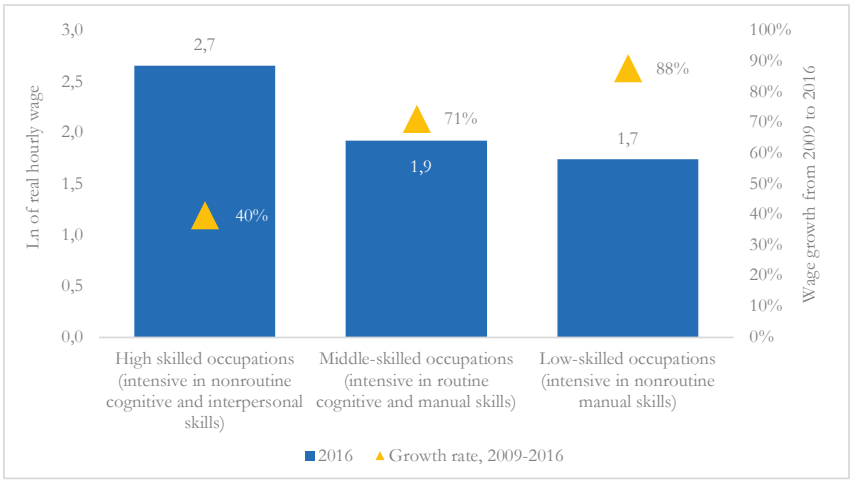
fostering the demand for more skills is still limited. This is evident in the relatively low levels of firm investment in training of employees. This is also consistent with the relatively low levels of FDI, which would otherwise help accelerate the demand, and likely supply, for more skilled workers. If demand for more and better skills does not accelerate, the incentives to acquire more and better skills on the supply side will decrease.

(b) Wage growth and premia suggest slow demand for more and better skills

25. **Wage developments across skill levels suggest that the demand for low and mid-level skills relative to high level skills has remained strong**. High wage growth and premia for specific types of skills can be reflective of higher demand pressures for those skills. Between 2009 and 2016, real wages for low and middle-skills occupations has grown more quickly than those for high-skill occupations (Figure 117). This may not be so unusual given the base effect of significantly higher real wages at the upper end of the skills spectrum. Nevertheless, the large difference in real wage growth rates nevertheless point to strong relative demand for low skill employees.

26. **Part of the sharp increase in real wages for low-skill workers could be related to minimum wage developments.** The increasing minimum wage and salaries in the public sector between 2014 and 2016 might have affected the positive gains in real wages and wage premiums particularly for middle and low skill demanding occupations. Public subsidies for minimum wages in recent years might have further reinforced distortions on the demand side.

Figure 117: Real wage growth for low skill workers nearly double that of high-skill workers



Source: An adaptation for Turkey of Frey and Osborne 2013.
Note: Arrows show the share in low, medium, and high probability categories in the US, 2010.

27. **These trends are confirmed by wage developments across workers' educational attainments.** Considering unconditional averages, secondary graduates see a higher (and increasing over time) return to their educational investment than others, who face low (and flat) returns (Figure 118). On the other hand,

workers in the informal sector derive minimal or no benefit from achieving a higher education (Figure 119).

Figure 118: Secondary graduates' earnings increasing over time in the formal sector

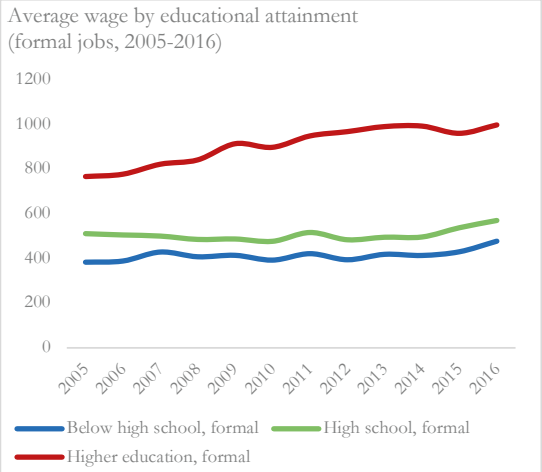
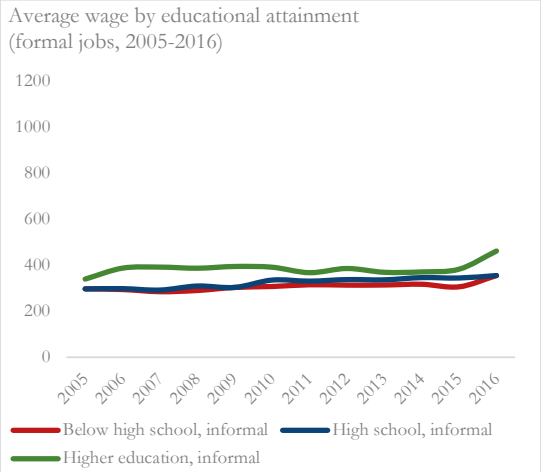


Figure 119: Workers in the informal sector derive little benefit from achieving higher education



Source: LFS, WB Staff estimates.

28. **To ascertain the effects of education on wages, it is however important to control for other characteristics**. Even though education is important determinant of wage, workers with the same education level might not been paid the same wage level. There are other factors that affect wage such as work experience, labor market status, gender, geographic area of residence etc. Wage regressions can be used to estimate the effect of education on earnings controlling for other individual characteristics.

29. **Few studies in Turkey measure returns to education controlling for these other factors**. One study finds that an extra year of schooling increases wages by 17 percent in Turkey, which is much higher than average OLS estimates typically found in advanced OECD economies (Aydemir and Kirdar 2013). Another study on wage inequality in Turkey (focusing however on a period pre-2011) finds that returns to education are not constant, but increase over different levels of education, and that the highest returns are achieved with university-level education (Tansel and Bircan 2010).

30. **Building on earlier studies, real hourly wage is estimated below as a function of education, work experience, labor market status and other characteristics:**

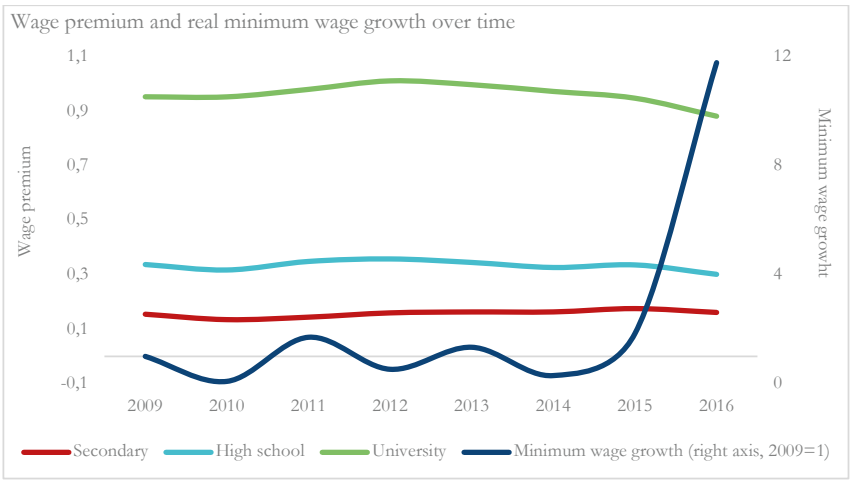
$$\ln(wage_{it}) = \beta_1 + \beta_2 * Education_i + \beta_3 * Experience_{it} + \beta_4 * LMstatus_{it} + x'_{it}\gamma + u_{it}$$

Regional CPIs were used for wages at constant prices. Education includes: primary and less than primary, secondary, high school (inc. vocational high school) and university. Labor market includes interactions for: (i) permanent, paid and casual and formal workers, (ii) temporary, paid and casual and formal workers, (iii) paid and casual and formal workers**.** Remaining control variables (x) include dummies for sector of economic

activity and geographic region of residence. The sample includes permanent wage and casual workers aged between 25 and 64. [75]

31. **The results show that premiums for university-educated workers increased slowly from 2009 to 2012 and then fell (albeit slightly) from 2012 to 2016 compared to primary educated workers** (Figure 120)**.** It should be noted that the decline is very sharp in 2016. A similar trend is observed for high-school educated workers. On the other hand, wage premium remains roughly at the same level for secondary school educated workers compared to primary educated workers. There might be several explanations for these trends.

Figure 120: Wage premium for university-educated workers has fallen most recently compared to primary educated workers



Sources: LFS 2009-2016, WB Staff estimates.
Note: Gross real daily minimum wage was used. The figure presents the evolution of the wage premium by education level compared to the primary school, as measured by the coefficient on the education variable in the Mincer-style earnings equations.

32. **One reason might be that the increase in the supply of more-educated workers might be running ahead of increases in demand**. As educational attainment has been steadily increasing in Turkey, increases in the relative supply of more educated workers may put pressure on the earnings premiums to fall. This could be accompanied both by increasing growth in demand for skilled labor or by declining growth in demand for skilled labor. In the former case, the supply is expected to win out over increases in demand. The latter one could be related to a slowdown in the process of skill-biased technological change or to a shift in the structure of production away from high-skill-intensive sectors toward low-skill-intensive sectors (World Bank, 2012).

[75] Several specifications of the model (including Heckman correction) by using different Turkish micro data (Survey of Income and Living Conditions and Household Budget Survey) were tested. Results are robust across different models.

33. **Other plausible explanations might be the increases in minimum wage, as noted above**. The increase in minimum wages leads to a rise in relative wages of low-skilled workers. The minimum wage in Turkey increased very sharply after 2014 (Figure 120). Several studies find that minimum wages compress the distribution of wages among workers. Because minimum wage has a bigger impact on the wages in the bottom part of the distribution than on those higher up (World Bank, 2012). This is in line with the findings on real wage growth, which show higher real wage increases for medium and low-skill-intensive occupations than high-skill-intensive ones.

34. **In addition, Turkey has become one of the world's largest refugee-hosting countries**. The large influx of Syrian refugees, particularly after 2011, has the potential to affect employment and wages in Turkish labor market. Findings from earlier studies (Del Carpio and Wagner, 2015[76]) are consistent with the above trends. They find that the refugees inflow was associated with a large-scale displacement of domestic workers in the informal sector. Those displaced are men that did not complete high school education. This means that low-educated men in Turkey moved from the formal to the informal sector, following the increasing absorption of Syrian refugees in the Turkish labor market. However, more research is needed to assess whether these findings indeed reflect a causal relationship.

35. **The analysis of wage developments and premia therefore provide some additional evidence on the relative importance of demand side factors deterring deeper skills**. This is reflected in the high wage growth for low skill workers relative to high skill workers, and the decline (albeit most) in wage premia for university educated workers relative to primary educated workers. Whilst the impact of minimum wages certainly plays a role in driving up earnings of those at the lower end of the wage spectrum, these developments together with the findings from the earlier sections suggest that a demand side boost is needed to deepen the skills of the Turkish labor force.

No significant relationship between skill composition and firm productivity

36. **This final section looks at the interaction between firm-level skills and productivity.** As noted at the start, skills are essential determinants of firms' ability to innovate and absorb new technology. To assess whether the skill mix across firms has or has not impacted on productivity growth, firms are first grouped in three categories based on the prevalence of occupation-related skills, namely routine manual (low), non-routine manual (medium) and non-routine cognitive (high).[77] In sum:

(i) **Low skilled firms** are those whose share of employment for routine manual workers exceeds the national average;

[76] Del Carpio, X., and Wagner, M. C. (2015). The impact of Syrians refugees on the Turkish labor market. Policy Research working paper; no. WPS 7402. Washington, D.C. World Bank Group.

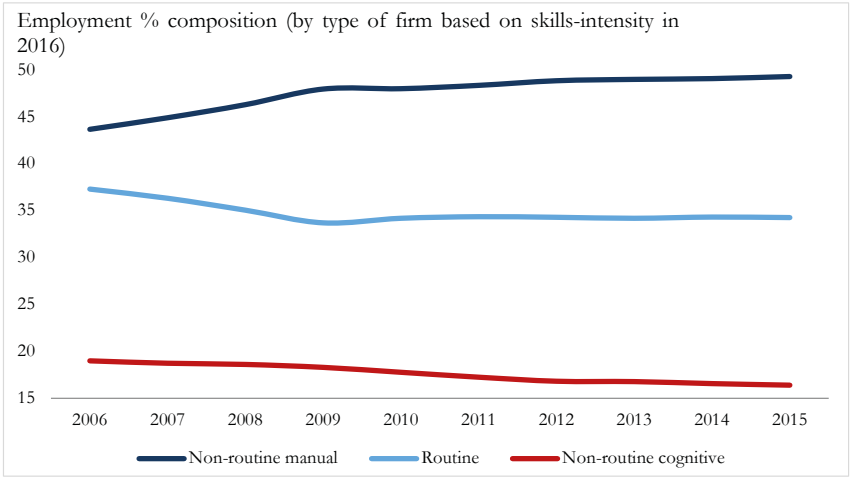
[77] This section uses EIS data for categorizing skills by firms and assessing the impact of this on productivity. Given the absence of information on workers' educational attainment in the EIS data, skills of the workforce are proxied by the information available on occupations ISCO-codes. Occupations are classified therefore into three broad categories:
(i) Occupations intensive in non-routine cognitive tasks and interpersonal skills, such as: professionals (doctors, lawyers, architects, dentists, journalists), academics, managers, etc.;
(ii) occupations intensive in routine tasks (both manual and cognitive), such as: clerks, secretaries, administrative assistants, book-keepers, mechanic workers, call-center attendants, etc.
(iii) Occupations intensive in non-routine manual tasks, e.g. typically involving repairing, attendance, care, or some form of interactions with clients, such as: plumbers, electricians, care-givers, caretakers, security personnel, sales workers, cleaners, waiters, bartenders, etc.

(ii) **Medium-skilled firms** are those whose share of employment for non-routine manual workers exceeds the national average;

(iii) **High skilled firms** are those whose share of employment for non-routine cognitive workers exceeds the national average.

37. **Firms characterized mostly by non-routine manual work (medium-skill) absorb nearly half of all employment** (Figure 121). Low skill firms (mostly routine manual) absorb around 35 percent of employment, whereas high skill firms (mostly non-routine cognitive) account for around 16 percent of employment.

Figure 121: Firms characterized by low skill labor make up a large share of employment, which has grown since 2006



Sources: EIS, WB Staff estimates.
Note: Includes only firms registered over the full period (2006-2015).

38. **Firms that today have largest share workers in non-routine manual occupations (medium skills) compared to the national average, have increased slightly their employment share over time** (Figure 121). On the other hand, the share of employment in firms that today absorb higher than average workers in non-routine cognitive occupations (high skill), has slightly declined. There is no indication of a "hollowing out" of routine occupations over time, as observed for instance in the US (Acemoglu and Autor, 2010). This suggests that the Turkish economy is likely to maintain its demand prevalently for occupations intensive in non-routine manual and routine type of skills in the coming years. Employment in key sectors such as manufacturing and wholesale and retail trade, remain prevalently intense in routine and non-routine manual occupations, respectively (Figures 122, 123).

39. **Interestingly, there is no significant correlation between skill incidence and firm productivity.** One might expect labor productivity to be higher in firms that have higher incidence of workers engaged in non-routine cognitive (high skill) work. However, there is little evidence of a clear association (Figure 124). In addition, over the last 10 years, TFP in firms which today have higher incidence of employment in non-routine cognitive occupations (high skill), has dropped by 12 percent compared to the 2006 levels (Figure 125). Surprisingly, the productivity decline is less pronounced for firms with higher intensity in routine occupations and non-routine manual occupations.

Figure 122: Employment in manufacturing predominantly in routine manual (low skill)

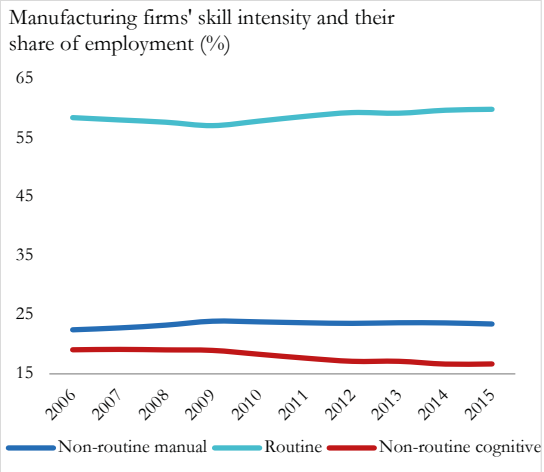
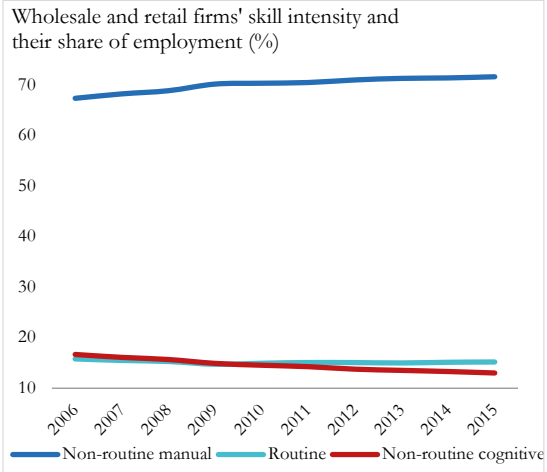


Figure 123: Employment in wholesale/retail mostly in non-routine manual (medium skill)



Source: EIS, WB Staff estimates.

Figure 124: No clear association between productivity and incidence of high skilled workers

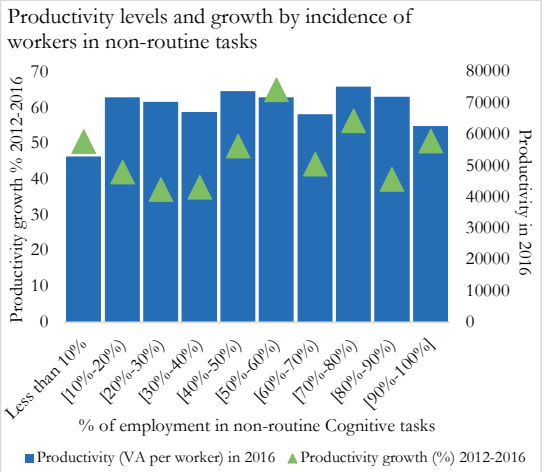
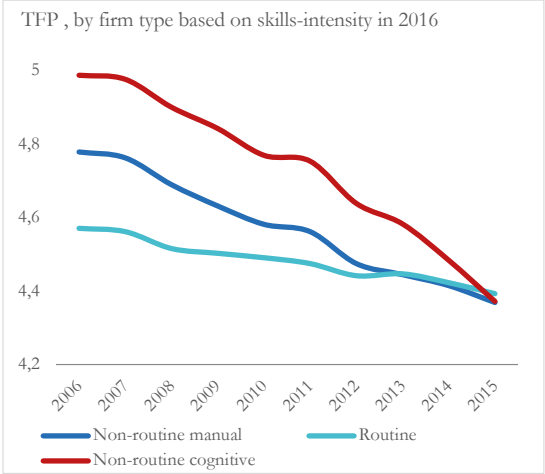


Figure 125: Firms with higher incidence of employment in non-routine cognitive face sharpest TFP drop



Source: EIS, WB Staff estimates.

40. **These counter-intuitive results are likely linked to the prevalence of small-micro firms in the economy**. These firms absorb the bulk of employment and suffer from declining productivity (Figure 126). Larger firms exhibit constant productivity over the last 10 years across all skill incidences (Figure 127). In manufacturing–while firms with high-skill employees register the highest TFP level during the whole period–for all 3 types of firms, TFP trends have been flat over the past ten years (Figure 128). On the contrary, in wholesale and retail trade, all type of firms experienced a decline in TFP (Figure 129).

Figure 126: Small firms exhibit low and falling productivity across all skill intensities

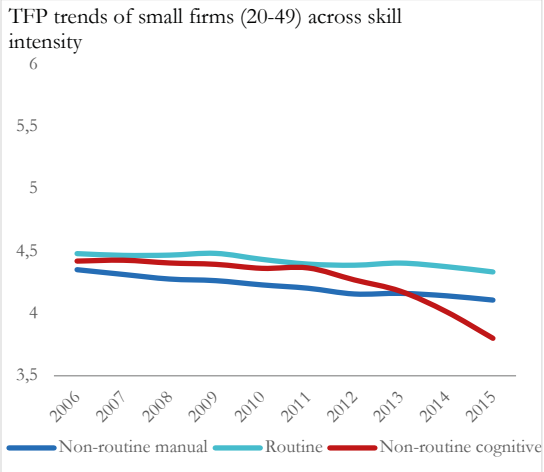
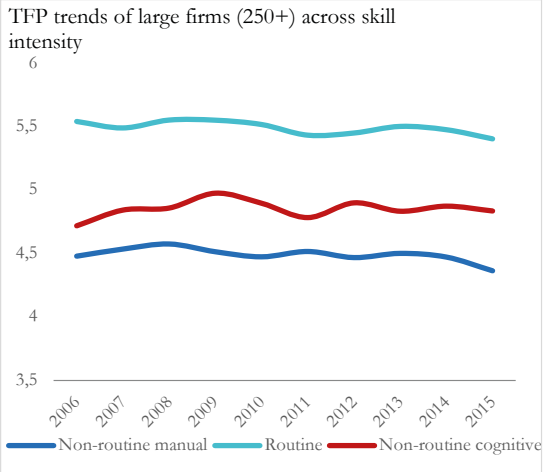


Figure 127: Large firms exhibit higher productivity particularly those with medium-skill labor



Source: EIS, WB Staff estimates.

Figure 128: Manufacturing firms' productivity relatively flat across all skill intensities

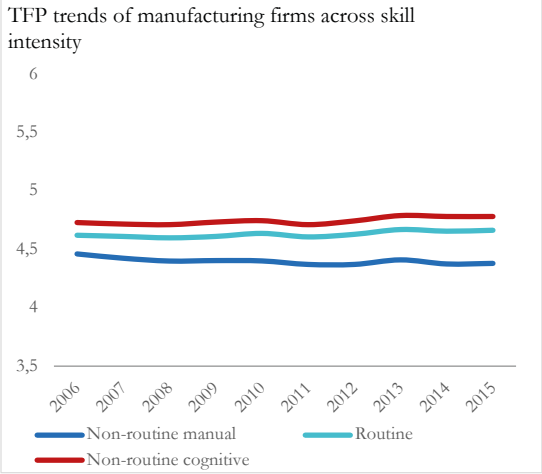
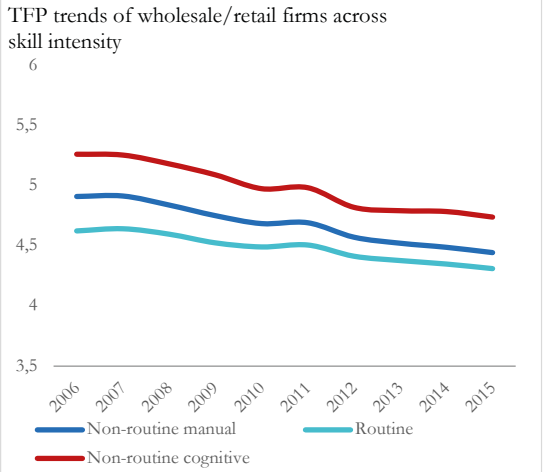


Figure 129: Wholesale/retail firms' productivity on declining trend across all skill intensities



Source: EIS, WB Staff estimates.

41. **Small firms are not the ones that will drive innovation and technological changes, or train their employees; they are therefore unlikely to contribute significantly to deepening skills**. The impact of firm characteristics on productivity and innovation are discussed further in chapters 2 and 4 respectively. In other words, small firms will not drive demand for higher skills. This means that even as the supply of skilled workers increases in the future, the prevalence of small-micro firms limits the labor market's capacity to absorb fully the next cohort of skilled graduates.

Conclusions and policy implications

42. **The main messages that emerge from the analysis on human capital and productivity in Turkey are as follows**:

(i) **Turkey's demographic dividend is less constrained by education than skills**: A relatively young population can sustain growth in labor supply for years to come. But education attainment is outpacing the labor market's ability to absorb more educated workers. Despite higher educational attainments, workers need to upgrade skills.

(ii) **Demand side factors *relative to* supply side factors deter deepening of skills:** Despite a steady increase in the demand for skills needed to accelerate productivity, progress is relatively slow. Wage growth and premia suggest slow demand for more and better skills. Plus, there is growing unemployment and NEET rates among the more educated.

(iii) **Turkey needs a boost in the demand for skills:** Without this, rising labor supply will not be absorbed in good quality jobs. This means accelerating FDI levels, which can increase the demand for more qualified workers.

(iv) **No significant relationship between skill composition and firm productivity:** These counter-intuitive results are likely linked to the prevalence of small-micro firms in the economy. These firms absorb the bulk of employment and suffer from declining productivity. Larger firms exhibit constant productivity over the last 10 years across all skill incidences.

Issues	Policy options
There is no significant correlation between skill incidence and firm productivity. One might expect labor productivity to be higher in firms that have higher incidence of workers engaged in non-routine cognitive (high skill) work. Over the last 10 years, TFP in firms which today have higher incidence of employment in non-routine cognitive occupations (high skill), has dropped by 12 percent compared to the 2006 levels.	Options that could strengthen the relationship between skills of the workforce and workers' and firms' productivity could be: • Investing in improving the foundational skills (numerical, literacy and problem solving) of future cohorts, starting from early years. • Revitalizing vocational training institutions, which are currently under-utilized, and lacking resources and investments; • Monitoring regularly the demand for skills (by sector and geographic area) to inform policy makers about the demands of the market, through a data-driven information system.

Issues	Policy options
The prevalence of small-micro firms in the economy might limit the capacity of firms to innovate, adopt new technology, and especially provide their own training to workers. Therefore, even if the supply of skilled	Same options as in chapter 2: • Review and address constraints to growth of large manufacturing firms. Strengthen their links to local and international value chains including SMEs.

workers increases in the future, given the structure of the Turkish economy and the prevalence of small-micro firms, the labor market might have a limited capacity to absorb fully the next cohort of graduates.	• Wind down supply subsidies that keep inefficient SMEs in business and prevent reallocation of resources to more productive firms.
A persisting challenge to firms' investment in workers' human capital, is the increasing mandatory cost of labor (e.g. the Minimum Wage hike registered in 2016). Greater labor costs and more costly compliance with labor regulations, might discourage formal job creation, especially among small firms, and create important trade-offs for firms, making financially constraint firms even less-likely to invest in training policies.	• Better labor market intermediation mechanisms, to maximize the quality of the match between firms and workers/skills; • Fiscal incentives for firms willing to invest in on the job training policies, that can improve the school- and university-to work transition of the youth, reduce "wait" unemployment, and therefore the incidence of NEET.

Chapter 6

Competition, regulation and productivity

VI. Competition, regulation and productivity

1. **Effective and open competition puts pressure on firms to become more efficient and allows high-productivity firms to increase their market share at the expense of low- productivity firms** (Olley and Pakes 1996; OECD, 2014). What is more, these latter, low-productivity firms will exit openly competitive markets, which also allows for the entry of more productive competitors (Aghion and Howitt 1990; Melitz 2003). In this way, competition may free up the efficient reallocation of market resources from low- to high-productivity firms as well as from low- to high-efficiency sectors. Industries where competition is more intense also tend to produce more innovation, further improving productivity (Blundell et al. 1999).

2. **Turkey has over time reformed its business regulatory framework, which has gradually helped increase market competition.** The big wave of reforms in the early 2000s targeted a reduction of state intervention in the economy and establishment of independent regulators, and through these aimed to encourage more private investment and competition in key sectors of the economy.[78] This chapter looks at: (i) the evolution and degree of competition across different sectors over the past ten years; (ii) the extent to which competition has impacted on the labor share of revenues, firms' ability to charge markups and firm-level productivity; and (iii) ongoing regulatory constraints to greater competition.[79]

More competitive sectors though manufacturing concentration remains high

3. **Turkey performs well among comparator economies in terms of intensity of local competition, whilst there is room to improve performance on competition policy**. On the intensity of local competition, Turkey ranks 6th among OECD economies in the 2017-2018 Global Competitiveness Report (Figure 130). This indicates that Turkish firms are subject to significant domestic market rivalry compared to most high and upper-middle income economies. The indicators on competition policy, on the other hand, present a different picture (Figure 131). Turkey ranks 25th out of 35 OECD economies on the effectiveness of antimonopoly policy, recording a score that is high for upper-middle income economies but low relative to high income ones.

4. **Intense local competition is borne out in Turkish firms' experiences.** This can be seen from the nature of competition as reported by firms—namely whether competition is against the informal sector, or against those whose main market is local as opposed to national or international (Table 16). To make sense of some underlying trends, sub-groupings in manufacturing and services are also presented, based on varying levels of technology or knowledge intensity (KI).[80] Overall, one-third of firms compete with the informal sector, though this decreases with technological intensity. Similarly, only in high-tech manufacturing do firms report that they generally operate beyond local markets. In all other sub-groupings firms' local market is predominantly their local city or municipality.

[78] WBG, "Turkey's Transitions: Integration, Inclusion, Institutions," (December 2014).
[79] A comprehensive competition assessment should evaluate (i) whether market regulation and sector policies are conducive to competition; (ii) whether antitrust rules and enforcement are effective; and (iii) whether there is competitive neutrality and non-distortive public aid support. The analysis presented in this chapter is limited to the first point and aims to explain how government regulation might be influencing the observed market outcomes.
[80] Using an OECD/Eurostat division. Manufacturing is divided into high-tech, high-medium-tech, low-medium-tech, and low tech. Services are divided into knowledge-intensive (KI) market services, high-tech KIS, other KIS, less KI market services, and other less KIS. Construction is still presented separately. The end notes from this chapter include the full list of sectors in each sub-sector.

Figure 130: Local competition in Turkey is high relative to comparator countries

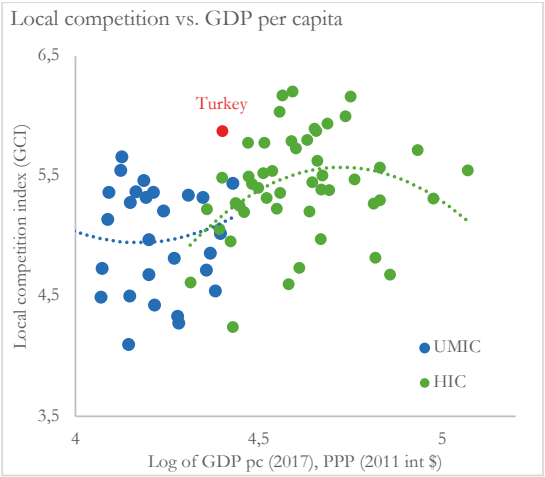
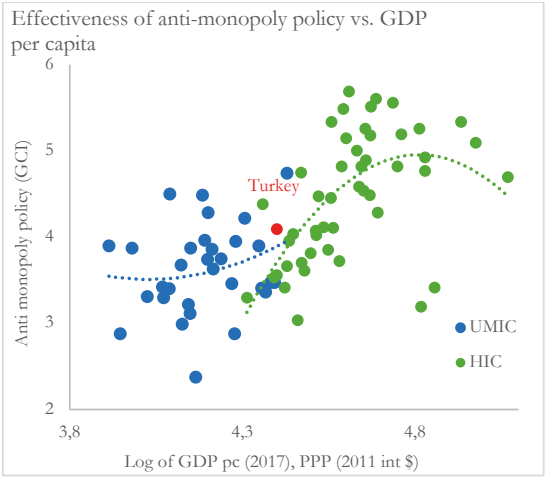


Figure 131: On competition policy however, Turkey falls behind comparator countries



Sources: Global Competitiveness Report. Notes: Index score 1-7, with 7 best. Dotted lines show a fitted, quadratic function.

Table 16: Competition with informal firms, and in local markets

Sector		Competing with Informal Firms	Main Market is Local
	Overall	**34.4%**	**88.8%**
Manufacturing	High tech	26.0%	47.0%
	High-medium tech	31.9%	76.5%
	Low-medium tech	31.2%	79.2%
	Low tech	47.6%	83.8%
Services	Less KI market services	30.6%	92.2%
Construction	Construction	31.5%	88.9%

Source: Regional Investment Climate Survey (RICA), 2015. Shown sub-sectors correspond to the population of the study. Figures are survey-weighted estimates.

5. **Competition is closely associated with the degree of concentration in individual sectors**. Concentration can be measured by the share of sales or employment in a sector that is capture by a small group of large firms. Where concentration is high (i.e. small group of large firms capture large share of sales and employment in the sector), so often is market power, also indicating that competition is low. Conversely, declining concentration represents the diffusion of market power from a certain few firms to other competitors, including new entrants.

6. **Recent work, mainly focusing on the US market, has focused on the increasing predominance of a handful of extremely large firms in certain sectors**. That is, in highly concentrated markets, a certain few firms account for increasingly high shares of sales and employment. These "superstar" firms are more and more able to capture higher markups for what they sell, but also to use their market position to lower the relative price of their inputs, including the share of profits accruing to labor (see, for example, De Loecker and Eekhout 2017 on markups and Autor et al. 2017 on labor share).

7. **While the concerns in the US market are that markets are increasingly concentrating, in Turkey an opposite trend is emerging in the concentration in manufacturing and in construction**. This is illustrated by looking at the average share of sales and employment accounted for by the top 4 and top 20 firms in each sub-sector. (Figure 132, 133, 134).[81] Both manufacturing and services show notable declines in concentration between 2006 and 2016. Autor et al. provide analysis for manufacturing[82], and so some rough comparisons can be drawn. For instance, from 2006 to 2011, the average share of sales accounted for by the top 20 firms in manufacturing increased from approximately 72 percent to 74 percent in the US; in Turkey on the other hand, the change over this same period was from 73 percent to 69 percent. In fact, over the whole period 2006 to 2016, this measure of concentration dropped a total of 8 percent (Figure 132).[83] Herfindahl-Hirshchman indexes (HHI), based on either sales or employment, confirm this general de-concentrating trend in manufacturing, but trends generally flat in services and construction.

Figure 132: Manufacturing concentration declining though remains high overall

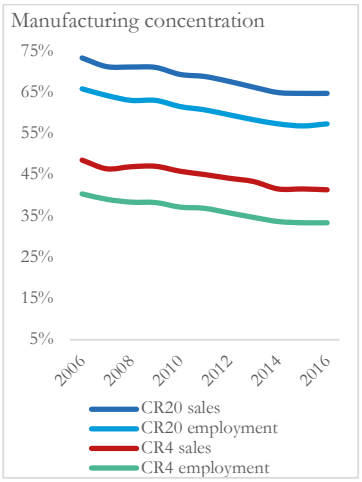


Figure 133: Services concentration is lower and has remained relatively flat

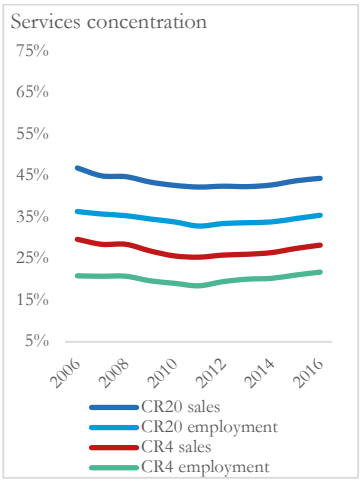
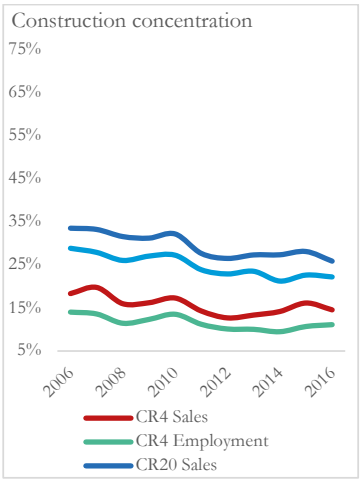


Figure 134: Construction has even lower concentration but has also declined over the sample period



Source: EIS, WB Staff estimates.
Notes: Figures are modeled after those shown in Autor et al. (2017) and show the concentration of the top four (CR4) and top 20 (CR20) firms in a four-digit Nace2 sector in a given year. These sectors are averaged together weighted by their relative contribution to value added in 2006, the start of the period. Nace2 74 "Other professional, scientific, and technical activities" omitted as it is an extreme outlier value.

[81] Shares are averaged by four-digit Nace 2 activity sub-sector, weighted by their contribution to value added in 2006
[82] They separate out different services sub-sectors and so these figures are less comparable. Their manufacturing data are available for the period 1981 to 2011.
[83] Note that the scaling of graphs varies. To avoid interpretation based on these scales, gridlines are shown in 10% increments and Technical Appendix includes the actual figures shown.

8. **Manufacturing remains the most concentrated, even though the trend is toward a more openly competitive market.** Just thirty-one firms (across both manufacturing and services) account for over one fifth of value added on average over the period shown, while only accounting for 5 percent of total employment in 2016, indicating a much higher market concentration in value added than in the labor market.[84] As reflected in the figures above, similar concentrations in sales are highest in manufacturing, which despite experiencing a notable decline over the period, remains highly concentrated. Such a persistent high degree of concentration further highlights potential risks from near-monopolistic market shares, underlining Turkey's relative performance on antimonopoly policy shown above.

9. **More high-tech and skill intensive sectors tend to be more concentrated, with gradual increases in competition over time.** This is to be expected as high tech and more skill intensive sectors more difficult to break into. They involve greater risk for example in terms of high start-up costs and long gestation periods. For this reason, public subsidies and incentives are often targeted to these sectors to overcome market failures that lower investment in high-tech and skill-intensive sectors (Chapter 4).

10. **In Turkey, there is some evidence of declining concentration in more sophisticated manufacturing and services sectors between 2006 and 2016.** All manufacturing sub-sectors have exhibited decreasing concentration (i.e. more competition) between 2006-2016 (Table 17).[85] High and medium-tech sub-sectors remain highly concentrated in value added, though far less so in terms of employment. In the services sector, knowledge intensive market services (see Technical Appendix) exhibited increased concentration in value added over time, though a decrease in employment concentration. All other sub-sectors showed declined concentration. On the employment side, only less knowledge intensive market services increased concentration, though as shown below, this is the predominant market sub-sector.

Table 17: Concentration across manufacturing and services based on skill and technology intensity

		CR 20, Value Added				CR 20, Employment		
		2006	2016	Diff.		2006	2016	Diff.
Manuf.	High tech	79.6	72.2	-7.4		62.3	52.9	-9.4
	Medium-high tech	56.2	42.0	-14.3		23.2	18.4	-4.8
	Medium-low tech	42.9	28.7	-14.2		10.4	6.9	-3.5
	Low tech	22.8	15.3	-7.5		9.2	5.9	-3.3
Services	KI Market services	40.1	50.5	10.4		20.9	19.3	-1.6
	High-tech KIS	61.6	35.0	-26.6		28.4	23.0	-5.3
	Less KI market services	12.6	10.2	-2.4		5.2	6.8	1.7
	Construction	23.1	18.0	-5.1		9.9	6.1	-3.8

Sources: EIS, WB Staff estimates.
Note: Other KIS and Other less KIS are omitted as the two groups together account for approximately 1% of value added or employment.

[84] Based on calculations from EIS data. The decline in real value-added share of these firms over the period is from 29% in 2006 to 21% in 2016; and from 7% of employment to 5% over the same period. These firms are identified as having accounted individually for 0.5% of value added in a given year over the period.
[85] The two residual "other" services sub-sectors are omitted hereafter as they collectively account for roughly 1% of value added and employment.

11. **There has been a general shift in the economy towards services**; all manufacturing sub-sectors (except low-tech, which accounts for the biggest share in value added and employment) lost value-added and employment shares between 2006 and 2016 (Table 18). In services, less knowledge intensive market services—predominantly commercial trade—dominate in terms of value added and employment shares. Though this sub-sector shows little movement in shares, it did drop substantially in labor productivity, dampening overall labor productivity of services (chapters 1 and 2). In the professional-services-heavy sub-sector of knowledge market services, shares and labor productivity grew notably; construction accounted for the greatest change in shares toward services, but with declining labor productivity. Therefore, sectors that are absorbing more labor are becoming less concentrated, though labor productivity in those sectors is also declining (Figures 135, 136).

Table 18: Manufacturing and services sub-sectors' shares in total value added and employment (2006-2016)

		Share, Value Added (%)			Share, Employment (%)			Value Added per Worker (log)		
		2006	2016	Diff.	2006	2016	Diff.	2006	2016	Diff.
Manuf.	High tech	2.5	1.9	-0.5	1.2	0.8	-0.4	7.5	7.8	31.6
	Medium-high tech	19.4	16.6	-2.8	8.8	7.9	-1.0	7.4	7.3	-11.5
	Medium-low tech	15.0	14.8	-0.2	9.7	9.1	-0.6	7.6	7.3	-23.8
	Low tech	18.6	18.9	0.3	20.9	17.7	-3.2	6.6	6.5	-3.8
Services	KI Market services	3.1	3.8	0.7	4.8	6.6	1.8	6.8	6.9	11.3
	High-tech KIS	1.7	1.7	0.0	0.9	1.3	0.3	8.1	7.6	-48.2
	Other KIS*	0.4	0.3	-0.1	0.4	0.4	0.1	6.7	6.1	-57.9
	Less KI market services	34.3	35.3	1.1	44.0	44.4	0.4	6.5	6.2	-32.5
	Other less KIS*	0.5	0.4	-0.1	0.7	0.5	-0.2	6.6	5.7	-95.6
	Construction	4.6	6.2	1.6	8.5	11.3	2.8	6.1	5.8	-23.2

Sources: EIS, WB Staff estimates Notes: * Omitted from other tables and figures due to small shares.

12. **Labor productivity in services is declining, except for knowledge intensive market services, where a slight increase in competition is associated with a slight increase in labor productivity**. In services, sub-sectors may be more prone to localized competition, with less scope for economies of scale. But increased employment concentration in low skilled services drags down overall productivity. The impact of competition on productivity is analyzed in more depth below.

Figure 135: Lower employment concentration but also lower labor productivity in manufacturing

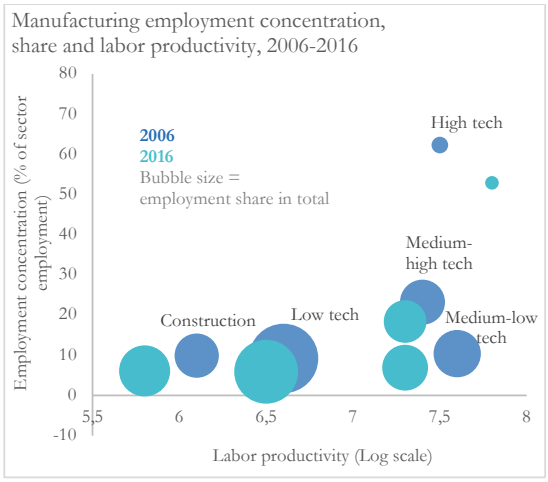
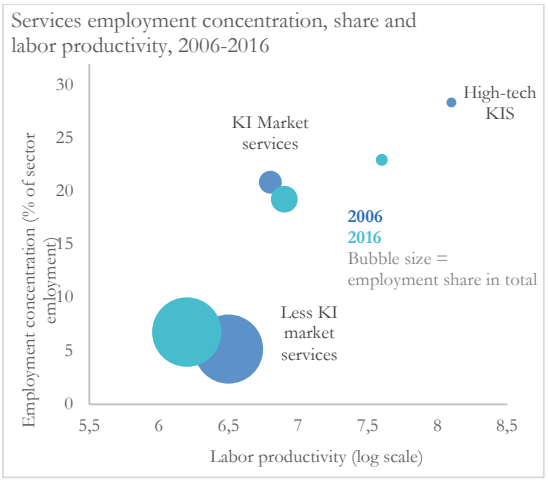


Figure 136: Increased employment concentration in low skilled services drags down overall productivity



Sources: EIS, WB Staff estimates.

Impact of competition on markups, labor share of revenues and productivity

(a) With reduced concentration, labor share is rising whilst markups are declining

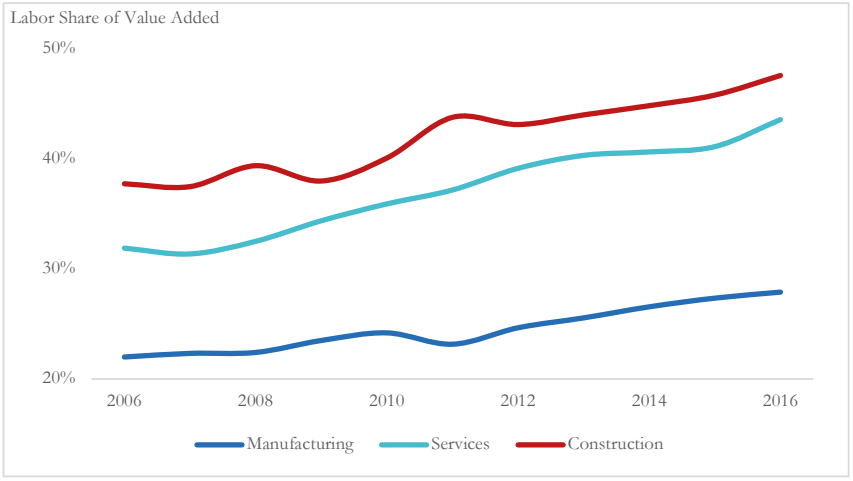
13. **Additional measures of market power help illuminate competitive market forces.** The concentration measures presented in the first part of this chapter, while illustrative, are also limited in cases of high product differentiation (Bresnahan 1989), which allows firms to command higher prices and revenues relative to their marginal costs. The most granular data presented in this chapter is for a given four-digit sector, within a year, and thus may mask even finer gradations in competition. What is more, concentration measures do not always move in tandem with increased competition, per se: reduced concentration does not necessarily and always imply reduced market power for a handful of firms. A useful framework that illustrates this point is one where opening of competition results in a 'winner take most' scenario, whereby a few firms command larger and larger market shares (Autor et al. 2017). This scenario may result as new technology and availability make consumers more sensitive to price differences, resulting in those consumers purchasing from only a small sub-set of firms (Akerman et al. 2017).[86]

14. **There is a global concern over the secular decline of the once-stable share of revenues going to labor** (Karabarbounis and Neiman 2013; Dao et al. 2017; Autor et al. 2017). One issue in such a scenario, is that firms are able to command greater prices and revenues, with lower total labor compensation accruing to workers, as a proportion of total firm revenues—what is known as "labor share". In fact, several analyses have noted that globally, labor share has been declining for the past several decades. This decline has been attributed to foreign competition, technological change, and predominant-firm market power. Market power enables firms to charge a higher markup (price above marginal cost of producing one unit), leading to higher revenue due to inelastic demand, but a proportionately smaller increase in labor share.

[86] As elaborated in Autor et al. (2017).

15. **In Turkey, the labor share has been on a consistent, positive trend over the past decade, in stark contrast to trends in several high-income economies** (Figure 137). This is consistent with lower concentration (and the strong contribution of labor incomes to Turkey's impressive record of poverty reduction).[87] In general, if market power is declining, firms cannot command prices too far above the marginal cost required to produce a good or service (i.e. a markup); this will also result in a larger share of the bottom line accruing to labor.[88] Likewise, a rising labor share would occur due to either increased wage values or due to a shift toward labor-intensive production; with some evidence for the latter following in the later parts of this chapter.

Figure 137: Labor share in value added is rising across all sectors



Source: EIS, WB Staff estimates. Notes: Labor share is the total wage bill divided by value-added, which is adjusted to remove measurement error form the first-stage of the Ackerberg-Caves-Frazer TFP estimate, as in De Loecker and Eekhout's (2017) estimate of markups. Sector level averages weight four-digit Nace2 sectors by value added contribution in 2006.

16. **Service sectors across all skill levels dedicate a greater share of value added to labor compared to manufacturing** (Figures 138 ,139). High labor share in high-tech knowledge intensive services is likely driven by wages, whereas in construction and low skill areas by employment levels. Similar wage and employment-driven trends may explain the relative movement of low and high-tech manufacturing. What is clear across both figures, nonetheless, is the general rise in labor share across all sub-sectors.

[87] WBG, "Turkey's Future Transitions: Towards Sustainable Poverty Reduction and Shared Prosperity," (2017).

[88] Formally, this can be expressed by defining the share of labor of firm i as $\frac{wL_i}{VA_i} = \frac{\alpha^L}{\mu_i} + \frac{wF}{VA_i}$, where VA_i is firm-level value added and μ_i is a firm-level markup. Wages, *w*, are set at the market level, for both variable labor and a fixed amount of labor, F, which is required for production. The elasticity of labor is α^L. Note that for labor share to increase, the comparative statics of wages, fixed labor, and the elasticity of labor are upward; they are downward for value added and markups. Thus, increased labor intensity either through wages, the labor requirement F, or α^L would be consistent with an increasing labor share. See Autor et al. (2017) for a framework.

17. **Consistent with the above trends, firm-level markups have also declined relative to their 2006 values**. Firms can charge markups when they have market power, but this can cause inefficiencies by embedding non-competitive firms and practices. Therefore, a reduction in markups suggests that firms' market power may be loosening with greater competition.

18. **The median firm-level markups (relative to labor share) have fallen precipitously across all sub-sectors in services and manufacturing**. In services, the sharpest drops have been at either extreme of the skills spectrum (Figure 140): (i) among high-tech knowledge intensive services, which is likely due a base effect given that markups are likely to be high to start with, and more intense competition (Figure 140); and (ii) among low knowledge intensive market services, which is likely due to stronger competition. In the manufacturing sector, the sharpest drop in markups has been in the high-tech sub-sectors. This is also likely driven in part by a base effect; but this is also the one sub-sector within manufacturing that experienced lower concentration and higher competition (Figure 141).

Figure 138: Labor share in high skill services and construction driven by wage and jobs respectively

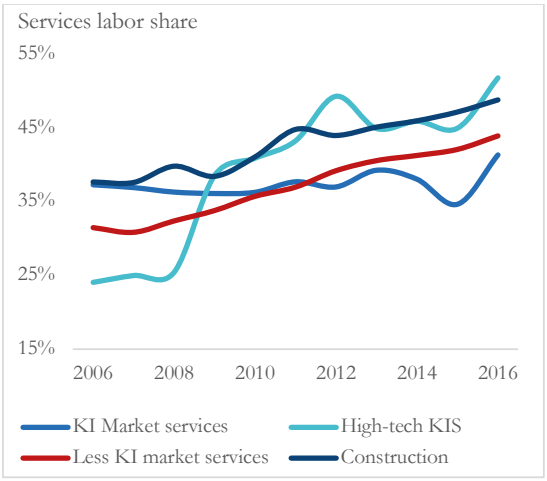
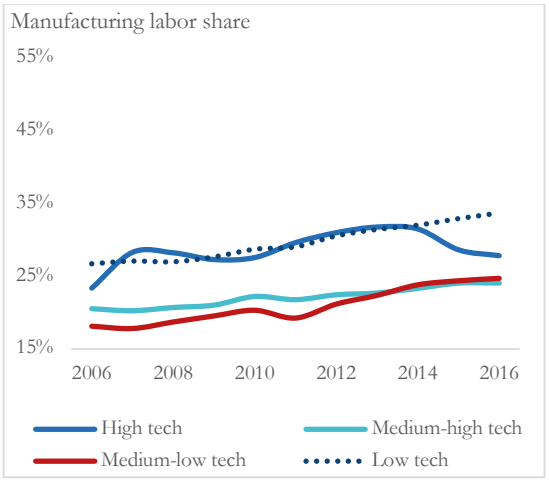


Figure 139: Labor share in high and low skill manufacturing driven by wage and jobs respectively



Sources: EIS, WB Staff estimates.
Notes: Labor share is the total wage bill divided by value-added, which is adjusted to remove measurement error form the first-stage of the Ackerberg-Caves-Frazer TFP estimate, as in De Loecker and Eekhout's (2017) estimate of markups. Sector level averages weight four-digit Nace2 sectors by value added contribution in 2006.

Figure 140: Sharp drop in markups across all services sub-sectors

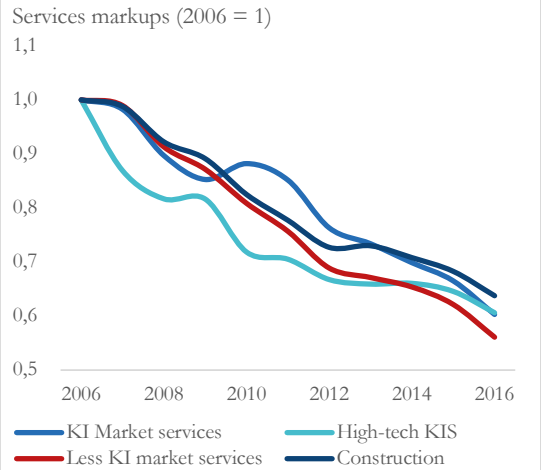
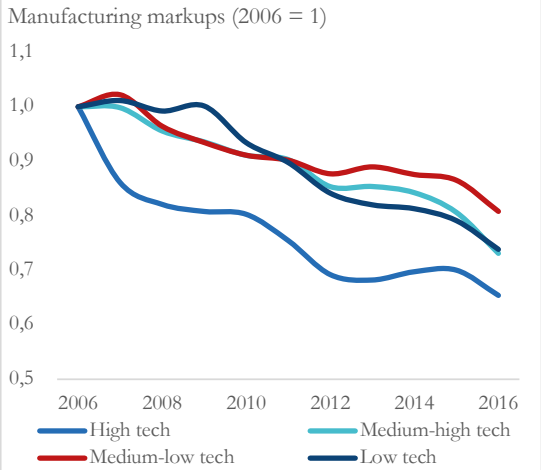


Figure 141: Sharpest drop in markups in the high-tech sub-sectors sectors within manufacturing



Sources: EIS, WB Staff estimates.
Notes: Values shown are the weighted-average of four-digit-level median markups based, following e.g. De Loecker and Eekhout (2017). Figures are from a Cobb-Douglas estimate and thus are not conditional on other firm-level inputs, like capital. Sector level averages weight four-digit Nace2 sectors by value added contribution in 2006.

(b) More competition but in less productive sectors hampers overall productivity growth

19. **Despite the increases in terms of labor share and markups, the observed declines in concentration have been associated with declining productivity.** In terms of the concentration of sales, for example, declines in market concentration are associated with reductions in productivity (Table 19).[89] These results are close to unity, meaning a 1 percent decline in concentration measures is correlated with a 1 percent reduction in productivity measures.

[89] Table 20 presents the predicted marginal effects of a 1% *decrease* in market concentration (across various measures). These are based on coefficients from stacked regressions, where the output is the five-year change in productivity or labor share regressed against the five-year change in concentration (in either sales or employment). The observation level is a four-digit, Nace2 sector, over different periods (for example 2007-2012).

Table 19: Correlation between a 1 percent decline in concentration and overall productivity

Concentration in Sales						
	CR 4		CR 20		HHI	
TFP	**-1.1%**	***	-0.5%		**-1.2%**	**
Labor Productivity	**-1.4%**	***	**-0.8%**	**	**-1.3%**	***
Labor Share	**0.1%**	***	**0.2%**	***	**0.1%**	*
Concentration in Employment						
	CR 4		CR 20		HHI	
TFP	0.1%		0.3%		-0.5%	
Labor Productivity	-0.1%		**0.1%**	*	0.0%	
Labor Share	0.0%		0.2%		-0.5%	

Note: Calculations based on EIS data and show regression coefficients multiplied by -1% to reflect a linear, marginal effect of a change in a concentration measure. Stacked five-year change regressions of change within four-digit Nace2 sector; n=2568 for all regressions. Observations are weighted by their contribution to total value added in 2006. Year fixed effects included. Robust standard errors clustered on the Nace2 four-digit sector level. Nace2 74 omitted as an extreme outlier. Bold results indicate significant results at * 10%, ** 5%, and *** 1%.

20. **This should not be taken to say that more competitive markets result in declining productivity.** The above results should be given their appropriate caveats. First, as illustrated above, sectors, particularly manufacturing remain notably concentrated. Second, under a model of 'winner take most' competition, where a few highly productive firms capture increasing market share, such trends are consistent with the lack of highly productive market superstars and the presence of increasing numbers of less productive (and possibly more labor-intensive) firms. That is, the prevailing market conditions are such that there has been declining market concentration at the same time as a re-allocative shift toward less productive activities. This is consistent with findings in chapter 1 and 2, and is analyzed further below. Interestingly, the lower pane of the table shows little movement correlated with changes in market concentration measures for employment. This question of the allocative forces are taken up in the last part of the chapter.

21. **Some interesting trends are unmasked at sub-sector level**. In manufacturing, the correlation between decreasing concentration and lower productivity is driven by medium-high-tech and low-tech manufacturing (Table 20). High-tech manufacturing, in fact, shows signs that decreased concentration is correlated with notably high gains in productivity.

Table 20: Correlation between a 1 percent decline in concentration and productivity across sub-sectors

		CR4		C420		HHI	
High-tech Manufacturing n=72	TFP	-0.9%		**7.7%**	***	**1.2%**	***
	Labor Productivity	-1.9%		**7.9%**	**	**0.9%**	***
	Labor Share	**0.2%**	***	0.0%		0.0%	
Med.-high-tech Manufacturing n=348	TFP	**-1.8%**	***	**-1.7%**	**	**-1.6%**	***
	Labor Productivity	**-2.2%**	***	**-2.5%**	***	**-2.5%**	***
	Labor Share	0.1%		**0.4%**	***	0.1%	
Med.-low-tech Manufacturing n=354	TFP	**-1.6%**	***	-0.8%		-0.4%	
	Labor Productivity	-0.7%		-0.2%		-0.3%	
	Labor Share	0.1%		**0.3%**	***	0.0%	
Low-tech Manufacturing n=474	TFP	-0.6%		-1.0%		**-2.0%**	**
	Labor Productivity	**-1.3%**	**	**-1.4%**	***	**-2.1%**	***
	Labor Share	0.1%		**0.2%**	*	**0.3%**	***
KI Market Services n=132	TFP	**-5.1%**	**	**-2.8%**	*	**-6.5%**	*
	Labor Productivity	**-5.5%**	***	**-2.3%**	*	**-7.4%**	***
	Labor Share	0.2%		0.0%		**0.4%**	***
High-tech KIS n=132	TFP	-4.5%		-6.7%		-2.0%	
	Labor Productivity	**-4.5%**	*	-5.4%		**-2.1%**	*
	Labor Share	**0.4%**	***	**0.6%**	***	0.0%	
Less KI Market Services n=822	TFP	0.6%		0.8%		1.0%	
	Labor Productivity	-0.3%		-0.2%		-0.5%	
	Labor Share	0.0%		0.1%		0.1%	
Construction n=132	TFP	-1.1%		-0.8%		-1.5%	
	Labor Productivity	-1.5%		-1.3%		-1.7%	
	Labor Share	0.3%		0.4%		0.2%	

Note: calculations based on EIS data and show regression coefficients multiplied by -1% to reflect a linear, marginal effect of a change in a concentration measure. Stacked five-year change regressions of change within four-digit Nace2 sector. Observations are weighted by their contribution to total value added in 2006. Year fixed effects included. Robust standard errors clustered on the Nace2 four-digit sector level. Nace2 74 omitted as an extreme outlier. Bold results indicate significant results at * 10%, ** 5%, and *** 1%.

Regulatory framework affecting competition improves but still restrictive

(a) Turkey catching up quickly on regulatory reform but still behind peers

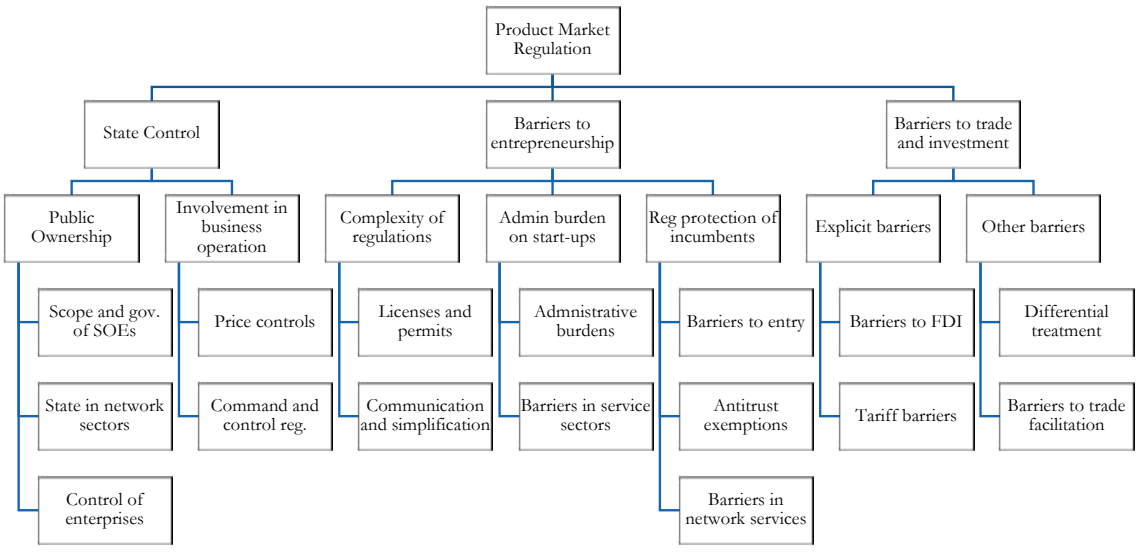
22. **Competition-enhancing regulations enable the market to select the most efficient firms, thereby creating incentives for firms to reduce costs and for new, more efficient firms to enter the market** (Aghion and Schankerman, 2004). By contrast, the presence of dominant players in the market with too little competition can drive up firm markups and can decrease the level of innovation (Aghion et al. 2001; Impulliti and Licandro 2018). Effective antitrust policies should avoid the creation of dominant positions while safeguarding economies of scale and incentives for innovation, especially in resource and technology-intensive sectors. Regulations directly impact the entry and exit of firms. An efficient bankruptcy settlement law can ensure that investors are able to close a failing entrepreneurial experience and move on to new challenges. Similarly, a streamlined business entry legislation allows competitive firms to enter the market.

23. **There is a vast amount of empirical evidence suggesting that pro-competitive regulations enhance productivity growth**. Hsieh and Klenow (2009) show that eliminating idiosyncratic distortions to United States levels could increase manufacturing TFP by 30 to 50 percent in China and by 40 to 60 percent in India. Nguyen et al. (2016) show that such improvements could boost manufacturing TFP in Turkey by 24.5 percent. Aghion et al. (2008) point out that increased competition—resulting in a 10 percent reduction in markups—can lead to an increase in productivity growth in South Africa by between 2 and 2.5 percent yearly. Finally, Nicoletti and Scarpetta (2003) find that reforms intended to promote private governance and competition tend to also boost productivity across OECD economies.

24. **A comprehensive competition policy framework relies on two complementary pillars**: enabling markets by removing sector specific competition constraints; and economy wide enforcement of competition policies (Kitzmuller and Licetti, 2012). Both pillars rely on an effective institutional set up that can foster and guarantee healthy market conduct.

25. **In the past two decades, Turkey made progress in regulatory reform.** This includes modernization of institutions, improvement in the quality of regulations and simplification of administrative procedures (World Bank, 2010). The OECD's Product Market Regulations Indicators (PMR) summarize information on economy-wide and industry-specific regulatory provisions that have the potential to restrict competition in areas where competition is viable (Figure 142). The analysis conducted in this chapter relies on 2013 data in the absence of more updated figures. PMR data are extremely informative and updating such data set represents a priority for countries that intend to monitor the effects of their regulatory framework on competition. Since the 1998 edition of the indicators Turkey's score has steadily improved, implying an overall reduction in the regulatory barriers to competition. The scores of high performing countries that recently crossed the HIC bar improved more quickly, but Turkey caught up quickly with selected Trapped MICs, whose progress has been relatively flat (Figure 143).

Figure 142: OECD Product Market Regulation



Source: OECD.

Figure 143: Turkey is catching up on regulatory reforms as measured by PMR

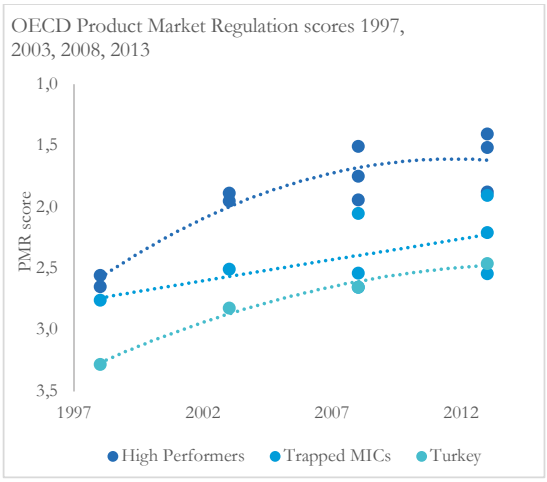
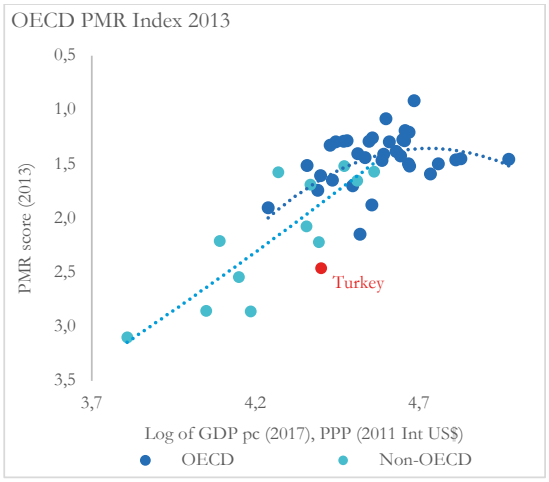
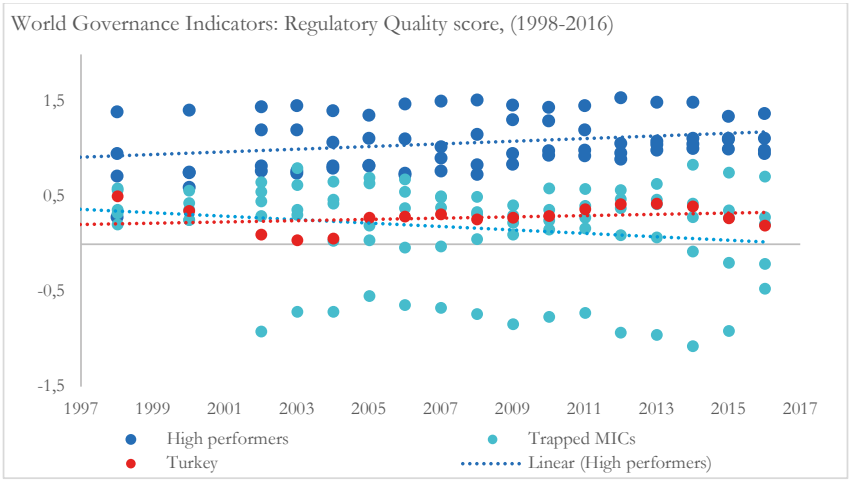


Figure 144: Though remains behind recent HIC graduates and other OECD economies



Sources: OECD.
Notes: PMR Score 1 is best. High Performers as in other parts of the report include Chile, Czech Republic, Korea and Poland. Trapped MICs in the above chart include Brazil, Mexico, South Africa.

Figure 145: With some indication that progress in most recent years has slowed down



Sources: World Governance Indicators

26. **Despite the improvements achieved in the past decade, regulatory restrictions to competition are still more prevalent in Turkey than comparator countries.** Turkey's PMR score is almost twofold (1.9) more restrictive (higher score in the index) than the average OECD best-practice economy. Even when compared to non-OECD members Turkey performs poorly (Figure 144). The World Governance Index Regulatory Quality score also suggests some slippage in most recent years (Figure 145).

27. **Disaggregated PMR data allow to identify specific dimensions where regulation could be most hampering to competition in Turkey**. Barriers to entrepreneurship, such as burdensome market-entry procedures and restrictive permitting systems, are high. Moreover, restrictions in the services sector are common. These are typically regulations stipulate a fixed number of suppliers, grant exclusivity in the provision of services and impose restrictions to practice. Finally, state control on economic activities, such as price regulation mechanisms and rules that grant large state participation in markets, are prevalent.

28. **The next sub-sections look at two aspects of the regulatory framework that affect competition and productivity**. The first relates to regulatory barriers for firm entry and exit, which are implicit constraints on competition. Barriers to firm entry also fall under the PMR barriers to entrepreneurship (Figure 143, 144), where Turkey performs lags comparator countries. The second, are regulatory restrictions on services, as discussed in chapters 3 and 6, which impact services and manufacturing sectors' productivity. Turkey is also trailing comparator countries in the PMR barriers to the service sector.

(b) Despite regulatory reform, the impact of firm entry and exit on productivity is negative

29. **Regulatory barriers to firm entry and exit can dampen within sector productivity gains as more efficient entrants are prevented from displacing less efficient incumbents.** This can be aggravated by supply side subsidies discussed in chapter 1 or poor targeting of business incentives, which can distort markets and enable less productive firms to survive. The World Bank Group's Doing Business indicator on Starting a Business can be a proxy for regulatory barriers to firm entry.[90] Turkey performs well on this dimension, in-line with OECD, high-income averages (Figure 146): in Turkey, starting a business takes 7 procedures (compared to an OECD average of 5), but these can be accomplished in under a week, which is 2 days shorter than the OECD average 8.5 days.

Figure 146: Turkey performs well on business entry regulations

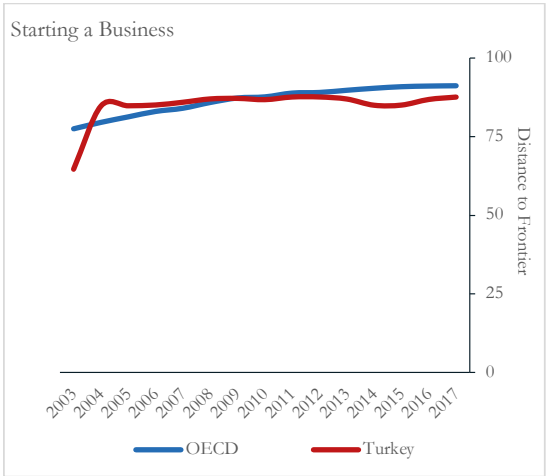
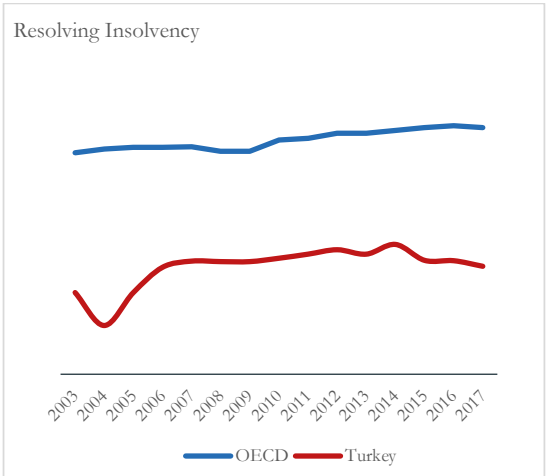


Figure 147: Though not very well on regulations for dealing with insolvency



Sources: WBG Doing Business, 2018
Notes: Distance to frontier = economy's relative position to global best practices (100 = the frontier).

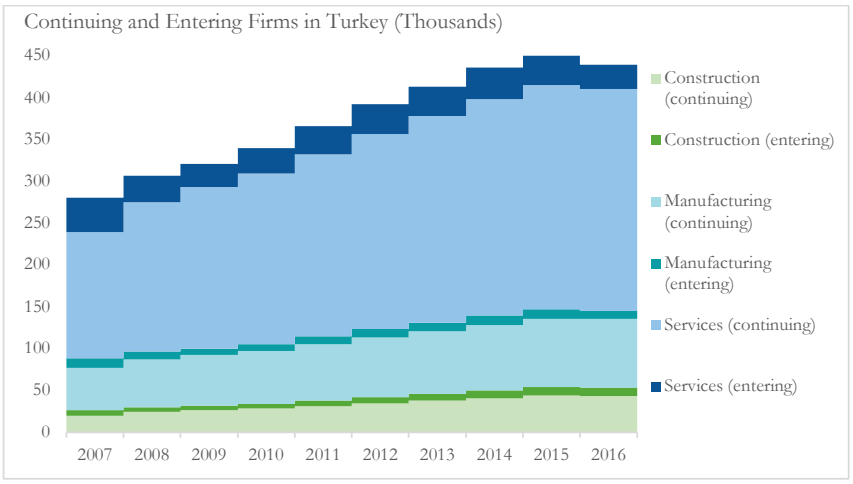
[90] http://www.doingbusiness.org/methodology

30. **While Starting a Business in Turkey is comparatively efficient and less burdensome, an opposite conclusion emerges when looking at Resolving Insolvency** (Figure 147). Although these measures do not capture all barriers to firms' exit, DB's Resolving Insolvency gives a sense of the time, procedures, and legal protections for creditors to recover owed assets. Where these procedures are less burdensome, creditors are more willing to lend, often allowing for greater dynamism in the private sector (see Araujo et al. 2012 and Paik 2013). By contrast, in economies where these procedures are burdensome, less productive firms are more likely to remain in the market, dampening overall productivity (Aga and Francis, 2017).

31. **Turkey fares particularly poorly on DB's indicator for the time and cost required for firms to resolve insolvency**. In Turkey, it takes a creditor up to five years to recover only 15 cents on the dollar from an insolvent firm, compared to a process that requires less than two years, with a recovery rate of over 70 percent for creditors in high-income OECD economies.[91] What is more, this process in notably expensive in Turkey, where it costs the equivalent 14.5 percent of the creditor's estate to recovery owed assets, including a tax of 4.6 percent and legal fees of nearly 5 percent. To address these challenges, a new 'concordat' procedure was recently introduced, which enables authorities to set timelines for the procedure, and puts a heavy focus on business continuation rather than its liquidation through new financing, confirmation of contracts and sale of essential assets in bankruptcy (Law No. 7101 Amending to Code of Enforcement and Bankruptcy, 2018).

32. **The regulatory ease in starting up a business in Turkey is associated with a growing number of firms across all sectors**. This can be seen by the cumulative number of active firms operating in Turkey (Figure 148). Unsurprisingly, the services sectors predominate; yet over the 2007 to 2016 period the share of firms in these broad sectors remains roughly the same, with services accounting for 68 percent of firms in 2007 and 67 percent in 2016.

Figure 148: The private sector in Turkey is broadly adding firms

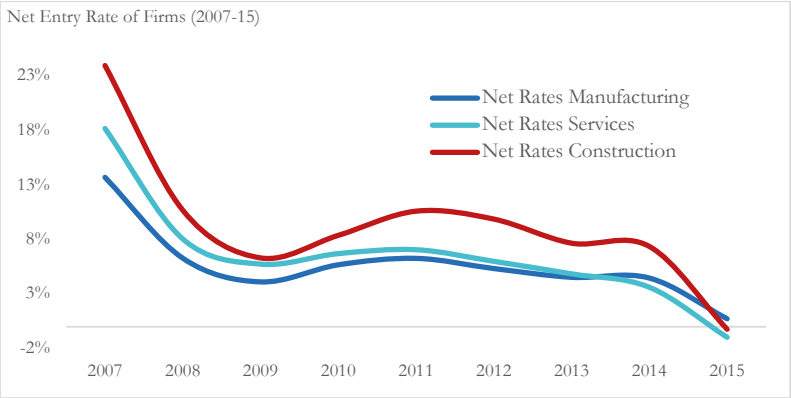


Sources: EIS, WB Staff estimates.

[91] Based on the 2018 Doing Business Report.

33. **At the same time, the rate of firm entry is decelerating, whilst the rate of firm exit is accelerating**. Over the period 2007 to 2015 (the period for which exit and entry rates can be calculated in the EIS data), the net entry rates of firms (new entrants plus exiting firms over the stock of continuing firms) dropped sharply—a trend that continued even after an initial plunge between 2007 and 2008 (Figure 149). These trends point two developments: (i) over the period entry rates far outpace exit rates – only in recent years have former slightly decreased, including in 2015 when the net rate dropped to zero; (ii) the declining trend in net entry rates over more recent years has been due to a pick-up in the exit rate of firms.

Figure 149: The net rate of firm entry is declining



Sources: EIS, WB Staff estimates.
Notes: Net entry rates defined as new entrants plus exiting firms over the stock of continuing firms.

34. **While net entry rates are generally decelerating, trends differ by sub-sectors**. The average net entry rates for two periods (2008 to 2011 and 2012 to 2015)[92] by sub-sectors show that net entry rates decelerated most in high-skill sub-sectors (Table 21). As noted above, these are also sectors that generally more difficult to break into.

Table 21: Net entry rates, 2008-2015

		Avg. 08-11	Avg. 12-15	Diff.
Manufacturing	High tech	5.3%	2.3%	-2.9%
	Medium-high tech	4.7%	2.8%	-1.9%
	Medium-low tech	6.3%	4.3%	-2.0%
	Low tech	5.5%	3.8%	-1.8%
Services	KI Market services	9.4%	5.4%	-4.0%
	High-tech KIS	12.9%	5.7%	-7.2%
	Less KI market services	11.1%	4.9%	-6.2%
	Construction	6.5%	3.1%	-3.4%

Sources: EIS, WB Staff estimates.

[92] Rates for 2007 are omitted as that year appears to be somewhat of an outlier. Including these rates maintains (and in many cases increases the magnitude) of results.

35. **The next step is to understand how firm entry and exit have impacted on within sector productivity**. If competitive forces allow more productive, new firms to enter the market as less productive firms exit, productivity will increase. If stagnant or less productive firms remain in operation, while new, dynamic firms are dissuaded from entering, productivity will flounder. Just the same, if more market share is gained by more efficient firms (or more efficient sectors), there will be a productivity gain. Researchers have been interested in breaking down the various potential sources of productivity growth, and several have adopted various decompositions to make sense of various trends. Generally, these decompositions separate out the effects of different types of firms, their measure of productivity, and their share of the market.

36. **The analysis shows that only manufacturing experienced net gains in Total Factor Productivity (TFP), and that this was due to TFP gains of incumbents rather than net entry dynamics.**[93] This is illustrated by decomposing the TFP (and labor productivity) effect(s) of both continuing firms (which includes both productivity growth *within* firms, as well as or market share shifts *between* firms) and the effect of net entry (Figure 150).[94] Both services and construction experienced declining productivity in both measures. What is more, the effect of net entry is negative across all broad sectors and for both measures; this indicates that on average, less productive firms are entering the market than those leaving it.

Figure 150: The effect of net entry on productivity has been negative

Sources: EIS, WB Staff estimates.
Notes: Figures are additive components of a log-difference of productivity and approximate the percentage change growth over the 2007-2016 period.

[93] TFP is calculated using a value-added measure of output using material inputs as a proxy for underlying productivity according Levinsohn and Petrin (2003). The correction proposed by Ackerberg et al. (2015) is used to allow firm-level labor inputs to affect their subsequent productivity levels.
[94] This section will rely on dynamic Olley-Pakes productivity decompositions with entry and exit of Melitz and Polanec (2015). Figures showing "continuing" effects combine both within and between effects; "Net entry" combines the effect of entry and exit.

37. **The relative change of labor productivity can also be informative, recalling that labor productivity can grow (shrink) either due to increased (decreased) TFP or due to firms increasing (decreasing) more capital per worker.**[95] Each of the broad sectors showed an entry effect that was positive for TFP (Table 22) i.e. even though entry effects are productivity-enhancing, they're generally offset by productive firms leaving the market. This would be consistent with expansions of new firms in low-value-added, labor-intensive industries, particularly if these effects represent a shift across sectors. Likewise, the exit effect for all three sectors was negative for TFP, particularly so for services and construction, indicating a loss from the market of more efficient, comparatively capital-intensive firms.

38. **Decomposing for manufacturing and services sub-sectors, labor productivity increased in only high- and low-tech manufacturing, with TFP increasing in the former but decreasing in the latter.** In high-tech manufacturing, net entry (the added effect of entry plus exit) had a dampening effect on productivity growth, meaning that productivity gains came from shifts toward more productive continuing firms. In low-tech manufacturing, net entry effects were positive for labor productivity (LP), but were negative for TFP, largely due to the exit of more productive firms.

Table 22: Entry and exit effects on TFP and labor productivity

			Cont.	Entry	Exit	Change
Manufacturing	**High tech**	LP	115.6%	-16.7%	-52.2%	46.7%
		TFP	84.4%	6.7%	-59.5%	31.6%
	Medium-high tech	LP	-3.7%	-18.1%	12.3%	-9.5%
		TFP	-14.3%	-5.2%	8.0%	-11.5%
	Medium-low tech	LP	-8.6%	32.9%	-32.1%	-7.8%
		TFP	-9.1%	3.2%	-18.0%	-23.8%
	Low tech	LP	17.3%	16.8%	-15.5%	18.6%
		TFP	-10.6%	1.9%	4.9%	-3.8%
			Cont.	Entry	Exit	Change
Services	**KI Market services**	LP	-52.3%	24.3%	-57.1%	-85.1%
		TFP	36.1%	-18.0%	-6.8%	11.3%
	High-tech KIS	LP	-94.0%	13.3%	-85.1%	-165.9%
		TFP	7.1%	-23.0%	-32.2%	-48.2%
	Less KI market services	LP	-12.5%	3.8%	-16.8%	-25.5%
		TFP	-12.1%	-13.4%	-7.0%	-32.5%
	Construction	LP	-10.3%	60.7%	-70.3%	-19.9%
		TFP	-11.0%	47.2%	-59.4%	-23.2%

Sources: EIS, WB Staff estimates.
Notes: Figures are additive to the total change over the 2007-2016 period for each sub-sector. LP: Labor productivity. Cont.: continuing firms.

39. **In services, all productivity measures, except for TFP in KI market services, showed decreases**. However, the net effect of firm entry in all services sub-sectors was negative, for both labor productivity and TFP. Thus, the TFP gains for KI market services were from shifts of market shares toward more productive, continuing firms.

[95]From a Cobb-Douglas production function, the first-order change in labor productivity $(Y/L)' = (A)' + \alpha (K/L)'$, where $(A)'$ is the change in TFP and $\alpha (K/L)'$ is the change in capital per worker, scaled to the elasticity of capital, α.

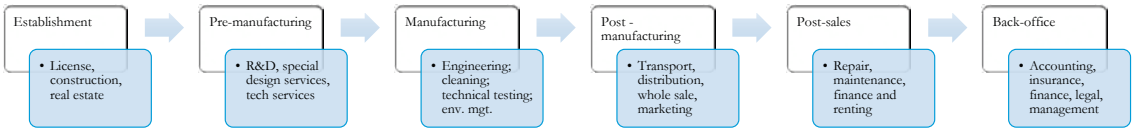
(c) Regulations in the service sector pose obstacles to competition and productivity[96]

40. **Appropriately regulated and productive services are a major determinant of TFP growth**. Services can be direct outputs or an input that is embodied in another service or manufacturing (Chapters 1 and 2). They are important drivers of Global Value Chains (GVCs) (Chapter 3). Firm-level studies (Arnold et al. (2015; 2011), Van der Marel et al. (2016)) show that regulatory reform in services has a positive impact on downstream manufacturing and services firms' productivity. When service inputs are effectively supplied, this has a knock-on effect on industries that use services. In other words, services sector deregulation can lead to a more productive allocation of resources, thereby generating economy-wide productivity effects. Yet, to optimize benefits from deregulation of services, good institutions are needed to guide this process of services liberalization (Beverelli, et al., 2015; Van der Marel, 2016).

41. **A recent World Bank study finds that Turkey has much potential to increase the impact of services on manufacturing productivity** (Haven and Van Der Marel, 2018)**.** It finds that the bulk of services inputs in Turkish manufacturing exports come from (relatively less productive) transport and distribution; OECD firms, in contrast, rely on a much higher share of (relatively more productive) business services. It also finds, surprisingly, that manufacturing firms with service affiliates tend to be less productive.[97]

42. **Part of the reason for the above results is because most service activities within Turkish manufacturing are in traditional service sectors.** Services can be categorized into six production process stages (Figure 151). Most service activities within Turkish manufacturing firms are in the post-manufacturing stage (e.g. transportation and distribution), which are also fast-growing sectors. Back-office services and establishment services are the next largest categories. Establishment services and post-manufacturing services are in large part comprised of more *traditional services*. *Modern services* include telecom, computer, R&D, intellectual property, banking, insurance; these tend to be more prevalent in pre-manufacturing, post-sales and back-office stages.

Figure 151: Production stages of the value chain where services are added



Sources: Haven and Van Der Marel (2018) based on high-level categorization from Low and Pasadilla (2015).

43. **A key difference between traditional and modern services is that modern services can be delivered at arm's length** (e.g. using the internet), without simultaneous production and consumption in the presence of producers and consumers. As a result, modern services often are associated with higher levels of value added and hence productivity (see Ghani et al. 2012; Ghani 2010). Moreover, traditional services are often in sectors that many countries have found difficult to reform, e.g. transportation services which still face many restrictions globally.

[96]This section is based entirely on Haven, T, and E Van Der Marel, "Servicification of manufacturing and boosting productivity through services sector reform in Turkey," The World Bank (2018).
[97] For instance, non-exporter manufacturing firms with a services affiliate are 18 percent less productive than firms without a services affiliate. Exporters with a services affiliate are 9 percent less productive than those without one.

44. **Consistent with the above, the type of services that Turkish manufacturing firms perform is correlated with their productivity.** Overall, manufacturing firms engaged in post-manufacturing and establishment services are the least productive in Turkey, whereas those engaged in pre-manufacturing and back-office service are relatively more productive. Regression analysis shows that firms with establishment services are around 20 percent less productive than non-servicified firms. Similarly, manufacturing firms that also produce post-manufacturing services are on average 13.8 percent and 18.7 percent less productive in the case of exporters and non-exporters respectively compared to their non-servicified peers.

45. **Turkey has scope to further reduce services regulatory restrictions.** The discussion below covers three regulatory areas in particular: i) FDI restriction in services; ii) domestic regulatory barriers in services that affect both Turkish and foreign firms; and iii) discriminatory services trade barriers that prevent foreign service providers from entering and operating in the Turkish economy.

46. **First on FDI in services, Turkey generally has an open policy regime (Figure 69), though there are restrictions within the establishment and post-manufacturing stages of production.** High FDI restrictions still exist in services sectors such as maritime and air transport, which are part of the post-manufacturing stage. Although FDI for construction services (establishment stage) is not restricted, the real estate sector has high FDI barriers. Similarly, while there are few restrictions for FDI in overall business (back-office) services, accounting services face high barriers.

47. **FDI restrictions in the post-manufacturing and establishment stages can have a negative impact on the productivity of manufacturing firms.** Evidence of positive spillovers from FDI is discussed in chapter 3. FDI barriers in Turkey not only limit the entry of more productive foreign service providers, but also productivity-enhancing spillovers to local suppliers of those service providers. This could have a negative productivity impact on manufacturing firms, particularly those that rely more heavily on efficient establishment and post-manufacturing services. Establishment services are more prevalent in Automotives, Plastics and Textiles, and post-manufacturing services stand out for Agribusiness, Plastics, Textiles, and Chemicals.

48. **Secondly, domestic regulatory barriers affect both domestic and foreign service suppliers.** Based on the 2013 OECD PMR results, higher levels of domestic regulatory restrictions in Turkey are mainly in post-manufacturing and back-office services. The largest restrictions are in rail and road transport (post-manufacturing stage), as well as accounting and legal services (back-office stage). These sectors may be indicative of the broader restrictiveness of services within each production stage, as many more services fall under each stage.

49. **Turkey shows a mix of entry and conduct barriers.** Rail transport services are completely restricted, affecting both firm entry and conduct. Air transport services mainly have restrictions related to public ownership, which affects the entry of foreign firms, but some conduct barriers also exist. The road transport sector has high entry barriers, while operations regulations are significantly lower. Gas and electricity services (manufacturing stage) have high conduct regulations, such as vertical integration policies, public ownership regulations, and uncompetitive market structures, whereas they are relatively open to firm entry. Architectural and engineering services (manufacturing stage) have high entry barriers while accounting and legal services (back-office services) have both restrictive entry and conduct regulations.

50. **Thirdly on services trade barriers, these are more prevalent in Turkey in the post-manufacturing and back-office stages**. Regulatory policies can have an explicit discriminatory nature preventing entry from foreign services suppliers.[98] These can be distinct from restrictions on foreign firms investing in a host country. Trade-related restrictions in services in the post-manufacturing stage are particularly high for air transportation, followed by logistics cargo handling (OECD STRI).[99] In the post-sales stage, courier services appear to be the most restrictive. Back-office restrictions are led by accounting services (where Turkey is still completely closed), followed by legal services.

51. **The most restrictive components of trade barriers in air transport and cargo-handling services are related to foreign entry and competition.** In air transport, there are still equity restrictions. Turkey also has some restrictions on mergers and acquisitions by foreign firms and nationality restrictions on boards of directors. Regarding competition policies, Turkey has regulations related to slots (i.e. no auction takes place to give away slots, all carriers are allowed to retain slots from one season to another, and no administrative slot system is in place) and minimum capital requirements, all of which affect foreign service suppliers. In logistics cargo handling services, there are barriers to competition, such as price and fee regulations, contracts awarded without competitive bidding processes, and minimal capital requirements.

52. **Services trade barriers tend to affect firm operations more than entry.** Although entry barriers are still present in services markets, more restrictions affect firm operations. On the other hand, no clear pattern arises when looking at the differences between discriminatory and non-discriminatory barriers. In most services sectors (apart from air transport and insurance or logistics freight and maritime services), restrictions affect both foreign and domestic firms.

53. **Restrictions on firm operations can dampen growth.** Cross-country differences in the post-entry performance of all firms tend to be more marked than differences in entry and exit patterns, which suggests an important role for services conduct regulations (Van der Marel et al. 2016). Furthermore, the OECD (2016) finds that post-entry growth patterns between countries explain firms' ability to achieve sufficient scale to reach global markets, and the share of small firms that are relatively old negatively affects aggregate productivity and employment growth. Put differently, in countries with high restrictions on firm operations, there are not sufficient selection mechanisms or up-or-out dynamics. Regulations on the operations of the firm are in effect barriers to up-scaling after firm entry.

54. **In Turkey, services firms are relatively small, and there is little evidence of post-entry firm growth in both goods and services.** The recent Turkey enterprise survey (World Bank, 2017) shows that services firms are overwhelmingly small on average, with a few stand-out large firms. This reflects the general patterns in Turkey that both goods and services firms tend to be smaller than in comparator countries. More importantly, the vast majority of firms in Turkey start with very few employees and show no significant pattern of growth. No matter the age group, about three quarters of firms in Turkey that start small remains small. Only a handful of Turkish firms see a substantial growth pattern. Moreover, medium-sized firms (20-99 employees) do not show signs of scaling-up over time. Reducing conduct regulation could therefore help young firms to grow or exit (i.e. "up-or-out").

[98] Although regulatory services barriers can be *de jure* non-discriminatory, some non-discriminatory regulatory barriers may still have an effect on the operating costs of the foreign entrant making them *de facto* discriminatory (Francois and Hoekman, 2010). This is because complying with specific domestic regulations might be costlier for foreign suppliers than for local ones who have better access to information and lower red tape costs (Crozet and Milet, 2016).
[99] While there are more services sectors under each production stage, only 22 services sectors are covered by the OECD's STRI.

Conclusion and policy options

44. **The main messages that emerge from the empirical analysis on competition, regulation and productivity in Turkey are as follows**:

(i) **Reduced concentration across the board though manufacturing concentration remains high:** More high-tech manufacturing and skill intensive services tend to be more concentrated as these sectors are more difficult to break into. But even here, the trend, particularly in terms of employment shares of large firms, has been on a downward path.

(ii) **With reduced concentration, labor share is rising whilst markups are declining**: Total labor compensation as a share of firm revenues has consistently risen over the past decade largely due to a shift towards labor-intensive production. Firm-level markups (i.e. price above marginal cost of producing one unit) has been declining across all sectors.

(iii) **A shift towards less productive sectors hampers overall productivity growth:** This is not to say that more competitive markets result in declining productivity. Declining concentration has been accompanied by reallocation towards less productive sectors, which is related to business regulations that have an impact on competition.

(iv) **Despite regulatory reform, the impact of firm entry and exit on productivity is negative:** Starting a business is relatively easy, though dealing with insolvency is difficult. Net entry remains positive, though rate of firm exit in recent years has outpaced firm entry. But net entry has had a negative impact on productivity (i.e. on average, less productive firms are entering the market than those leaving it).

(v) **Regulations in the services sector pose obstacles to competition and productivity:** Scope to reduce restrictions on FDI in services; domestic regulatory barriers in services that affect Turkish and foreign firms; discriminatory services trade barriers that prevent foreign service providers from entering and operating in Turkey.

Issues	Policy options
Firm entry and exit	
Dynamism in high value-added, particularly capital-intensive industries is low. By extension, many of these sectors remain highly concentrated and closed to competition.	While policy barriers to entry (such as the procedure and costs to opening a business) are not comparatively high, other barriers to entry in these sectors persist, including the predominance of a few superstar firms. Measures, such as anti-trust policies, further opening competition in these sectors are important. Moreover, aligning capital risk, via policies that, for instance, would increase creditor recovery rates would help support more activity in these sectors.
Turkey fares poorly on the time and cost required for firms to resolve insolvency. This creates inefficiencies in the economy by keeping "zombie" firms alive, and hampers reallocation of resources to more productive firms.	Implement new 'concordat' procedure, which enables authorities to set timelines for the procedure, and puts a heavy focus on business continuation rather than its liquidation through new financing, confirmation of contracts and sale of essential assets in bankruptcy.

Issues	Policy options
Competition in the services sector	
Productivity gaps appear in areas where services are more restricted. Restrictions on competition in services, particularly from foreign firms may lead Turkish manufacturers to provide more services in-house than would be optimal from a productivity perspective. Minimum prices are in place for accounting, architecture, legal, and engineering services, while notaries regulate the exact level of pricing. Limitations on advertising apply to some professions and access to several professions is closed to foreign nationals. Fees for key professional services, such as legal and notaries, are among the highest in the OECD and the EU for comparable transactions (World Bank, 2013).	Remove FDI restrictions in: maritime and air-transport (post-manufacturing services); real estate (though not construction); overall business services, and accounting services. Professional services should be opened to competition. This includes reform to Turkey's regulatory framework governing the liberal professions (professions requiring special training in the liberal arts or sciences, such as notaries, lawyers, engineers, or accountants) and the regulations imposed by professional associations lessen competition by either restricting entry (such as stipulating a fixed number of suppliers, exclusivity in the provision of services, and restrictions to practice) or aiding members in coordinating prices (such as establishing minimum prices).

End notes: Classification of sectors by capital and knowledge content

MANUFACTURING	
High-tech	pharmaceuticals, computers, electronics, and precision instruments
High-medium-tech	chemicals, electrical equipment, machinery & equipment, motor vehicles, and transport equipment
Low-medium-tech	refined petroleum products, rubber & plastics, minerals, basic and fabricated metals
Low-tech	food & beverages, tobacco, textiles, garments, leather, wood, paper, printing, furniture, and other

SERVICES	
KI Market services	water & air transport, legal, consulting, architecture & engineering, advertising, professional activities, human resources, and security
High-tech KIS	motion pictures, broadcasting, computer programming, information service, and scientific R&D*
Other KIS	publishing, veterinary activities, arts, libraries, gambling, and sports
Less KI market services	retail, wholesale, auto sales, land transport, warehousing, hotels & restaurants, real estate, leasing, travel agencies, landscaping, office administration
Other less KIS	Postal and courier activities
Construction	Construction

* The classifications are based on EUROSTAT categories (groupings by NACE2): https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf .

Technical Appendix

Technical Appendix

Data Source

We rely on Entrepreneur Information System (EIS) which is an administrative dataset and which contains data on all registered firms in Turkey. EIS is compiled and administered by the Ministry of Industry and Technology (MOIT) and spans 2006-2016. Data are collected from various sources and matched. Table 23.

Table 23: Overview Entrepreneur Information System

Turkish Statistical Institute	2006-2016	Plant Level	*Enterprise:* ID *Plant*: ID, Activity Code (Nace Rev.2 4 Digit), Location (City), Social Security ID, Employment
Social Security Institution	2006-2016	Enterprise Level	*Enterprise:* ID, Activity Code (Nace Rev.2 4 Digit), Location of the Administrative Center (City), Social Security ID, Year of Establishment
Social Security Institution	2006-2016	Worker Level	*Plant:* ID *Worker:* ID, Gender, Age, Wage, Days Worked, Occupation (2014-2016)
Ministry of Finance[1]	2006-2016	Enterprise Level	*Enterprise:* ID, Balance Sheet Data, Income Statement Data
Ministry of Customs and Trade	2006-2016	Enterprise-Product Level	*Enterprise*: ID, Exports (Quantity, Value, Product Code - HS 6 Digit), Imports (Quantity, Value, Product Code – HS 6 digit)
Turkish Patent Institute	2009-2016	Enterprise Level	*Enterprise:* ID, Number of Patents, Number of Designs, Number of Brands
KOSGEB[2] and TUBITAK[3]	2011-2016	Enterprise Level	*Enterprise*: ID, Type and Amount of support received
Ministry of Finance	2006-2016	Enterprise Level	*Enterprise*: Reporting ID, Partner ID, Value of Goods/Services Sold/Purchased (above 5,000 TL), Time of Transaction

Notes: [1] This information is only available for the specific types of firms which are obliged to provide the Ministry of Finance with their balance sheet and income statement data. Namely, firms that either make purchases for amounts above TL160000 or make sales for more than TL 220000. These firms constitute around 20-25% of all enterprises in Turkey but account for more than 90% of the total economic activity.
[2] Small and Medium Enterprises Development Organization
[3] The Scientific and Technological Research Council of Turkey

Coverage

The analysis covers the period 2006-2016 and the manufacturing, construction and services sectors. Manufacturing sector includes 2-digit Nace Rev.2 sectors 10-32. We exclude 33 - Repair and installation of machinery and equipment.

Table 24: Manufacturing Nace Rev.2 2digit sub-sectors

10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing

Construction sector includes 2-digit Nace Rev.2 sectors 41-43.

Table 25: Construction Nace Rev.2 2digit sub-sectors

41	Construction of buildings
42	Civil engineering
43	Specialised construction activities

Services sector, on the other hand, includes retail and wholesale (45-47), transportation and storage (49-53), accommodation and food (55-56), ICT (58-63), real estate (68), scientific, occupational and technical activities (69-75), administrative and support services (77-82) and culture (90-93). We leave finance and insurance (64-66), public administration (84), education (85), health (86-88) and other services (94-99) either because there are too few firms or because these sectors are mostly state dominated.

Table 26: Service Nace Rev.2 2-digit Sub-sectors and sector classifications

Retail and Wholesale	45	Wholesale and retail trade and repair of motor vehicles and motorcycles
	46	Wholesale trade, except of motor vehicles and motorcycles
	47	Retail trade, except of motor vehicles and motorcycles
Transportation and Storage	49	Land transport and transport via pipelines
	50	Water transport
	51	Air transport
	52	Warehousing and support activities for transportation
	53	Postal and courier activities
Accomodation and Food	55	Accommodation
	56	Food and beverage service activities
Information and Communication Technologies	58	Publishing activities
	59	Motion picture, video and television programme production, sound recording and music publishing activities
	60	Programming and broadcasting activities
	61	Telecommunications
	62	Computer programming, consultancy and related activities
	63	Information service activities
Finance	64	Financial service activities, except insurance and pension funding
	65	Insurance, reinsurance and pension funding, except compulsory social security
	66	Activities auxiliary to financial services and insurance activities
Real Estate	68	Real estate activities
Scientific, Occupational and Technical Activities	69	Legal and accounting activities
	70	Activities of head offices; management consultancy activities
	71	Architectural and engineering activities; technical testing and analysis
	72	Scientific research and development
	73	Advertising and market research
	74	Other professional, scientific and technical activities
	75	Veterinary activities
Administrative and Support Services	77	Rental and leasing activities
	78	Employment activities
	79	Travel agency, tour operator and other reservation service and related activities
	80	Security and investigation activities
	81	Services to buildings and landscape activities
	82	Office administrative, office support and other business support activities
Public Administration	84	Public administration and defence; compulsory social security
Education	85	Education
Health	86	Human health activities
	87	Residential care activities
	88	Social work activities without accommodation
Culture	90	Creative, arts and entertainment activities
	91	Libraries, archives, museums and other cultural activities
	92	Gambling and betting activities
	93	Sports activities and amusement and recreation activities
Other Services	94	Activities of membership organisations
	95	Repair of computers and personal and household goods
	96	Other personal service activities
	97	Activities of households as employers of domestic personnel
	98	Undifferentiated goods- and services-producing activities of private households for own use
	99	Activities of extraterritorial organisations and bodies

Variable Descriptions and Productivity Calculations

For the labour productivity and total factor productivity (TFP) calculations, we create many variables using information from the balance sheets and income statements of the firms. Below is a table which provides a detailed description of the variables created for productivity calculations:

Variable	Definition
Employment	Simple average of number of employees in each quarter
Total Wages	Total wages paid to all employees within a year
Capital Stock	Tangible Assets + Intangible Assets (both depreciated values)
Real Capital Stock	Capital stock deflated with PPI for capital goods
Output	Net Sales + Change in Stocks of Finished and Semi-Finished Goods
Real Output	Output deflated with sectoral deflators
Value Added	Total Operating Profits + Total Wages + Depreciation of Tangible and Intangible Assets
Real Value Added	Value added deflated with sectoral deflators
Material Inputs	Output - Value Added
Real Material Inputs	Material inputs deflated with PPI for intermediate inputs

We have two different measures of labour productivity and three different measures of TFP.

First measure of labour productivity is real value added per worker which is defined as:

$$Value\ Added\ per\ Worker_{i,t} = \frac{(Labour\ Costs_{it} + Operating\ Profits_{it} + Depreciation_{it}) \Big/ Sectoral\ Deflator_t}{Number\ of\ Employees_{it}}$$

Depreciation of the tangible and intangible assets is taken as a proxy for the cost of capital. We use two-digit sectoral PPI for the manufacturing industry to get the sectoral deflators, whereas for the services sector we use CPI at a more aggregated level.

Second measure of labour productivity is real output per worker which is calculated as follows:

$$Output\ per\ Worker_{i,t} = \frac{(Total\ Sales_{it} + Change\ in\ Stocks_{it}) \Big/ Sectoral\ Deflator_t}{Number\ of\ Employees_{it}}$$

Our main TFP measure is estimated using the methodology of Ackerberg, Caves and Frazer (2015). This methodology requires a proxy variable to control for unobservables when estimating the production function. To estimate our main measure of TFP, we calculate intermediate inputs as the difference between output and value added and use this as the proxy variable. For robustness checks, we estimate two more measures of TFP: one with changing the proxy from intermediate inputs to exporting status dummy and another one with changing the methodology to the one of Levinsohn and Petrin (2003). We estimate these three measures of TFP by using the real value added as the outcome variable.

The table below provides the correlations of various productivity measures for the manufacturing, services and construction sectors. As can be seen from the table, value added based measures of productivity are more robust to alternative estimation methods indicated by the high correlations.

		TFP - ACF (Raw Material)	TFP - ACF (Export Dummy)	TFP - LevPet	Value Added per Worker
Manufacturing	TFP - ACF (Raw Material)	1.00			
	TFP - ACF (Export Dummy)	0.79	1.00		
	TFP - LevPet	0.70	0.71	1.00	
	Value Added per Worker	0.75	0.74	0.90	1.00
		TFP - ACF (Raw Material)	**TFP - ACF (Export Dummy)**	**TFP - LevPet**	**Value Added per Worker**
Services (excl. Construction)	TFP - ACF (Raw Material)	1.00			
	TFP - ACF (Export Dummy)	0.73	1.00		
	TFP - LevPet	0.52	0.15	1.00	
	Value Added per Worker	0.70	0.20	0.88	1.00
		TFP - ACF (Raw Material)	**TFP - ACF (Export Dummy)**	**TFP - LevPet**	**Value Added per Worker**
Construction	TFP - ACF (Raw Material)	1.00			
	TFP - ACF (Export Dummy)	0.99	1.00		
	TFP - LevPet	0.74	0.78	1.00	
	Value Added per Worker	0.93	0.93	0.83	1.00

Data Cleaning Procedure

EIS contains data on all the firms in Turkey. The table below provides the number of observations in the population of firms along with the total employment and total output of these firms for manufacturing, construction and services sectors as defined above. At this point, we should note that employment data exists for all registered firms in Turkey. Therefore, total employment figures in the table below reflect total formal employment. Output, on the other hand, is the total for the subset of firms that are obliged to provide the Ministry of Finance with financial information.

Year	Sector	Number of Firms	Employment	Output
2006	Manufacturing	267,926	2,203,769	381,484,547,573
2007	Manufacturing	319,882	2,354,990	438,169,620,583
2008	Manufacturing	331,622	2,446,322	508,302,681,956
2009	Manufacturing	331,967	2,296,449	462,181,177,176
2010	Manufacturing	334,957	2,522,344	559,099,220,925
2011	Manufacturing	342,996	2,793,105	745,091,585,354
2012	Manufacturing	355,846	3,078,413	807,639,470,175
2013	Manufacturing	383,254	3,257,779	908,614,524,777
2014	Manufacturing	389,879	3,415,472	1,057,706,269,075
2015	Manufacturing	385,847	3,602,990	1,175,175,520,971
2016	Manufacturing	383,308	3,542,384	1,291,590,596,422
2006	Construction	127,410	637,858	63,585,008,129
2007	Construction	150,820	745,953	82,087,142,229
2008	Construction	159,680	796,175	93,416,589,108
2009	Construction	164,216	734,872	93,517,959,675
2010	Construction	171,057	864,691	107,768,741,994
2011	Construction	182,190	1,030,222	137,901,485,473
2012	Construction	192,094	1,171,863	164,973,293,213

Year	Sector	Number of Firms	Employment	Output
2013	Construction	209,761	1,249,725	202,678,948,872
2014	Construction	223,682	1,332,040	245,312,309,860
2015	Construction	231,083	1,502,219	279,881,015,389
2016	Construction	244,735	1,509,878	340,201,762,189
2006	Services	1,483,808	3,312,349	933,671,256,569
2007	Services	1,902,416	3,667,125	1,080,981,905,567
2008	Services	2,002,545	4,058,336	1,202,255,889,927
2009	Services	2,042,054	4,096,422	1,203,891,023,079
2010	Services	2,082,690	4,500,560	1,451,251,274,056
2011	Services	2,108,170	5,070,099	1,807,401,477,872
2012	Services	2,142,723	5,653,675	2,069,377,335,648
2013	Services	2,384,274	5,998,540	2,352,089,826,866
2014	Services	2,407,658	6,377,970	2,689,111,070,769
2015	Services	2,401,843	6,999,001	3,076,907,964,502
2016	Services	2,401,205	6,941,987	3,293,805,270,503

As stated above, balance sheet and income statement data from the Ministry of Finance are available for firms that that either make purchases for amounts above TL160,000 or make sales for more than TL 220000. In the first step of the data cleaning procedure, we drop all the observations for which the balance sheet and the income statement information are missing. In this first step, we also drop the observations where net sales, real output, real capital stock, real value added or real material inputs are negative in a given year. This first step of the cleaning procedure produces the following table:

	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2006	Manufacturing	76,828	1,655,195	327,295,046,811	28.68%	75.11%	85.80%
2007	Manufacturing	84,800	1,838,007	382,675,157,112	26.51%	78.05%	87.33%
2008	Manufacturing	87,771	1,913,908	447,654,278,750	26.47%	78.24%	88.07%
2009	Manufacturing	86,767	1,778,958	400,490,470,369	26.14%	77.47%	86.65%
2010	Manufacturing	89,102	2,023,683	495,295,946,515	26.60%	80.23%	88.59%
2011	Manufacturing	93,847	2,310,315	678,796,073,807	27.36%	82.71%	91.10%
2012	Manufacturing	99,351	2,539,927	744,593,433,681	27.92%	82.51%	92.19%
2013	Manufacturing	102,649	2,697,784	832,101,606,344	26.78%	82.81%	91.58%
2014	Manufacturing	108,267	2,891,280	977,803,868,806	27.77%	84.65%	92.45%
2015	Manufacturing	113,886	3,063,823	1,088,666,215,515	29.52%	85.04%	92.64%
2016	Manufacturing	117,869	3,060,625	1,196,991,674,424	30.75%	86.40%	92.68%
2006	Construction	38,091	408,003	55,851,461,210	29.90%	63.96%	87.84%
2007	Construction	44,273	506,480	72,578,884,216	29.35%	67.90%	88.42%
2008	Construction	47,155	551,357	82,744,127,156	29.53%	69.25%	88.58%
2009	Construction	47,376	505,496	82,374,103,619	28.85%	68.79%	88.08%
2010	Construction	49,601	597,456	94,378,004,254	29.00%	69.09%	87.57%
2011	Construction	54,060	718,297	120,915,059,412	29.67%	69.72%	87.68%
2012	Construction	58,939	822,237	142,512,995,468	30.68%	70.16%	86.39%
2013	Construction	63,363	897,931	176,890,848,811	30.21%	71.85%	87.28%
2014	Construction	68,626	952,685	208,978,434,449	30.68%	71.52%	85.19%
2015	Construction	75,032	1,056,392	243,941,285,320	32.47%	70.32%	87.16%

	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2016	Construction	81,116	1,073,162	294,483,396,813	33.14%	71.08%	86.56%
2006	Services	316,629	2,375,164	825,210,598,587	21.34%	71.71%	88.38%
2007	Services	360,768	2,746,784	969,609,735,983	18.96%	74.90%	89.70%
2008	Services	378,462	3,060,685	1,055,772,035,697	18.90%	75.42%	87.82%
2009	Services	381,947	3,106,746	1,066,822,861,149	18.70%	75.84%	88.61%
2010	Services	394,556	3,454,367	1,292,977,557,779	18.94%	76.75%	89.09%
2011	Services	415,011	3,891,208	1,612,106,962,107	19.69%	76.75%	89.19%
2012	Services	443,008	4,368,498	1,843,676,798,300	20.68%	77.27%	89.09%
2013	Services	459,883	4,655,128	2,095,184,485,916	19.29%	77.60%	89.08%
2014	Services	487,378	4,943,885	2,422,939,792,370	20.24%	77.52%	90.10%
2015	Services	517,646	5,375,442	2,711,346,139,981	21.55%	76.80%	88.12%
2016	Services	537,488	5,386,675	2,956,905,054,471	22.38%	77.60%	89.77%

In the second step of the data cleaning procedure, we drop all the observations of a firm if the firm always has less than 2 employees. This second step of cleaning provides the following sample:

Year	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2006	Manufacturing	61,675	1,651,624	315,447,550,819	23.02%	74.95%	82.69%
2007	Manufacturing	69,453	1,835,037	368,132,693,401	21.71%	77.92%	84.02%
2008	Manufacturing	73,575	1,911,148	434,097,427,052	22.19%	78.12%	85.40%
2009	Manufacturing	73,688	1,776,838	390,345,374,297	22.20%	77.37%	84.46%
2010	Manufacturing	77,051	2,021,681	485,078,285,833	23.00%	80.15%	86.76%
2011	Manufacturing	82,320	2,308,120	669,162,307,704	24.00%	82.64%	89.81%
2012	Manufacturing	87,803	2,537,529	735,450,131,124	24.67%	82.43%	91.06%
2013	Manufacturing	91,807	2,695,243	821,751,060,005	23.95%	82.73%	90.44%
2014	Manufacturing	96,427	2,888,429	965,839,613,510	24.73%	84.57%	91.31%
2015	Manufacturing	100,517	3,059,880	1,074,826,448,973	26.05%	84.93%	91.46%
2016	Manufacturing	101,136	3,054,279	1,178,892,904,729	26.39%	86.22%	91.27%
2006	Construction	28,087	406,051	50,508,231,611	22.04%	63.66%	79.43%
2007	Construction	33,701	504,766	66,707,678,295	22.35%	67.67%	81.26%
2008	Construction	36,584	549,754	76,217,137,416	22.91%	69.05%	81.59%
2009	Construction	37,221	504,237	76,609,882,282	22.67%	68.62%	81.92%
2010	Construction	39,762	596,266	87,973,068,634	23.24%	68.96%	81.63%
2011	Construction	44,195	716,918	113,716,117,710	24.26%	69.59%	82.46%
2012	Construction	48,768	820,699	132,792,102,500	25.39%	70.03%	80.49%
2013	Construction	52,531	896,204	166,075,416,164	25.04%	71.71%	81.94%
2014	Construction	56,542	950,700	196,503,525,337	25.28%	71.37%	80.10%
2015	Construction	61,337	1,053,582	229,819,385,385	26.54%	70.14%	82.11%
2016	Construction	63,595	1,068,357	270,704,760,867	25.99%	70.76%	79.57%
2006	Services	203,573	2,346,944	764,096,584,054	13.72%	70.85%	81.84%
2007	Services	235,129	2,719,863	897,424,771,553	12.36%	74.17%	83.02%
2008	Services	254,016	3,032,882	980,719,942,950	12.68%	74.73%	81.57%
2009	Services	261,308	3,081,698	995,547,404,110	12.80%	75.23%	82.69%
2010	Services	276,533	3,429,010	1,213,176,414,333	13.28%	76.19%	83.60%
2011	Services	295,968	3,862,752	1,521,869,113,097	14.04%	76.19%	84.20%

Year	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2012	Services	316,890	4,335,782	1,751,726,857,324	14.79%	76.69%	84.65%
2013	Services	332,208	4,619,243	2,000,572,529,973	13.93%	77.01%	85.06%
2014	Services	348,061	4,902,945	2,310,253,541,335	14.46%	76.87%	85.91%
2015	Services	362,267	5,323,395	2,579,791,543,100	15.08%	76.06%	83.84%
2016	Services	359,876	5,320,166	2,787,083,546,317	14.99%	76.64%	84.62%

In the third step, we drop the service sectors as explained in the first section and marked grey in Table 4. This produces the following sample:

Year	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2006	Manufacturing	61,675	1,651,624	315,447,550,819	23.02%	74.95%	82.69%
2007	Manufacturing	69,453	1,835,037	368,132,693,401	21.71%	77.92%	84.02%
2008	Manufacturing	73,575	1,911,148	434,097,427,052	22.19%	78.12%	85.40%
2009	Manufacturing	73,688	1,776,838	390,345,374,297	22.20%	77.37%	84.46%
2010	Manufacturing	77,051	2,021,681	485,078,285,833	23.00%	80.15%	86.76%
2011	Manufacturing	82,320	2,308,120	669,162,307,704	24.00%	82.64%	89.81%
2012	Manufacturing	87,803	2,537,529	735,450,131,124	24.67%	82.43%	91.06%
2013	Manufacturing	91,807	2,695,243	821,751,060,005	23.95%	82.73%	90.44%
2014	Manufacturing	96,427	2,888,429	965,839,613,510	24.73%	84.57%	91.31%
2015	Manufacturing	100,517	3,059,880	1,074,826,448,973	26.05%	84.93%	91.46%
2016	Manufacturing	101,136	3,054,279	1,178,892,904,729	26.39%	86.22%	91.27%
2006	Construction	28,087	406,051	50,508,231,611	22.04%	63.66%	79.43%
2007	Construction	33,701	504,766	66,707,678,295	22.35%	67.67%	81.26%
2008	Construction	36,584	549,754	76,217,137,416	22.91%	69.05%	81.59%
2009	Construction	37,221	504,237	76,609,882,282	22.67%	68.62%	81.92%
2010	Construction	39,762	596,266	87,973,068,634	23.24%	68.96%	81.63%
2011	Construction	44,195	716,918	113,716,117,710	24.26%	69.59%	82.46%
2012	Construction	48,768	820,699	132,792,102,500	25.39%	70.03%	80.49%
2013	Construction	52,531	896,204	166,075,416,164	25.04%	71.71%	81.94%
2014	Construction	56,542	950,700	196,503,525,337	25.28%	71.37%	80.10%
2015	Construction	61,337	1,053,582	229,819,385,385	26.54%	70.14%	82.11%
2016	Construction	63,595	1,068,357	270,704,760,867	25.99%	70.76%	79.57%
2006	Services	188,344	2,123,436	593,296,721,454	12.69%	64.11%	63.54%
2007	Services	217,376	2,451,876	693,799,392,235	11.43%	66.86%	64.18%
2008	Services	234,685	2,724,574	802,349,725,427	11.72%	67.14%	66.74%
2009	Services	241,278	2,757,207	799,295,518,353	11.82%	67.31%	66.39%
2010	Services	255,529	3,077,153	967,194,681,025	12.27%	68.37%	66.65%
2011	Services	273,686	3,479,282	1,232,903,717,154	12.98%	68.62%	68.21%
2012	Services	293,079	3,901,863	1,424,963,713,947	13.68%	69.01%	68.86%
2013	Services	306,880	4,145,943	1,632,882,159,993	12.87%	69.12%	69.42%
2014	Services	321,370	4,397,964	1,894,671,533,187	13.35%	68.96%	70.46%
2015	Services	334,401	4,756,479	2,105,497,600,655	13.92%	67.96%	68.43%
2016	Services	331,700	4,770,722	2,296,136,459,143	13.81%	68.72%	69.71%

In the final step of the cleaning procedure, we do an outlier cleaning at the year and Nace 2-digit level using value per worker as the reference variable. All observations, which are more than 3 interquartile ranges away from the mean within a year & nace 2-digit cell, are marked as outliers and all the observations of a firm are dropped if less than 75 percent of the observations of that firm are marked as outliers. We keep the threshold at the 75 percent as we regard those firms which always have outlier observations as those that are on the frontier or lower end of the productivity distribution and we want to keep them in the dataset for the aggregations. Those, which do not always but sometimes have outlier observations, are marked as those with measurement errors and dropped.

The table below provides the final sample after this final step of the cleaning procedure:

Year	Sector	Number of Firms	Employment	Output	Number of Firms (%)	Employment (%)	Output (%)
2006	Manufacturing	53,301	1,467,175	277,273,516,435	19.89%	66.58%	72.68%
2007	Manufacturing	61,650	1,658,766	324,166,855,968	19.27%	70.44%	73.98%
2008	Manufacturing	66,471	1,763,689	385,911,286,791	20.04%	72.10%	75.92%
2009	Manufacturing	68,278	1,697,623	356,066,767,639	20.57%	73.92%	77.04%
2010	Manufacturing	71,394	1,908,077	438,978,119,603	21.31%	75.65%	78.52%
2011	Manufacturing	76,365	2,169,064	609,427,710,599	22.26%	77.66%	81.79%
2012	Manufacturing	81,242	2,384,452	669,739,021,600	22.83%	77.46%	82.93%
2013	Manufacturing	85,119	2,542,263	753,079,286,009	22.21%	78.04%	82.88%
2014	Manufacturing	89,375	2,709,055	878,560,336,183	22.92%	79.32%	83.06%
2015	Manufacturing	93,020	2,870,666	980,750,888,240	24.11%	79.67%	83.46%
2016	Manufacturing	91,555	2,842,799	1,071,827,857,349	23.89%	80.25%	82.99%
2006	Construction	21,113	304,383	36,149,631,985	16.57%	47.72%	56.85%
2007	Construction	26,942	407,393	50,887,637,049	17.86%	54.61%	61.99%
2008	Construction	30,365	470,780	58,741,493,967	19.02%	59.13%	62.88%
2009	Construction	32,024	439,706	57,121,395,057	19.50%	59.83%	61.08%
2010	Construction	34,360	518,204	67,917,562,024	20.09%	59.93%	63.02%
2011	Construction	38,215	630,245	87,343,922,121	20.98%	61.18%	63.34%
2012	Construction	42,297	722,368	102,916,791,797	22.02%	61.64%	62.38%
2013	Construction	45,933	778,679	128,906,842,040	21.90%	62.31%	63.60%
2014	Construction	50,147	846,047	155,411,684,022	22.42%	63.52%	63.35%
2015	Construction	54,135	948,638	188,469,487,593	23.43%	63.15%	67.34%
2016	Construction	53,306	905,204	215,635,199,758	21.78%	59.95%	63.38%
2006	Services	160,275	1,838,721	475,709,938,256	10.80%	55.51%	50.95%
2007	Services	191,857	2,180,685	575,439,106,969	10.08%	59.47%	53.23%
2008	Services	210,161	2,451,542	666,896,230,366	10.49%	60.41%	55.47%
2009	Services	220,431	2,522,783	672,963,014,007	10.79%	61.59%	55.90%
2010	Services	233,965	2,824,811	820,614,245,493	11.23%	62.77%	56.55%
2011	Services	251,867	3,215,386	1,045,438,312,199	11.95%	63.42%	57.84%
2012	Services	268,866	3,602,298	1,207,620,216,758	12.55%	63.72%	58.36%
2013	Services	282,571	3,818,126	1,381,797,414,222	11.85%	63.65%	58.75%
2014	Services	296,345	4,048,960	1,609,824,809,666	12.31%	63.48%	59.86%
2015	Services	306,600	4,370,236	1,809,593,240,446	12.77%	62.44%	58.81%
2016	Services	295,017	4,300,296	1,932,455,082,940	12.29%	61.95%	58.67%

As can be seen from the table above, in our final sample, we keep 19 percent to 24 percent of all firms in the manufacturing industry over the period of analysis. Although low in numbers, these firms capture 66-80 percent of the total employment and 72-82 percent of the total output. For the construction sector, 16-23 percent of firms are kept in the final sample and these firms account for 47-63 percent of the total employment and 56-67 percent of the total output of the construction sector. For the services sector, percentages are fairly lower. We keep 10-12 percent of all the firms in the services sector in our sample and these firms account for 60-63 percent of total employment and 50-59 percent of total output.

Size, Age and Technology Classifications

	Manufacturing		Services		Construction	
	Number of Firms	%	Number of Firms	%	Number of Firms	%
2-9 employees	51,387	56.1%	224,489	76.1%	34,068	63.9%
10-19 employees	16,211	17.7%	38,207	13.0%	10,035	18.8%
20-49 employees	14,319	15.6%	22,283	7.6%	6,398	12.0%
50-99 employees	4,719	5.2%	5,373	1.8%	1,714	3.2%
100-249 employees	3,255	3.6%	2,978	1.0%	764	1.4%
250-499 employees	1,018	1.1%	939	0.3%	199	0.4%
500+ employees	646	0.7%	748	0.3%	128	0.2%
TOTAL	91,555	100.0%	295,017	100.0%	53,306	100.0%

	Manufacturing		Services		Construction	
	Number of Firms	%	Number of Firms	%	Number of Firms	%
0-1 year	7,210	7.9%	19,837	6.7%	5,630	10.6%
2-5 years	22,720	24.8%	72,205	24.5%	19,891	37.3%
6-10 years	21,006	22.9%	73,221	24.8%	13,600	25.5%
11-15 years	13,385	14.6%	46,011	15.6%	5,247	9.8%
16-20 years	12,304	13.4%	39,065	13.2%	4,512	8.5%
21-25 years	8,982	9.8%	25,553	8.7%	3,093	5.8%
26+ years	5,831	6.4%	18,458	6.3%	1,262	2.4%
TOTAL	91,438	99.9%	294,350	99.8%	53,235	99.9%

	Manufacturing		Services		Construction	
	Number of Firms	%	Number of Firms	%	Number of Firms	%
Exporter	24,364	26.6%	31,521	10.7%	2,135	4.0%
Non-exporter	67,191	73.4%	263,496	89.3%	51,171	96.0%
TOTAL	91,555	100.0%	295,017	100.0%	53,306	100.0%

	Manufacturing		Services		Construction	
	Number of Firms	%	Number of Firms	%	Number of Firms	%
Importer	17,487	19.1%	22,040	7.5%	1,295	2.4%
Non-importer	74,068	80.9%	272,977	92.5%	52,011	97.6%
TOTAL	91,555	100.0%	295,017	100.0%	53,306	100.0%

Nace 2-digit	Technology Class
10	Low Technology
11	Low Technology
12	Low Technology
13	Low Technology
14	Low Technology
15	Low Technology
16	Low Technology
17	Low Technology
18	Low Technology
19	Medium Low Technology
20	Medium High Technology
21	High Technology
22	Medium Low Technology
23	Medium Low Technology
24	Medium Low Technology
25	Medium Low Technology
26	High Technology
27	Medium High Technology
28	Medium High Technology
29	Medium High Technology
30	Medium High Technology
31	Low Technology
32	Low Technology

Nace 2-digit	Sub Sector	Technology Class
41	1-Construction	Not Classified
42	1-Construction	Not Classified
43	1-Construction	Not Classified
45	2-Retail and Wholesale	Less KI Market Services
46	2-Retail and Wholesale	Less KI Market Services
47	2-Retail and Wholesale	Less KI Market Services
49	3-Transportation and Storage	Less KI Market Services
50	3-Transportation and Storage	KI Market Services
51	3-Transportation and Storage	KI Market Services
52	3-Transportation and Storage	Less KI Market Services
53	3-Transportation and Storage	Other Less KIS
55	4-Accomodation and Food	Less KI Market Services
56	4-Accomodation and Food	Less KI Market Services
58	5-Information and Communication Tech.	Other KIS
59	5-Information and Communication Tech.	HiTech KIS
60	5-Information and Communication Tech.	HiTech KIS
61	5-Information and Communication Tech.	HiTech KIS
62	5-Information and Communication Tech.	HiTech KIS
63	5-Information and Communication Tech.	HiTech KIS
64	6-Finance and Insurance	KI Financial Services
65	6-Finance and Insurance	KI Financial Services
66	6-Finance and Insurance	KI Financial Services
68	7-Real Estate	Less KI Market Services
69	8-Scientific, Occupational and Technical Activities	KI Market Services
70	8-Scientific, Occupational and Technical Activities	KI Market Services
71	8-Scientific, Occupational and Technical Activities	KI Market Services
72	8-Scientific, Occupational and Technical Activities	HiTech KIS
73	8-Scientific, Occupational and Technical Activities	KI Market Services
74	8-Scientific, Occupational and Technical Activities	KI Market Services
75	8-Scientific, Occupational and Technical Activities	Other KIS
77	9-Administrative and Support	Less KI Market Services
78	9-Administrative and Support	KI Market Services
79	9-Administrative and Support	Less KI Market Services
80	9-Administrative and Support	KI Market Services

Nace 2-digit	Sub Sector	Technology Class
81	9-Administrative and Support	Less KI Market Services
82	9-Administrative and Support	Less KI Market Services
84	10-Public	Other KIS
85	11-Education	Other KIS
86	12-Health	Other KIS
87	12-Health	Other KIS
88	12-Health	Other KIS
90	13-Culture	Other KIS
91	13-Culture	Other KIS
92	13-Culture	Other KIS
93	13-Culture	Other KIS
94	14-Other Services	Other Less KIS
95	14-Other Services	Less KI Market Services
96	14-Other Services	Other Less KIS
97	14-Other Services	Other Less KIS
98	14-Other Services	Other Less KIS
99	14-Other Services	Other Less KIS

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