PATHS OF PRODUCTIVITY GROWTH IN POLAND

A FIRM-LEVEL PERSPECTIVE

EXECUTIVE SUMMARY

WORLD BANK GROUP

Ministry of Economic Development and Technology

Statistics Poland

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Wojciech Wołocznik, Cambridge, United Kingdom

Interior design and typesetting:
Piotr Ruczynski, London, United Kingdom

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BACKGROUND

This executive summary is a supplement to the technical report "Paths of productivity growth in Poland: a firm-level perspective." Both documents are the main outputs of Phase 1 of a project, "Technological readiness and management skills — Productivity growth drivers in Poland," conducted in collaboration with the European Commission (EC) Directorate-General for Structural Reform Support (DG REFORM). The project aims to support Poland's Ministry of Economic Development and Technology with enhancing the effectiveness of firms' support systems by providing evidence based on firms' capabilities, context, and barriers to productivity growth. The project consists of three phases:

- Phase 1 focuses on understanding firm-level productivity growth and formulates policy recommendations to enhance the economy's productivity performance.
- Phase 2 provides evidence based on Polish firms' capabilities by implementing and analyzing a Technology Adoption Survey.
- Phase 3 aims to build capacity and support the redesign of instruments to build firms' capabilities.

AUTHOR'S NOTE

This executive summary was prepared by the Finance, Competitiveness, and Innovation Global Practice of the World Bank Group (WBG). The WBG team, led by Łukasz Marć (Economist), included Umut Kilinc (Economist), Magda Malec (Consultant) and Bartłomiej Skowron (Consultant). Mirosław Błażej and Mariusz Górajski from Statistics Poland collaborated with the WBG team on the preparation of the decomposition and regression results.

KEY FINDINGS

Poland needs to realize substantial productivity improvements to spur economic growth. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its productivity (Krugman, 1994), and increases in individual firm productivity are the most critical factor contributing to economic growth (ILO, 2013). Such within-firm performance can be complemented by the reallocation of resources from less-productive to more-productive firms and sectors, as well as the entrance of high-productivity firms and the exit of low-productivity firms. Putting productivity at the center of Poland's growth agenda means designing and adopting an effective mix of policies to improve market functioning, create an efficient business environment, and provide incentives for entrepreneurship and firm upgrading. It will require focusing on monitoring and developing programs that support productivity growth (while not disturbing the functioning of the market unnecessarily), with particular attention to strengthening firms' productivity — innovation or adoption of better technologies, digitalization, managerial and organizational talent, and labor skills.

Productivity growth in the Polish manufacturing sector has stagnated since 2012 and is significantly lower than in services and construction. The total factor productivity (TFP) growth stagnation in the manufacturing sector in Poland between 2012 and 2019 resulted mainly from a deterioration in the allocative efficiency in the prime manufacturing industries: metals and food and beverages. During that period, the largest low-productivity firms in these industries grew and expanded their market share at the cost of more productive firms. Consequently, the productivity growth of the entire manufacturing sector was dampened. This period of stagnation calls for policy attention additionally because the worsening allocative efficiency in manufacturing changed a long-observed (since 1997) trend of reallocation of resources from less-productive to more-productive firms and sectors, driving the aggregate productivity growth in Poland (World Bank, 2017). Moreover, labor productivity growth significantly outpaced TFP growth, indicating that the expansion of the manufacturing industry came primarily from increasing capital intensity (using more machines per employee) rather than improvement in technical efficiency.

Aggregate productivity growth acceleration after 2017 can be credited to improvements in within-firm productivity performance, but not all industries are benefiting equally. Starting from 2017, productivity growth mainly accelerated due to improvements in firms' capabilities. However, in civil engineering, the

construction of buildings, and the manufacturing of paper, chemicals, and machinery, within-firm productivity worsened, demonstrating a need for strengthening firm-specific productivity performance in these industries and taking a tailored approach to effective policy design. Moreover, the only two industries with exceptional productivity growth (telecommunications and the manufacturing of computers and electronics) can attribute their outstanding productivity performance to advances in firms' capabilities.

Small and medium-sized enterprises (SMEs) are the engines of productivity growth in Poland. SMEs are more likely to have substantially higher productivity growth than large Polish firms. Because smaller firms have greater productivity potential, targeting them with public incentive programs is more likely to increase economy-wide productivity and, in turn, lead to higher aggregate growth. At the same time, lower-productivity large firms do not lose market share in some sectors, indicating inefficient reallocation of market shares. The empirical analysis also suggests that firms in expanding industries have better productivity performance than those in other industries. Moreover, even though new firms entering the market begin with low levels of productivity, they grow much faster than older establishments.

KEY RECOMMENDATIONS

Improve allocative efficiency in manufacturing. Deterioration in allocative efficiency in manufacturing calls for attention to the structure and targeting of incentive programs in the form of tax relief, subsidized credits, grants, and other types of firm-specific interventions. Supporting potential high-productivity producers should not be limited to subsidizing selected growth-enhancing investments but should also include improving the business environment and facilitating access to finance.

Enhance firms' capabilities. Improving within-firm performance means increasing the amount of output firms produce with a constant quantity of inputs by, for instance, strengthening managerial skills, workforce skills, innovation capacity, and technology absorption capability. Policy interventions aiming to improve within-firm performance include, for instance, providing business advisory and technology extension services, facilitating entrepreneurial networks and clusters, and offering vouchers for training. Labor skills such as digital literacy and leadership are as important as technology itself.

Support SMEs. Empirical findings suggest that there is a need for policy intervention to intensify competition in Polish industries by detecting and removing regulations that provide asymmetric advantages to large firms. In addition to reducing barriers to competition, eliminating constraints on the growth of smaller firms, especially in manufacturing, is critical. Improving SMEs' ability to grow requires facilitating their access to finance, promoting financial market deepening, and supporting the development of the innovation supply side (for example, dedicated software for SMEs). Policy interventions need to address potential barriers to SMEs adopting technology because their gains from adoption may be greater than those for larger establishments. Moreover, facilitating market entry might foster aggregate productivity growth because younger firms tend to have better productivity performance than older ones.

Investigate barriers for growth for large Polish firms. Large firms should be incentivized (though not necessarily financially) to improve their within-firm productivity performance. Improving the business environment for large firms — especially in the food and beverages, metals, and rubber industries — and targeting elimination of industrial protection could improve their performance, but further investigation is needed to understand all the barriers to their productivity enhancement. Moreover, because firms in expanding industries had better productivity performance than other establishments, increasing demand for an industry's products and strengthening competition could also lead to higher aggregate productivity growth.

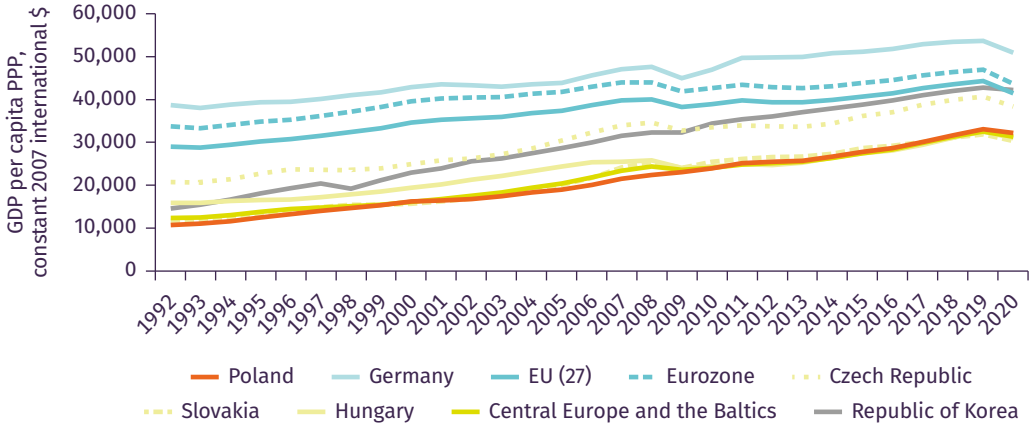
Employ the new wave of productivity diagnostics and improve data accessibility. Employing the new wave of productivity diagnostics is necessary to provide a comprehensive understanding of drivers of and barriers to productivity growth and define precise policy recommendations. These approaches require detailed firm-level data on prices, marginal costs, intangible assets, quality, and management. Getting accurate measurements of firm entry and exit, for example, requires collecting high-quality firm-level data. Consequently, building the institutional capacity of national statistical offices is essential for evidence-based policy design. Moreover, delivering high-quality research depends on government openness to share data. In this regard, Poland could establish an "Innovation and Productivity Excellence Center" or similar entity (see also World Bank, 2019) to provide analytical inputs for designing policy instruments and facilitate a knowledge platform with a repository of best practices related to policy design, implementation, and evaluation.

EXECUTIVE SUMMARY

Why Is Productivity Important?

After a long period of economic transformation that included introducing a series of market-oriented reforms and joining the European Union (EU), Poland was one of the fastest-growing economies in the world by 2020. The Polish gross domestic product (GDP) per capita increased by 300 percent between 1992 and 2020, and the country reached high-income status in 2009. Despite this remarkable growth, Poland still lags many European comparator countries, with its income per capita currently at three-quarters of the EU average (Figure 1). Factors delaying the catch-up with advanced economies include weak innovation performance, insufficient technology adoption, and labor force digital skills that are below the EU average. Because the post-transition (capital-driven) development model might be reaching its limits, the policy focus needs to shift toward different growth engines, such as productivity. With low levels of investment and a shrinking labor force due to population aging, Poland will increasingly depend on productivity advances for long-term growth, likely more so than in other advanced economies.

FIGURE 1 GDP Per Capita, 1992–2020

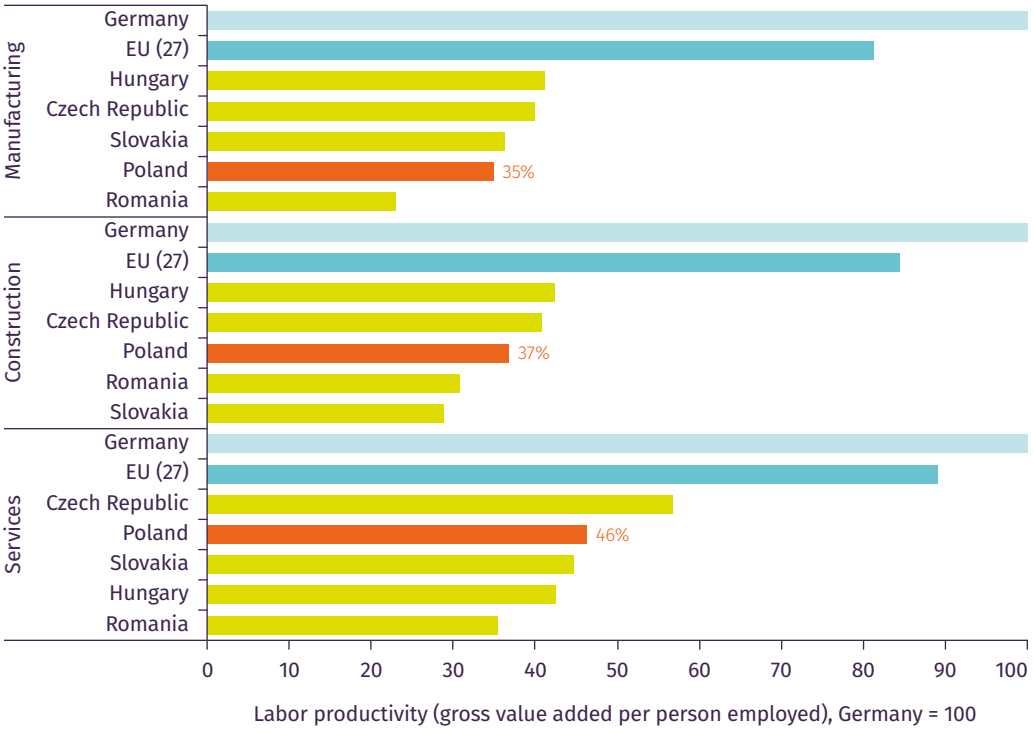


Source: Elaboration based on World Development Indicators.
Note: EU = European Union; GDP = gross domestic product; PPP = purchasing power parity.

Despite Poland's remarkable economic growth, a manufacturer in Poland still needs almost three times as many employees to produce the same output as an average manufacturer in Germany. In 2018, gross value added per

person employed in a manufacturing firm in Poland, a measure of labor productivity (see Box 1), was only 35 percent of the German average and slightly lower than in Hungary or the Czech Republic (Figure 2). Labor productivity across all sectors[1] in Poland is substantially lower than in the EU. In fact, an average firm in Poland needs more than twice as many workers to produce the same output as an average EU firm. The gross value added by each sector does not vary much across countries, but the structure of firm sizes is distinctly different (Eurostat 2021). For instance, in Poland, more than one-third of employees work in micro companies (34 percent of the labor force works in establishments with fewer than 10 employees), while in Germany, only 19 percent of workers are employed in micro firms. Much of the German labor force (41 percent) is employed in the largest companies (those with more than 250 employees).

FIGURE 2 Labor Productivity as Share of Germany's, 2018



Source: Elaboration based on Structural Business Survey (Eurostat 2021).
Note: Latest available data is for 2018. EU = European Union. Rep. = Republic.

1. Throughout this note, the word "sector" applies to the three major parts of the economy — manufacturing, construction, and services. The division follows the statistical classification of economic activities used in the European Union (NACE Rev. 2). We disaggregate the sectors further into industries (level 2 of NACE).

BOX 1 What is Productivity?

Productivity measures the technical efficiency in production—how the economy transforms the factors of production (for instance, capital and labor) into output. It can be quantified through two main indices: **labor productivity** and **total factor productivity (TFP)**.

Labor productivity indicates how much value added is produced per employee. Thus, it indicates how efficiently labor is employed in production, which also depends on the intensity of capital in the production process. Consider two hypothetical textile manufacturers. The first produces handcrafted shirts. The second uses high-tech equipment to produce shirts of similar quality. The equipment only requires one machine operator rather than several sewers. We can measure labor productivity in this case as the number of workers employed to produce each shirt. It would be lower for the producer that handcrafts shirts, even though both producers make shirts of the same quality.

TFP captures how efficiently firms transform inputs into outputs. Thus, it captures the increase in output that is not attributed to a change in the quantity of factors of production. The higher the TFP, the less input is needed for a given output. TFP can depend on a range of factors, such as skills, organizational structure, managerial talent, and adaptation or innovation of new or better technologies and processes to produce larger amounts or higher-quality products or services with fewer resources. TFP is not observable from the data directly but can be estimated.

Realizing substantial economic growth requires productivity improvements. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its productivity (Krugman, 1994). A global review by ILO (2013) finds that an increase in individual firm productivity is the most critical factor contributing to economic growth. Putting productivity at the center of Poland's growth agenda means focusing on monitoring and developing programs that support productivity growth (while not disturbing unnecessarily the functioning of the market), with particular attention to strengthening firms' productivity — innovation or adoption of better technologies, digitalization, managerial and organizational talent, and labor skills.

How to Improve Aggregate Productivity

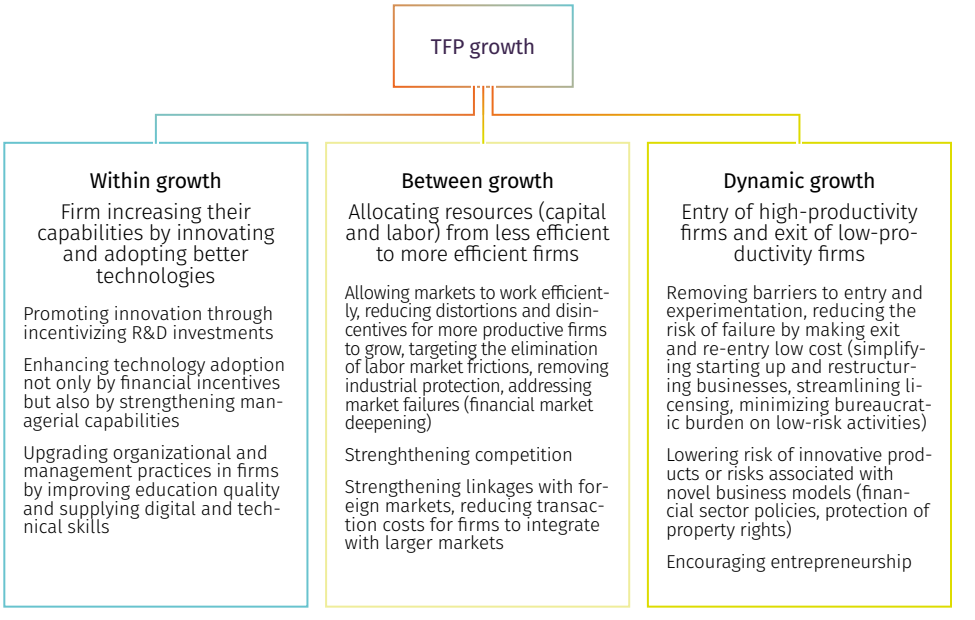
Effective policy design aiming to boost productivity requires not only identifying aggregate productivity trends but also determining micro productivity drivers. To investigate productivity dynamics across economic segments and to derive policy recommendations to improve the productivity performance of an economy, one needs to build the analysis on firm-level data. Each industry faces unique market conditions and is endowed with distinct technologies and skills. Without comprehensive knowledge about the nature of this heterogeneity, it is difficult to successfully design a cost-effective system of productivity-enhancing incentives. Employing firm-level data enables determining both aggregate

productivity trends and underlying heterogeneity across sectors and industries. Moreover, it allows decomposing productivity growth into four components — within, between, upscaling, and downscaling — that represent different drivers of productivity growth (Melitz and Polanec, 2015; see Box 2). Furthermore, it helps to determine whether potential drivers of productivity growth that are well-known in the literature (such as strengthening competition and investing in research and development) are also effective in influencing the performance of firms in a particular country.

BOX 2 How to Boost Productivity

Aggregate productivity can grow in four ways. One is by firms increasing their capabilities (within-firm productivity growth). The second is by the reallocation of resources from less productive to more productive firms (between-firm productivity growth). The third is the entry of more productive firms into the market (upscaling). The fourth is the exit of less successful firms from the market (downscaling).[a] The latter two can be considered together as dynamic productivity growth or net entry. Employing firm-level panel data enables decomposing productivity growth into these four components (Melitz and Polanec, 2015).

Boosting productivity requires policy actions addressing all components of productivity growth. The figure below presents an exemplary set of policy interventions and programs broken down into the three productivity growth components with which they are typically associated.



Sources: Cirera and Maloney (2017); Cusolito and Maloney (2018).

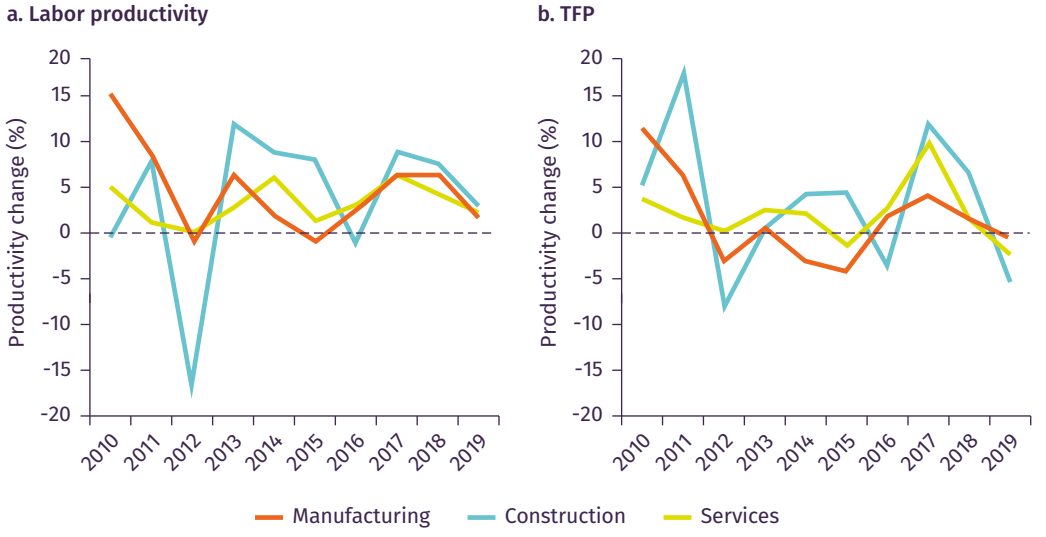
a. Capturing the contributions of firm entry and exit robustly depends heavily on the quality of the data, particularly the reliability of the panel structure. The entry and exit components are computed based on the absence or presence of data rather than information on firm entry and exit.

The report investigates differences in productivity dynamics across economic segments and derives policy recommendations to improve Poland's productivity performance. First, we estimate firm-level TFP, compute labor productivity indices, and analyze the main productivity patterns between 2009 and 2019 (dataset and calculations prepared by Statistics Poland based on firm-level *Annual Enterprise Survey*). Second, we decompose aggregate productivity performance into the within, between, and net entry components using the Melitz-Polanec decomposition method to understand the underlying response behind the observed productivity growth in Polish sectors and industries. Even when there is no innovation or adoption of better technology that would increase individual firm productivity (within-firm productivity growth), reallocating production factors such as capital and labor from less to more productive establishments increases economy-wide productivity (between-firm productivity growth). Therefore, barriers to this reallocation would suppress the productivity performance of an industry and, hence, aggregate productivity growth. However, significant productivity improvements require progress on every front. Even if the business environment is perfect, there will be no growth if entrepreneurs do not have the human capital necessary to take advantage of it. To support productivity, Poland needs to design and adopt an effective mix of policies to improve market functioning, create an efficient business environment, and provide incentives for entrepreneurship and firm upgrading.

Heterogenous Productivity Growth

Despite Poland's remarkable economic growth, productivity growth in the Polish manufacturing sector has stagnated since 2012 and is significantly lower than in services and construction. The empirical analysis (which was based on small, medium, and large Polish enterprises, without micro firms) indicates that economy-wide TFP grew annually on average by 3 percent between 2009 and 2019 (Figure 3). However, manufacturing, construction, and services follow distinctively different productivity trends. There are no significant TFP improvements in manufacturing after 2012. At the same time, the construction and service sectors demonstrate continuous modest TFP growth of 3 percent per year. Except for 2012, labor productivity follows an overall increasing trend in all sectors over the entire 11-year sample period. Faster labor productivity growth compared to TFP suggests increasing capital intensity of production methods between 2009 and 2019. In other words, to a large extent, firms expanded their production by using more machines per employee rather than by improving production efficiency.

FIGURE 3 Productivity Growth by Sector (2009–19)

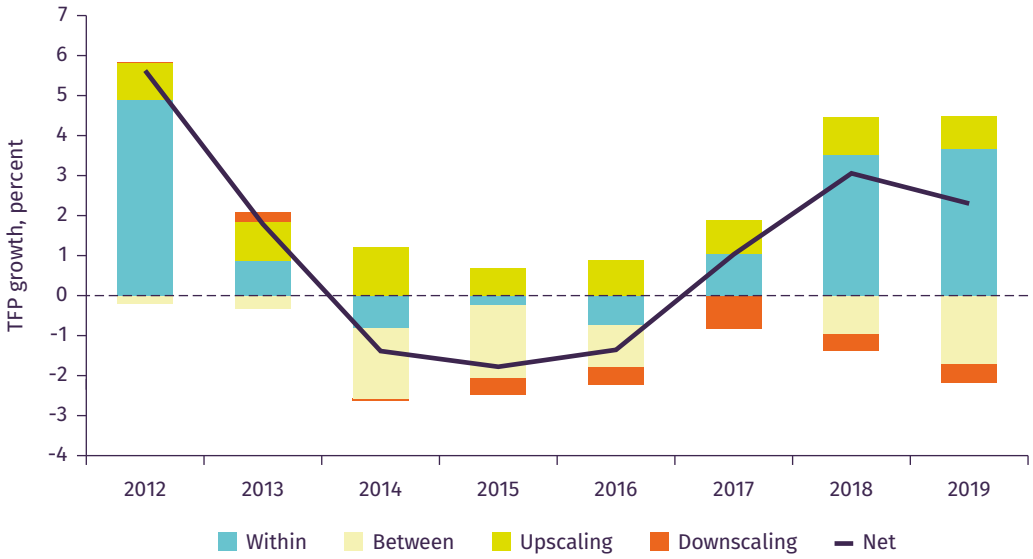


Source: Elaboration based on Statistics Poland calculations.
Note: TFP = total factor productivity.

Productivity Stagnation in Manufacturing

Declining efficiency of resource allocation was responsible for the productivity slowdown in manufacturing. (See Figure 4.) Large low-productivity producers in the two biggest manufacturing industries (food and beverages and metals) increased their market share over time at the cost of more productive firms within their industries, reducing the manufacturing sector's aggregate productivity performance. Simultaneously, allocative efficiency improved in some manufacturing industries, resulting in significant differences in productivity patterns across industries within the same sector. The deterioration in allocative efficiency calls for policy attention because the worsening allocative efficiency in manufacturing broke the long-observed trend of between components driving the aggregate productivity growth in Poland (World Bank, 2017). It points to the importance of removing barriers to the undisturbed flow of production factors and removing regulatory restrictions on competition. Economic policy in Poland would benefit from supporting companies with high potential to innovate or grow rather than helping inefficient establishments survive.

FIGURE 4 Manufacturing Sector Productivity Growth Decomposition



Source: Elaboration based on Statistics Poland calculations.
Note: The figure shows the results of decomposing 3-year productivity growth rates using the Melitz-Polanec method, smoothed to represent an annual change.

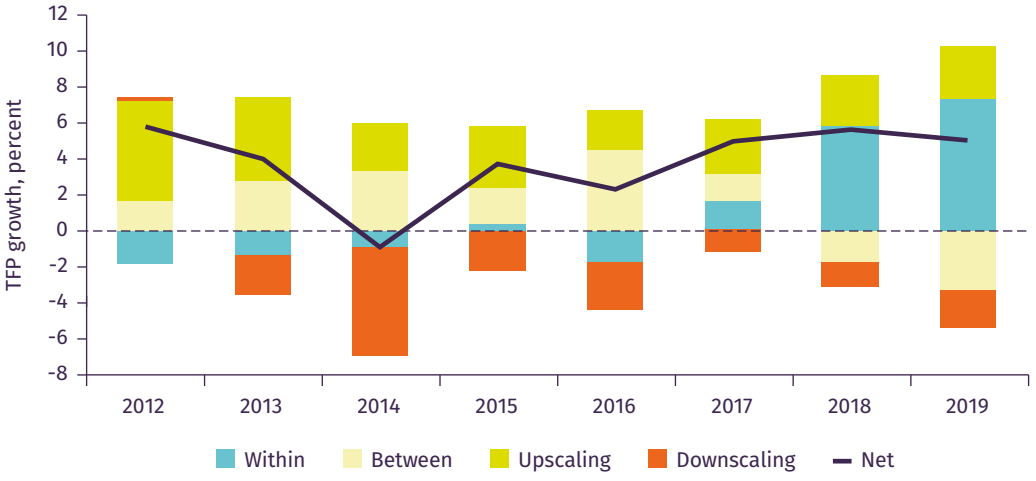
Productivity Volatility in Construction

Until 2017 Poland's construction industry profited from more efficient allocation of resources between firms, but afterward, its TFP growth was primarily driven by productivity improvements within firms. The within and between productivity components in construction followed divergent paths (Figure 5). The between component was positive and relatively high until 2017, while the within was generally negative. Starting from 2017, the situation reversed: the within component remained positive, while the between component was negative for the following two years. This suggests that Polish construction received a positive productivity shock in 2018 that increased firms' capabilities and, hence, the aggregate productivity growth of the sector. Firms that benefited from this positive shock, however, did not necessarily have large market shares, so the between-firm component decreased by the end of the sample.

The construction industry in Poland has a very dynamic structure, with high rates of firm entry and exit from the dataset. The construction sector underwent a disruption in 2010 – 13 due to an unprecedented demand boom related to the Union of European Football Associations Euro 2012 championship and projects co-financed by EU structural funds. The large negative downscaling contribution

in 2014 that is depicted in Figure 5 might reflect this negative shock and the bankruptcy wave that followed (Supreme Audit Office, 2018). It is also likely connected to Poland's lower net inflow of foreign direct investment (UNCTAD, 2013 – 2015).

FIGURE 5 Construction Sector Productivity Growth Decomposition



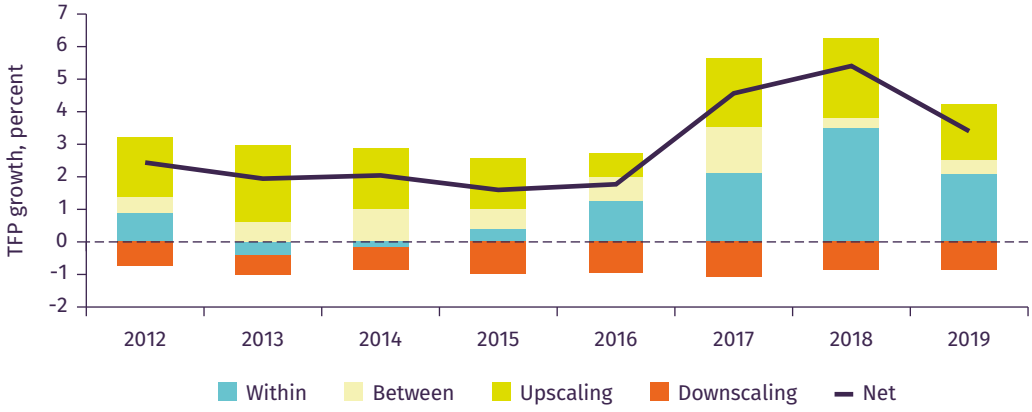
Source: Elaboration based on Statistics Poland calculations.
Note: The figure shows the results of decomposing 3-year productivity growth rates using the Melitz-Polanec method, smoothed to represent an annual change.

Continued Productivity Growth in Services

As in manufacturing and construction, the within-firm component contributed substantially to aggregate productivity growth in services, especially for the later period in the sample (2016 – 19), but unlike in other sectors, the efficiency of resource allocation improved continuously in services. The service sector in Poland had uninterrupted positive productivity growth throughout the sample period, with an increase in the growth rate after 2016 (Figure 6). In the earlier years, much of the growth came from the entry of new producers to the dataset and efficiency in resource allocation. After 2016, however, firms' own productivity performance was the main driver of the accelerated aggregate productivity performance. The only negative productivity contribution came from downscaling, indicating that some high-productivity firms exited the dataset, if not the market. The negative exit contribution, however, may be due to gaps in the data for some high-productivity firms. When a data point is missing for such a high-productivity firm, there are two consequences. First, its absence in a given year will be reflected as a negative contribution to the downscaling

component for that year. Second, the upscaling component will rise in the next year, when the missing firm is observed again in the sample. Thus, the simultaneously negative downscaling and positive upscaling components in the service sector's productivity decomposition may be mainly due to the unbalanced structure of the sample rather than to actual firm entries and exits. It points to the importance of collecting high-quality firm-level data in order to derive precise policy recommendations.

FIGURE 6 Services Sector Productivity Growth Decomposition



Source: Elaboration based on Statistics Poland calculations.
Note: The figure shows the results of decomposing 3-year productivity growth rates using the Melitz-Polanec method, smoothed to represent an annual change.

Smaller and Younger Firms Exhibit Better Productivity Performance

SMEs are the engines of productivity growth in Poland. They are more likely to have substantially higher productivity growth than larger Polish firms. Large firms, however, do not lose their market shares in some industries, indicating inefficient reallocation of market shares. These results have three main policy implications. First, empirical findings suggest that there is a need for policy intervention to intensify the competition in Polish industries. Second, removing barriers to growth for smaller firms, especially in manufacturing, seems to be key to accelerating aggregate productivity growth. Enhancing the growth of high-productivity smaller firms can be achieved, for instance, through facilitating their access to finance, promoting financial market deepening, and supporting the development of the innovation supply side (for instance, dedicated software) for small and medium enterprises (SMEs). Third, large firms should be incentivized (however, not necessarily financially) to improve their within-firm

productivity performance and further investigation is needed to understand their barriers to productivity enhancement.

Young firms in Poland have faster productivity growth than older firms. The relationship between the ages that a firm operates on the market and productivity growth suggests that younger firms experience the fastest productivity growth among all companies across all sectors. Moreover, even though new firms entering the market in manufacturing begin with low levels of productivity, their productivity grows much faster than older establishments in the sector. In this regard, facilitating market entry conditions might foster aggregate productivity growth.

Competition and Research and Development Contribute Positively to Productivity Growth

In manufacturing, intensifying competition (measured by increases in the number of competitors) is positively correlated with productivity performance, while in services and construction, increases in market concentration are associated with lower productivity performance. This indicates that manufacturing firms tend to have better productivity performance in industries where there is an increase in the number of competitors. Moreover, there is a positive association between productivity growth and increases in the level of market concentration. Also, manufacturing firms in industries with increasing average profit margins perform better in terms of productivity. One possible explanation for this is that manufacturing firms that improve their productivity performance tend to occupy more of the market, which leads to a joint increase in productivity and concentration in the industry. This, however, is more likely in industries where concentration is initially low. In services and construction — unlike in manufacturing — increases in market concentration are associated with lower productivity growth. Moreover, the industry-level profit margin does not have any significant influence on firm performance. These results jointly indicate that higher competition leads to better productivity performance in construction and services. The difference between manufacturing and the other two sectors is most likely due to differences in the initial levels of competition and market concentration, but further investigation is needed.

In expanding industries, firms tend to improve productivity performance over time. This result has several possible explanations. First, higher sales indicate the relative size of the sector and potentially higher competition. Second,

productivity often rises because of positive demand shocks (Mayer, Melitz, Ottaviano, 2016). Increased demand leads producers to shift their production toward their best-performing products or raise prices, both of which lead to increases in labor productivity and TFP. Third, larger sectors can generate higher demand for productivity-enhancing technologies because their market is larger (from the perspective of technology providers). The above findings suggest strengthening linkages between Polish and foreign firms because the Polish economy generally benefits from lower barriers to international trade and foreign markets (World Bank, 2019).

Performing research and development (R&D) improved firms' market share within the industry (between-firm component), but there is no evidence that it also led to firms' own productivity improvements (within-firm component). This may imply that R&D investments help more productive firms capture larger market shares, which in turn improves allocative efficiency. However, the results on R&D and firm performance are mixed. In the services and construction sectors, we do not find that firms' expenditures on R&D have any significant effect on TFP growth. However, in manufacturing, R&D is significantly and positively associated with firms' productivity growth. The fact that R&D expenditures and productivity are positively correlated in manufacturing may imply potential positive returns from R&D incentives. One possible reason for inconclusive results regarding the link between R&D expenditures and productivity growth might be the low number of companies reporting R&D expenditures in the panel dataset, especially until 2016. Second, productivity advances in services often happen through investments in intangible assets and measuring them reliably is still a challenge (Demmou et al. 2019).

ABBREVIATIONS AND ACRONYMS

DG REFORM	Directorate-General for Structural Reform Support
EC	European Commission
EU	European Union
GDP	gross domestic product
NACE	Statistical Classification of Economic Activities in the European Union
R&D	research and development
SMEs	small and medium enterprises
TFP	total factor productivity
WBG	World Bank Group

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