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SELECTED ISSUES

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March 13, 2025

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European Department

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CONTENTS

TRACING THE SLOWDOWN OF LABOR PRODUCTIVITY GROWTH

Labor productivity in Sweden is among the highest in Europe but has experienced a secular growth decline since the GFC, similar to trends in other advanced economies. Sweden's strong performance is supported by a skilled labor force, a competitive business environment, high R&D investments, and deep financial markets. However, evidence points to potential barriers to resource allocation across sectors and firms, which requires a multi-faceted solution. Proposed reforms by the authorities' Productivity Commission could effectively address these issues. More broadly, given the evolving structure of the Swedish economy, horizontal policies that facilitate the growth of services sector firms would be particularly beneficial.

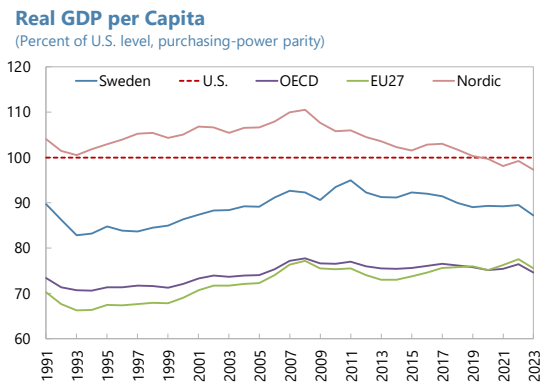
A. Introduction

1. The per capita income level in Sweden is higher than the average for other European countries but remains slightly below that of the United States (Figure 1, left panel). Since the early 1990s, Europe's real GDP per capita had rapidly converged with that of the U.S., but the convergence nearly stalled in the 2010s (IMF, 2024b). Sweden has experienced solid real GDP per capita growth, although the growth rate has slowed since the 2010s. Average labor hours per worker in Sweden have been stable (around 1,450 hours annually), indicating that labor productivity is a key factor in per capita income developments (Figure 1, right panel). Sweden's labor productivity grew faster than that of the U.S. until 2006. However, during the Global Financial Crisis (GFC) (2007–09), Sweden's labor productivity growth was -1.1 percent between, compared to 2 percent in the U.S. Since then, average growth rate (2010–23) has decreased by 1.6 percentage points in Sweden compared to the pre-GFC average, while in the U.S. it has decreased by 0.8 percentage points.[1] Though labor productivity has improved in the years leading to the pandemic, it remains uncertain whether such trend will continue after the compounded shocks since then and with an uncertain global environment.

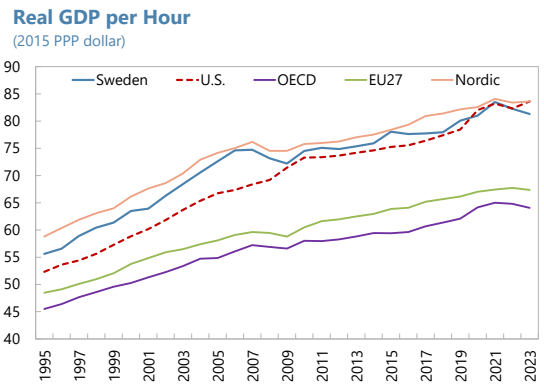
2. This paper studies the factors influencing Sweden's recent labor productivity trends. It will first place Sweden within the European context, highlighting its superior performance in several areas identified by the IMF (2024a). It will then document key findings from Swedish researchers' analysis (Persson et al. 2024) on the subject. Next, the paper will complement these findings by examining Sweden's recent labor productivity growth slowdown, focusing on the trends in resource allocation across sectors and firms. The final section will present the key takeaways.

[1] The OECD Productivity Database is frequently updated, which can lead to change in relative *level* of labor productivity between countries across different vintages, due in part to the revision of relative prices. Ordinal comparison between countries with similar real labor productivity should thus be made with caution. Changes across time for a given country are robust across vintages, which is the focus of this paper. Figure 1 is based on data accessed in February 2025.

Figure 1. Real Output and Labor Productivity of Selected Countries



Sources: WEO; and IMF staff calculations.

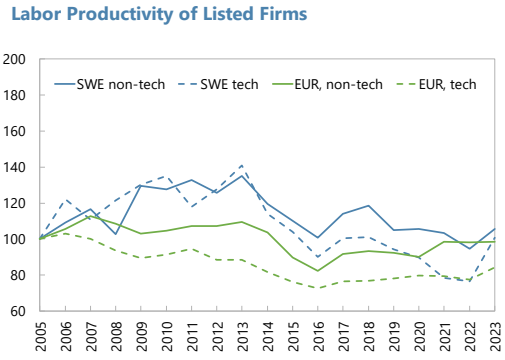


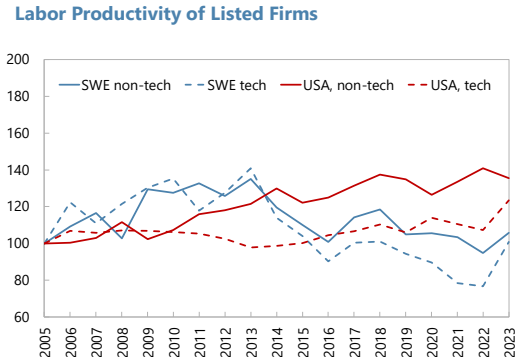
Sources: OECD Productivity Database (Feb 2025).

B. Sweden's Labor Productivity Relative to Other European Countries

3. Labor productivity of Sweden's listed firms outperforms that of their European peers in both high-tech and non-tech sectors (Figure 2, top-left panel).[2] They performed especially well before 2013, even outperforming their U.S. counterparts (Figure 2, top-right panel). However, since 2013, labor productivity in high-tech sectors has sharply declined, reducing their advantage over European peers and opening a gap with U.S. firms. Labor productivity started to rebound in 2023. Focusing on high-tech services, Swedish firms closely track the U.S. performance and maintain productivity advantage over European peers (Figure 2, bottom panels).

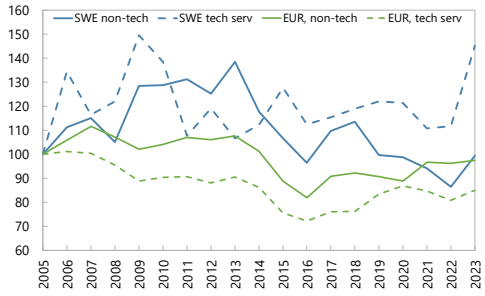
Figure 2. Labor Productivity of Listed Firms
(Index, 2005=100)

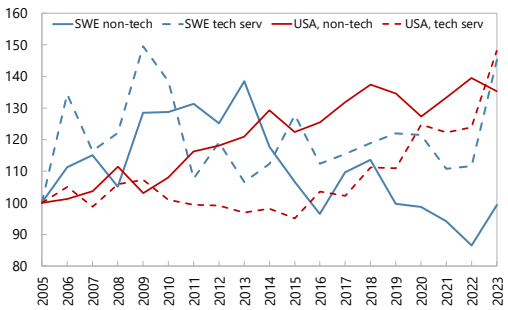




[2] Listed firms on average have larger size in Sweden. In the Compustat sample (excluding firms in the financial sector), the average number of employees is 5,700 (with a median of 390), compared to 15 (and a median of 2) in the Orbis sample (used later in the paper). High-tech sectors in Figure 2 top panels are defined following IMF (2024a), which covers both the manufacturing of sophisticated equipment, such as high-precision laboratory analytical instruments, communication equipment, semiconductor, electromedical and electrotherapeutic apparatus, as well as ICT services. High-tech services sector in Figure 2 bottom panels only include ICT services.

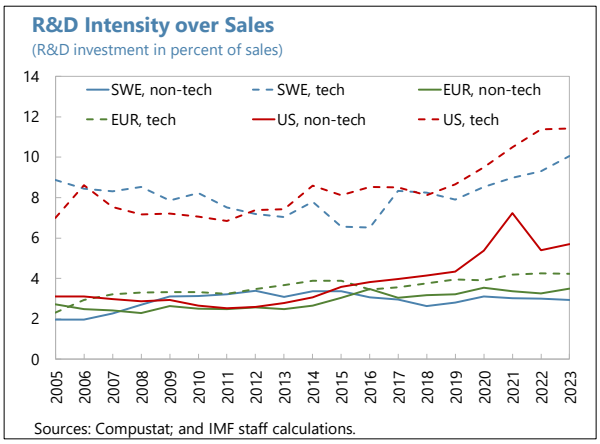
Figure 2. Labor Productivity of Listed Firms (concluded)
(Index, 2005=100)





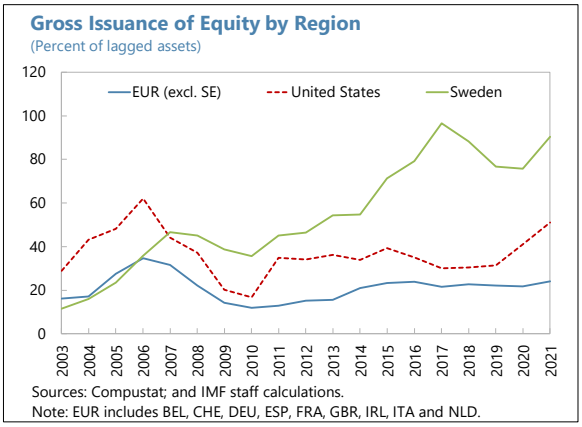
Sources: Compustat; and IMF staff calculations.

4. Swedish firms in the high-tech sector benefit from substantial R&D investment (Text Figure). While European tech firms on average allocate about 3 percent of their sales to R&D, Swedish firms invest more than twice that amount, on par with U.S. high-tech firms. Moreover, Swedish firms have been increasing their R&D spending in recent years. Given this, the recent slowdown in labor productivity growth among high-tech firms could reflect diminishing returns to R&D globally (Bloom et al., 2020), an increasing share of basic research in R&D activities, or a potential need to improve the conversion of innovation efforts into production in Sweden.



Sources: Compustat; and IMF staff calculations.

5. Swedish firms also benefit from more developed financial markets than their European counterparts, facilitating access to finance for risky investments, including R&D. The gross issuance of equity by publicly listed firms in Sweden exceeds that of other European countries and the United States (Text Figure); one contributing factor is the broad participation of the Swedish population in the equity market, for instance through the Investment Savings Accounts.[3] For startups, Sweden has one of the most developed venture capital (VC) industries in Europe. From 2013 to 2023, average VC investment in Sweden was about 0.5 percent of GDP, close to the U.S. average of 0.7 percent of GDP



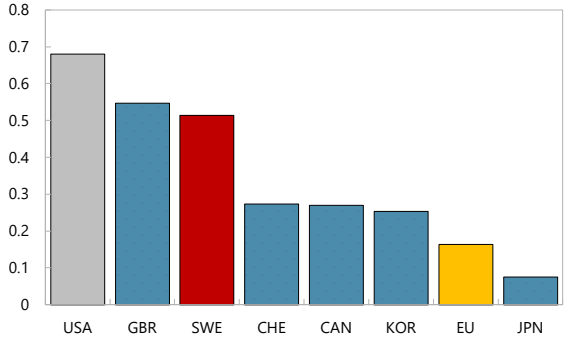
Sources: Compustat; and IMF staff calculations.
Note: EUR includes BEL, CHE, DEU, ESP, FRA, GBR, IRL, ITA and NLD.

[3] Gross issuance is used instead of net issuance because only a handful of firms report purchase of shares.

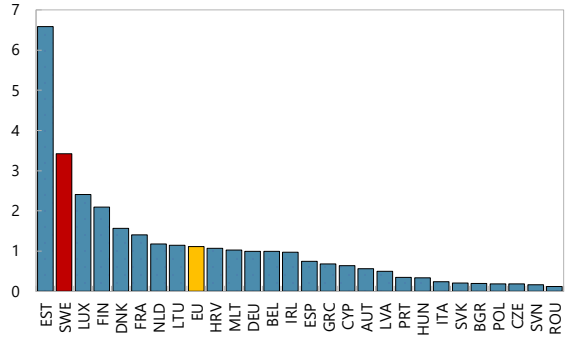
and more than double the Europe's average (Figure 3, left panel). Within Europe, Sweden's share of VC activity exceeds its total EU GDP share, ranking 2nd among EU member states, following Estonia (Figure 3, right panel).

6. Earlier analysis on Sweden (Persson et al., 2024) also concludes that the Swedish business sector has performed better than other OECD countries. Using administrative data on Swedish firms, the study's findings echo many of Sweden's strengths identified above (see Box 1). In particular, it highlights that the structural reforms implemented in the late 1980s and early 1990s bolstered competition and led to strong productivity growth until the GFC. It also finds that the Swedish economy has become increasingly intangible, with venture capital and stock market playing a larger role in financing firms' investment, leveraging Sweden's comparative advantage. Additionally, it documents that more productive firms employ a higher proportion of skilled labor, further underscoring an advantage commonly associated with the Swedish economy.

Figure 3. Venture Capital Investment



Source: Arnold, Claveres and Frie (2024).



Source: Arnold, Claveres and Frie (2024).

7. The study also identifies several warning signs contributing to the productivity slowdown since the GFC. A key concern is the weakening of the creative destruction process and a slowdown in resource allocation from less to more productive firms. In the 1990s, the entry of new, productive firms and the exit of less productive ones drove productivity growth; however, incumbent firms now dominate the process. Within sectors, productivity growth is driven increasingly by the most productive firms rather than being broadly distributed, especially in the industry sector. This shift has resulted in an expanding productivity gap between these and the remaining firms, indicating a slowdown in technology diffusion.

Box 1. Summary of the Analysis by Persson et al. (2024)

Sweden's business sector has, on average, higher labor productivity than other OECD countries, while also exhibiting a similar secular slowdown in growth rates after the GFC. A series of micro-based policy reforms implemented in the late 1980s and early 1990s supported the rapid productivity growth prior to the GFC. While the slowdown of labor productivity growth after the GFC is driven by factors shared by other advanced economies, the Swedish economy has also experienced important changes in its structure, with sizable heterogeneity across firms and industries.

Box 1. Summary of the Analysis by Persson et al. (2024) (concluded)

A key observation is the overall less dynamic creative destruction process in recent decades compared to the pre-GFC era. In the 1990s, entry and exit of firms drove a large share of total productivity growth in the business sector, while in recent years, the contribution from existing firms has dominated. In addition, within each sector, productivity growth is mostly driven by that of the most productive firms. Since 2000, productivity of firms in the top quintile of the productivity distribution has been increasing steadily while those in the third quintile and below have seen minimal growth, leading to increasing dispersion of productivity distribution. While many productive firms were acquired by large companies (koncerner in Swedish), the impact on the overall competitiveness of the Swedish economy, as reflected in common measures like the Herfindahl-Hirshmann index, appears to be limited, possibly due to Sweden's status as a small open economy, where these companies mainly compete in the international market.

The Swedish economy has also become increasingly intangible. Sweden was already ahead of many OECD countries during the IT boom, capitalizing on its comparative advantage in related sectors. While other countries have been catching up rapidly on this front, Sweden continues to hold leadership position in industries such as the ICT sector.

Labor mobility is key for workers to realize their productivity potential. Overall, the Swedish workforce manages to move from less to more productive firms. Workers who have recently studied or changed their profession are more likely to move from less to more productive firms, with the pattern most prominently observed among younger workers. Staff training is also common in Sweden, with a focus on workplace-related skills.

Policy advice from the report focuses on enabling the Swedish economy to better adapt to a more volatile and uncertain external environment. To achieve this, it is important to create a supportive environment that allows firms to respond to rapidly changing market conditions and to facilitate the movement of resources to the most competitive firms. The report proposes five policy recommendations: (i) Protect the creative destruction process by improving competition, flexibility, and neutrality in the product market; (ii) Improve efficiency in institutions that stimulate research, development, and commercialization in the innovation market; (iii) Improve and adapt the financial markets to a more intangible business sector; (iv) Advocate a regulatory system more oriented towards productivity and commercialization; (v) Increase opportunities for continuous further training throughout the entire career of workers.

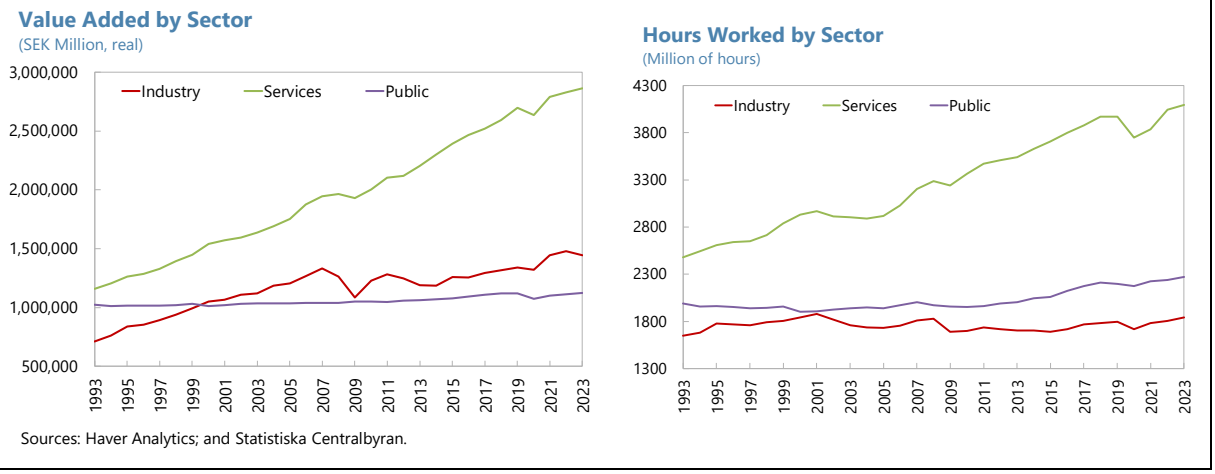
8. The Interim Report by the authorities' Productivity Commission shares many of the policy recommendations made by Persson et al. (2024), while also highlighting the need of reforms in several additional areas. One such area identified for reforms is the functioning of the housing and rental markets through adjusting the current regulatory framework, increasing competition in the construction sector, and strengthening the incentives of local governments to increase land supply. Moreover, the report calls for additional investments in transportation infrastructure, improving productivity in the public sector, including local governments, and fine-tuning the taxation system.

9. Complementing these studies, this paper analyzes trends in resource allocation across sectors and firms of different characteristics. It demonstrates that the decline in labor productivity growth in Sweden can be traced to changes in the composition of the economy across sectors and a secular decline of the sectoral labor productivity growth. It then provides evidence that this decline is closely related to the development of labor productivity at the firm level.

C. A Change in Sectoral Composition and Secular Labor Productivity Growth Decline

10. At the aggregate level, the GFC marks the beginning of Sweden's transition to a more services-oriented economy. When economic activity is categorized into four broad sectors—agriculture, industry, services, and government—value added in the industry and services sector grew in tandem before the GFC. However, post-GFC, while value added in services continued to grow, that of the industry sector flattened (Figure 4, left panel; the agricultural sector, accounting for less than 2 percent of total value added, is excluded). Consequently, the share of services in total value added increased from 39 percent in 1993 to 52 percent in 2023. A similar pattern can also be seen in hours worked (Figure 4, right panel).

Figure 4. Sectoral Composition of the Swedish Economy



Sources: Haver Analytics; and Statistiska Centralbyran.

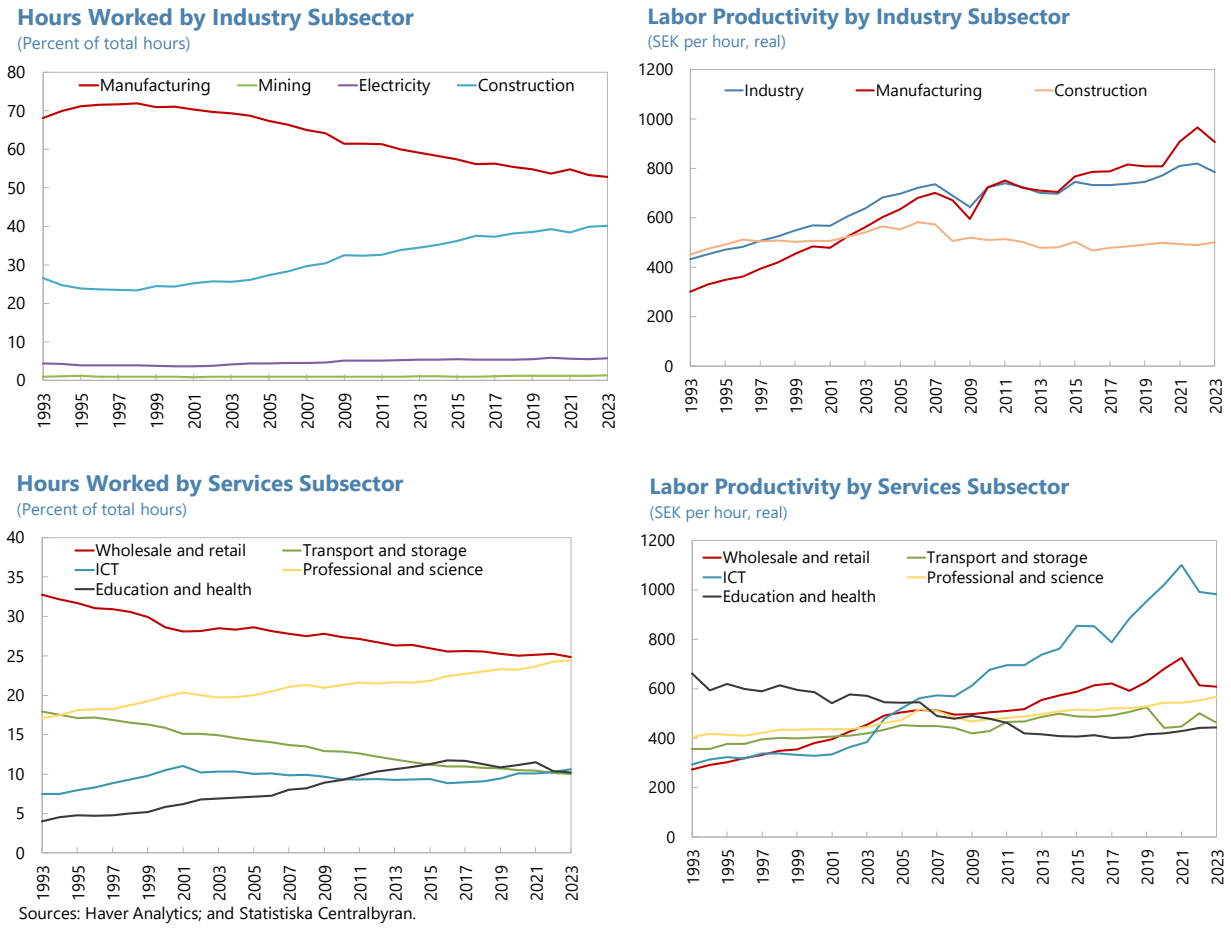
11. A shift of the composition of hours is also happening within both the industry and services sectors, notably with a rising share of hours in sectors with slower labor productivity growth.[4] In the industry sector, which consists of manufacturing, construction, mining, and utility production sectors, about 20 percent of the total hours worked has shifted from manufacturing to construction since the mid-1990s (Figure 5, top-left panel), the latter having a flat labor productivity trend (Figure 5, top-right panel).[5] In the services sector, about 30 percent of hours worked have shifted from the retail and wholesale, as well as transportation and storage sectors, to information and computer technology (ICT), professional and scientific activities, and education and health sectors (Figure 5, bottom-left panel). Notably, labor productivity growth in the sectors gaining hours

[4] The shift in hours does not provide direct evidence on the direction of workers' movement. For instance, Figure 5 top-left panel should not be interpreted as workers leave manufacturing sector and join construction sector. In fact, the fast growing of ICT sector during its boom in the 1990s was mainly drawing employment from the manufacturing sector.

[5] These are relative shares of hours in the industry sector (and services sector later). The total hours need to be multiplied by the overall sectoral hours in Figure 4 right panel. For instance, while the relative hours in the ICT sector remained flat since the 2000s (Figure 5 bottom-left panel), its total hours increased in the same pace as the services sector.

is lower (Figure 5, bottom-right panel), with productivity in the education, health and social activities declining since the 1990s.[6] Conversely, services sectors whose labor productivity grow the fastest—finance, ICT and wholesale and retail—have not seen an increase in relative hours worked; while those in finance and ICT have barely changed since the 2000s.[7]

Figure 5. Sectoral Composition of Manufacturing and Services Sectors



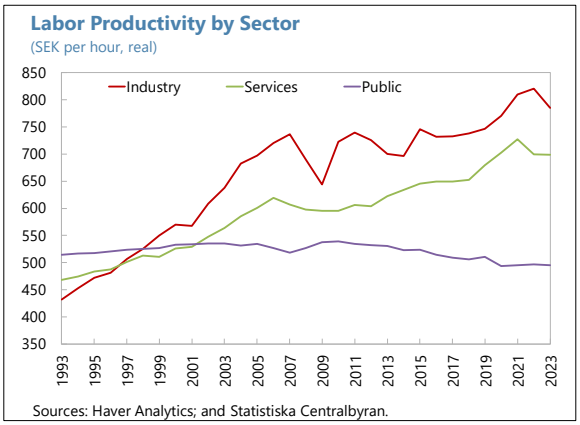
Sources: Haver Analytics; and Statistiska Centralbyran.

12. The secular decline of labor productivity growth post-GFC is evident in both the industry and services sectors (Text Figure). Average labor productivity growth dropped from 4 percent pre-GFC to 1.5 percent between 2010–23 for the industry sector, and from 2.2 percent to 1.2 percent for the services sector. The decline in the industry sector is driven by both lower labor productivity growth in the manufacturing sector and the relocation of resources to the construction sector (Figure 5, upper panels). In the services sector, specific subsectors driving this trend are less

[6] It should be noted that value added in services sectors is known to be hard to measure, due to various factors such as lack of market price, unobserved heterogeneity in quality, and price controls. Nonetheless, unless the measurement errors are changing systematically across time, the measured trends are likely to move in tandem with the true trends.

[7] Three sectors in Sweden appear to have the highest level of labor productivity are real estate, mining and electricity production (several times higher than average), but their shares are relatively small in the Swedish economy.

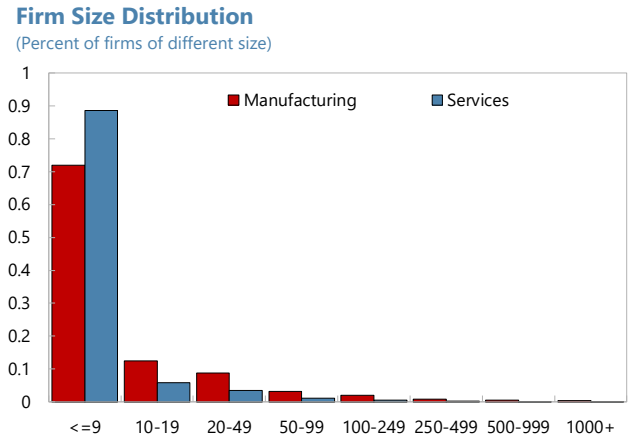
clear, due to greater heterogeneity. Notably, the retail and wholesale sector has seen average labor productivity growth decrease from 5 percent to 1.6 percent post-GFC, although it remains higher than in most services subsectors.



D. Organization of Production at the Micro Level

13. Sweden's economy features a large number of firms with less than 9 employees, while much of the employment and production are done by large firms.[8] The firm size distribution is fairly stable across time. On average between 1998 and 2021, about 70 percent of firms in the manufacturing sector had less than 9 employees, with the ratio being close to 85 percent in the services sector (Figure 6, top panel). Meanwhile, economic activities tend to concentrate on the largest firms with more than 1,000 employees, particularly in manufacturing, where about 70 percent of the employment and production is associated with the largest firms (Figure 6, bottom panels). The concentration is lower in the services sector, where production is also less concentrated than employment, with 35 and 45 percent of share for the largest firms, respectively. Importantly, firms with less than 9 employees contribute to a sizable share of the overall production in the services sector.

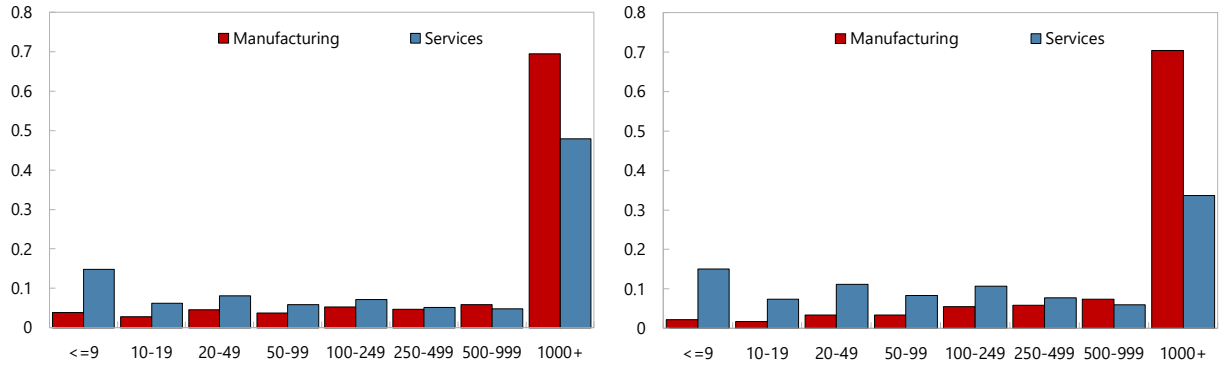
Figure 6. Firm Distributions of Sweden
(Average from 1998 to 2021)



[8] This section uses the Orbis data, which contain a representative sample of firms with balance sheet and income statements data. For Sweden, on average, about 350,000 firms are covered each year in the 2010s. The original data have been cleaned following the procedure documented in Kalemli-Özcan et al. (2024). Operating profits, used to calculate firm-level labor productivity, are converted to real values using the Eurostat price deflator at NACE 2-digit level.

Figure 6. Firm Distributions of Sweden (concluded)

(Average from 1998 to 2021)

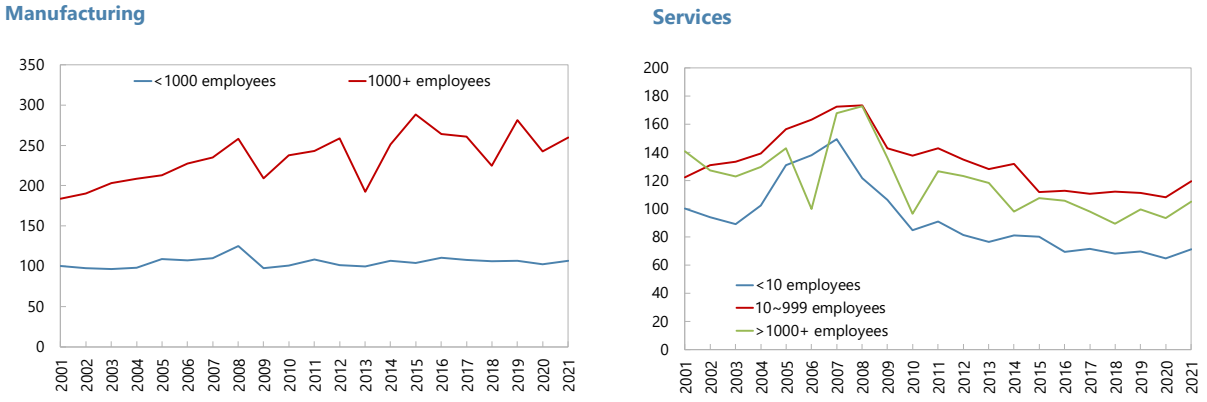


Sources: Orbis; and IMF staff calculations.

14. Large firms in the manufacturing sector exhibit higher labor productivity (measured as operating revenue per employee) than smaller ones (Figure 7 left panel), whereas medium-sized firms in the services tend to be more productive (Figure 7 right panel). Prior to the GFC, labor productivity growth was broad-based across firm sizes in both sectors. However, post-GFC, the trends have diverged. In manufacturing, productivity of the largest firms has continued to rise, while that of the smaller ones has stalled. By contrast, productivity in real terms has decreased for firms of all sizes in the services sector.[9]

Figure 7. Average Labor Productivity by Firm Size

(Normalized labor productivity, 100 = 2001 level of <1000 employees)



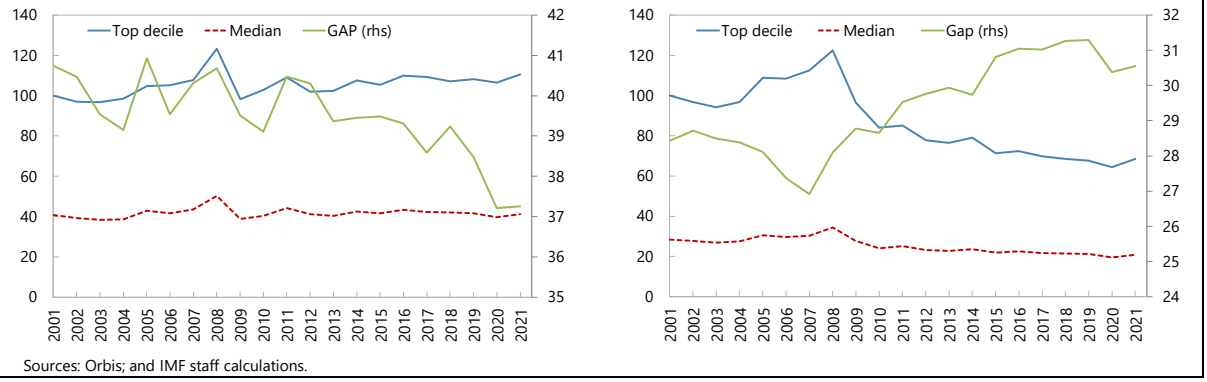
Sources: Orbis; and IMF staff calculations.

[9] Labor productivity is measured by operating revenue per employee in Figures 7 and 8, while by value added per hour in Figures 4 and 5. Operating revenue is used to preserve a representative sample as firm-level value added contains too many missing values in the Orbis data. In addition, sectoral value added in Section C is deflated using sectoral deflator of Statistics Sweden, the Orbis data are deflated using Eurostat deflator at NACE 2-digit level. The comparison between these figures should be made with such caveats in mind. The different productivity trend for leading firms in services between this study and Persson et al. (2024) could also be driven by the same factors, in addition to different sector groupings.

15. Technology diffusion in the manufacturing sector has slowed since the GFC, while the narrowing of the gap between frontier and median firms in the services sector is driven by decreasing productivity of frontier firms. Using the top decile of the productivity distribution as the proxy for frontier productivity and the ratio of the median to the frontier as a measure for technology gap, the average technology gap is lower in the manufacturing sector than in services (Figure 8). On average, a median firm in manufacturing is about 40 percent as productive as a frontier firm, compared to only 30 percent in services. The gap in manufacturing has widened since the GFC, indicating that spillovers from highly productive firms to the rest may be slowing. In contrast, although the technology gap is shrinking in services, this is due to falling productivity at the frontier rather than accelerating technology diffusion. This finding is consistent with the evidence that leading firms, especially in manufacturing, have driven productivity growth post-GFC, as documented in Persson et al. (2024).

Figure 8. Technology Gap between Lead and Median Firms

(Normalized labor productivity, 100 = 2001 top quintile level)



Sources: Orbis; and IMF staff calculations.

E. The Road Ahead

16. The analysis suggests that the slowdown in labor productivity growth in Sweden aligns with the global trend observed in other AEs. The main takeaways from this analysis are as follows:

a. The global slowdown in labor productivity growth affecting AEs is also evident in Sweden, as shown by the broad-based decline across sectors and firms.

b. Resources do not seem to increase more in sectors or firms where labor productivity grows rapidly.[10]

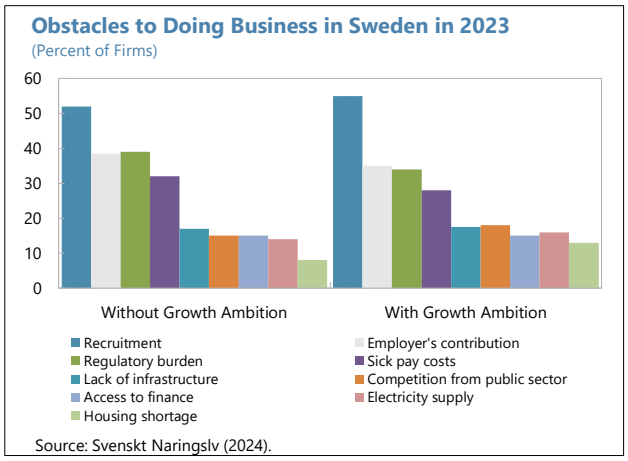
c. As labor productivity growth of large manufacturing firms rebounded from the GFC shock, enhancing spillovers to smaller firms is crucial.

[10] The evidence is only indicative as it does not specify the source of productivity growth. For example, for a firm experiencing higher intensity of automation, it is natural that measured labor productivity increases but the firm does not hire additional workers.

d. The labor productivity slowdown is more broad-based across the entire distribution of firms in the services sector, suggesting that horizontal solutions can be effective.[11]

17. Many common factors contributing to the secular decline in labor productivity in advanced economies also apply to Sweden. These include diminishing returns to R&D (Bloom et al., 2020), the legacy effects from the GFC (Duval, Hong, and Timmer, 2019), declining business dynamism (Akcigit and Ates, 2021), and slower technology diffusion (Andrews, Criscuolo, and Gal, 2015, 2016). Notably, some trends, such as the increasing share of services activities in the economy, represent a natural structural transformation following economic development and demographic transition, therefore do not necessarily require policy intervention.

18. The broad-based slowdown, in particular among services firms, coupled with evidence from other studies, suggests that barriers to labor mobility and hence firm growth may be contributing factors. In 2023, Swedish firms reported difficulty in recruitment, high employer contributions, regulatory burdens, and job protection levels (e.g., sick pay) as the leading obstacles to doing business (Text figure). Skill mismatches could be contributing to recruitment challenges. The OECD Economic Survey for Sweden in 2023 (OECD, 2023) documented that Sweden has one of the lowest shares of elementary jobs among EU members, second only to Norway, which hampers worker mobility across sectors and contributes to deteriorating labor market matches. Inefficient housing and rental market is another factor identified by several studies—OECD (2021, 2023) and the Productivity Commission (2024).



Source: Svenskt Naringslv (2024).

19. To revive labor productivity growth, Sweden should leverage its strengths to adapt to rapidly evolving economy. Improving resource allocation, especially by facilitating labor mobility, and allowing productive firms to scale up rapidly are crucial. Many reforms proposed by the authorities' Productivity Commission proposed in the Interim Report can be helpful. Key priorities include the following:

a. Simplifying and harmonizing regulations can ease the administrative burden on firms, especially smaller ones with limited resources. In light of a rapidly changing economy, regulations need to balance carefully protecting the public and stimulating innovation.

b. Improving housing and rental market functioning will help facilitate mobility of people and resources, for which maintaining transportation infrastructure can also contribute to. Stronger labor mobility between firms and locations can also support technology diffusion.

[11] Horizontal policies are those aiming to improve the general business environment for all firms and industries in an economy (such as promoting the ease of doing business, maintaining infrastructure). They contrast with vertical policies targeting a specific segment of the economy.

c. Improving educational outcomes, including among immigrants, addressing skill mismatches, enhancing efforts to upskill and reskill the labor force, and reducing long-term structural unemployment are important.

d. Closer collaboration between the business sector and the academia, along with ensuring that the R&D ecosystem aligns with industry needs, attracts ample talent, supports basic research, and facilitates commercialization, would leverage Sweden's impressive R&D capacity and support technology diffusion (see Box 2 for examples).

e. While Sweden's deep and robust financial sector supports access to finance, ensuring that small and medium-sized firms (which appear to be more productive in Sweden) continue to have adequate access to finance is important. Financial constraints can be more pronounced for firms in the services sector that lack collateral for bank loans. Sweden's strength in venture capital market is an asset, especially as the economy becomes more intangible.

Box 2. Sweden's R&D Ecosystem

Sweden's R&D ecosystem is characterized by the quadruple helix model, in which industry, universities, government and the civil society work closely in the innovation process. In addition to facilitating the translation of academic research to industry production under the traditional triple helix model, the civil society is included as a fourth pillar to ensure research efforts align with societal needs and remain sustainable. Around 70 percent of the R&D activities in Sweden are privately financed, with the government filling the remaining 30 percent; besides, the government also assumes the role of maintaining a platform to foster collaboration of other stakeholders. Sweden leads the global frontier in environmental technology, life sciences, and nanotechnology.

The government allocates funding for research and third-cycle education through direct government funding, external funding bodies, or municipalities, county councils and public research foundations. Direct government funding is provided primarily through four agencies: the Swedish Research Council, Formas, Forte, and Vinnova, each with their dedicated areas of focus. The direct funding is complemented by state-funded foundations, for instance the Chalmers University of Technology Foundation, the Swedish Foundation for International Cooperation in Research and Higher Education, and the Swedish Foundation for Strategic Research, to name a few. The Riksbank also provides a major funding source for humanities and social sciences under the Riksbankens Jubileumsfond. Complementing public financing, private organizations like the Knut and Alice Wallenberg Foundation also make significant contributions for R&D funding.

The interactions among stakeholders are best illustrated using an example; here the case of Robotdalen is presented (Hasche, Hoglund and Linton, 2020). Robotdalen started in 2003 as an initiative aimed at creating regional growth in Mälardalen by building an innovation system in robotics and automation, focusing on three areas: mobile robots providing service, innovative automation, and technology for independent life. The project involved two regional universities (Malardalen University and Orebro University), a few multinationals (e.g., ABB, Volvo, Atlas Copco and ESAB), a large number of SMEs, several governments at the regional and municipal level, as well as hospitals. The project is primarily funded by Vinnova under the Vinnvaxt initiative, complemented by funds from local governments and participating firms.

Robotdalen allows different parties to benefit more easily from the comparative advantage of each other. For large firms like ABB, the platform allows them to engage in intense and risky R&D activities with the help of research institutes and universities without interfering with their day-to-day operations. For this purpose, ABB started a collaborative robotic testing center together with Robotdalen, with the help of financing from Vinnova. Smaller firms, on the other hand, benefit mainly from business coaching and small,

Box 2. Sweden's R&D Ecosystem (concluded)

but critical funding, while complementing the research efforts of large companies. By engaging with larger firms and the academia, they also gain knowledge and access to cutting-edge technology and can explore the potential of adopting the technology in business, thereby facilitating the diffusion of technology. In turn, researchers and students are able to deepen their academic understanding by applying their knowledge to the real-life environment. Besides facilitating the accumulation and sharing of knowledge as a public good, Robotdalen also enables local governments facing similar issues to join force and share resources. Finally, the platform allows the end users of the innovation, for instance the elderly through local hospitals, to participate in the process so that the innovation efforts better reflect their needs.

While offering great potential, the model requires highly efficient communication and can also be supported by other complementary measures. As with other cases where multiple stakeholders are involved, communication breakdown can also hamper as opposed to facilitate the collaboration, for instance by misaligning the needs of industry, academics and the government; Garcia-Teran and Skoglund (2019) provides an example. The ecosystem can also be strengthened by other complementary measures. For instance, the authorities' interim report on tax incentives for R&D proposed, among other things, that the definitions of R&D activities be simplified and expanded, and that the tax relief on expert tax be increased.

The recent Research and Innovation Bill presented to the parliament by the government contains measures that further strengthens the model. The Bill will invest further in basic science research, Sweden's research infrastructure, groundbreaking technologies, and practical research that can improve the quality of the public sector. Finally, the Bill also includes measures to enhance international cooperation.

References

Andrews, Dan, Chiara Criscuolo, and Peter N. Gal. 2015. "Frontier Firms, Technology Diffusion and Public Policy: Micro Evidence from OECD Countries," OECD Productivity Working Paper 15/02, Paris.

Andrews, Dan, Chiara Criscuolo, and Peter N. Gal. 2016. "The Best Versus the Rest: The Global Productivity Slowdown, Divergence Across Firms and the Role of Public Policy," OECD Productivity Working Paper 16/05, Paris.

Akcigit, Ufuk, and Sina Ates. 2021. "Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory," *American Economic Journal: Macroeconomics*, 13(1), 257–98.

Arnold, Nathaniel, Guillaume Claveres, and Jan Frie. 2024. "Stepping Up Venture Capital to Finance Innovation in Europe," IMF Working Paper 24/146, Washington D.C.

Bloom, Nicholas, Charles I. Jones, John Van Reenen, and Michael Webb. 2020. "Are Ideas Getting Harder to Find?" *American Economic Review*, 110(4), 1104–44.

Duval, Romain, Gee Hee Hong, and Yannick Timmer. 2019. "Financial Frictions and the Great Productivity Slowdown," *Review of Financial Studies*, 33(2), 457–503.

Garcia-Teran, Jessica, and Annika Skoglund. 2019. "A Processual Approach for the Quadruple Helix Model: The Case of a Regional Project in Uppsala." *Journal of the Knowledge Economy*, 10, 1272–96.

Hasche, Nina, Linda Hoglund, and Gabriel Linton. 2020. "Quadruple Helix as a Network of Relationships: Creating Value within a Swedish Regional Innovation System." *Journal of Small Business and Entrepreneurship*, 32(6), 523–44.

International Monetary Fund (IMF). 2024a. "Europe's Declining Productivity Growth: Diagnoses and Remedies," IMF Regional Economic Outlook Notes: Europe, Washington D.C.

International Monetary Fund (IMF). 2024b. "Accelerating Europe's Income Convergence Through Further Integration," IMF Regional Economic Outlook Notes: Europe, Washington D.C.

Kalemli-Özcan, Şebnem, B. E. Sørensen, C. Villegas-Sanchez, V. Volosovych, and Sevcan Yeşiltaş. 2024. "How to Construct Nationally Representative Firm-Level Data from the Orbis Global Database: New Facts on SMEs and Aggregate Implications for Industry Concentration." *American Economic Journal: Macroeconomics*, 16(2), 353–74.

OECD. 2021. "OECD Economic Surveys: Sweden." Paris.

OECD. 2023. "OECD Economic Surveys: Sweden." Paris.

Persson, Lars, Karin Edmark, Pehr-Johan Norback, and Erik Prawitz. 2024. "Productivity Growth in the Swedish Business Sector," SNS Economic Policy Council Report, Stockholm.

The Productivity Commission. 2024. "Good Opportunities for Increased Prosperity: An Interim Report." Stockholm.