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Productivity Growth and Value Chains in Four European Countries

by Izabela Karpowicz and Nujin Suphaphiphat

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I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

European Department

**Productivity Growth and Global Value Chains in Four European Countries**

**Prepared by Izabela Karpowicz and Nujin Suphaphiphat<sup>1</sup>**

Authorized for distribution by Jeffrey Franks

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**Abstract**

Advanced economies have been witnessing a pronounced slowdown of productivity growth since the global financial crisis that is accompanied in recent years by a withdrawal from trade integration processes. We study the determinants of productivity slowdown over the past two decades in four closely integrated European countries, Austria, Denmark, Germany and the Netherlands, based on firm-level data. Participation in global value chains appears to have affected productivity positively, including through its effect on TFP when facilitated by higher investment in intangible assets, a proxy for firm innovation. Other contributors to productivity growth in firms are workforce aging, access to finance, and skills mismatches.

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**PRODUCTIVITY GROWTH AND GLOBAL VALUE CHAINS IN FOUR EUROPEAN COUNTRIES**

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## A. Introduction

In this paper we are analyzing the interplay of two concomitant phenomena we are witnessing today: on the one hand, the secular slowdown in productivity growth, and, on the other hand, the role of trade integration and its potential reversal in advanced economies. Advanced economies have been experiencing a material slowdown in labor productivity. Though labor productivity has started slowing in the mid-1970s, the slowdown was starker in the period post-financial crisis and has been more pronounced in the recent post-crisis years. Meanwhile, globalization and connectedness have come under attack following several decades of integration and strengthening economic ties among countries. Globalization has helped reap gains from specialization through increased trade and competition and has fostered transfer of knowledge and innovation from technology leaders to the rest of the world (IMF, 2018). Technological diffusion has contributed to productivity and boosted global growth, lifting large segments of population from poverty through job creation and human capital accumulation. But the expansion of global value chains (GVCs), i.e. the participation in an integrated value-added production process across countries, which was robust during the 1990s and has eased during the 2000s, is currently slowing further and even reversing its course.

The retreat from multilateralism, including a “trade war”, can hurt growth directly, through an increase in tariffs, but also through indirect channels. An increase in uncertainty and market volatility are known to affect the cost of capital and investment decisions, thus inhibiting efficient allocation of resources and constraining productivity. Understanding the role trade integration has played for firm productivity has thus become important and can help anticipate the effects of a withdrawal from specialization on corporate performance and growth.

We focus our analysis on four European countries over the past two decades, where possible, which we select based on firm-level data availability and the level of trade integration. Austria, Denmark, and the Netherland all display strong GVC participation and substantial linkages to Germany as a regional hub, whose total factor productivity growth has been somewhat stronger in recent years. The countries’ GVC participation rates with Germany range from 46 of gross exports for Denmark to 55 percent for the Netherlands with varied composition. While Austria and the Netherlands are more integrated with Germany through forward participation, Denmark is more integrated through backward participation as the country exports more inputs to Germany.

From Germany’s perspective, GVC participation rates to these countries range from 42 to 47 percent of its gross exports, where Denmark is the most integrated in the group.

What have been the trends in and drivers of labor productivity developments? What has been the role of sectoral employment shifts and trade integration for productivity developments? We attempt to answer these questions in subsequent sections: in section B, we analyze labor and total factor

**Table 1. GVC Participation Rates in Selected Countries 1/**

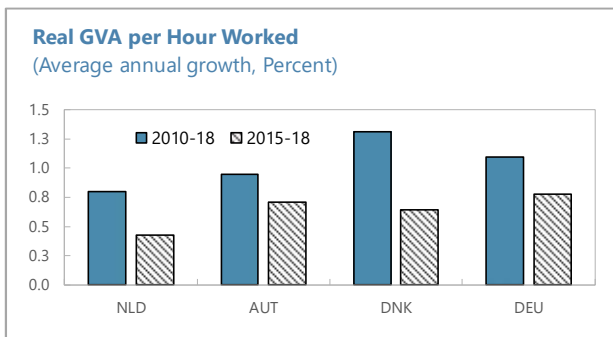
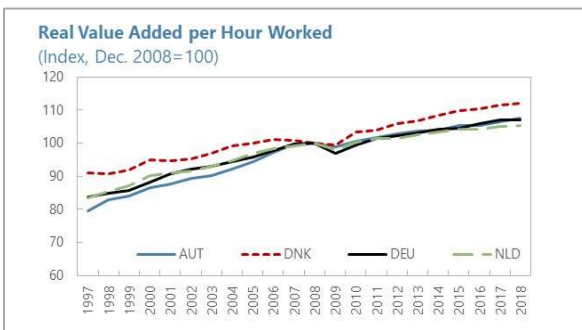
From/To	AUT	DEU	DNK	NLD
AUT		(25, 28)	(27, 24)	(20, 36)
DEU	(19,22)		(18, 29)	(17, 27)
DNK	(26, 24)	(27, 19)		(24, 33)
NLD	(27, 28)	(25, 29)	(28, 30)	

1/ The numbers in the parentheses denote backward and forward participation rates respectively. The sum of the numbers is equal to the total GVC participation rate.

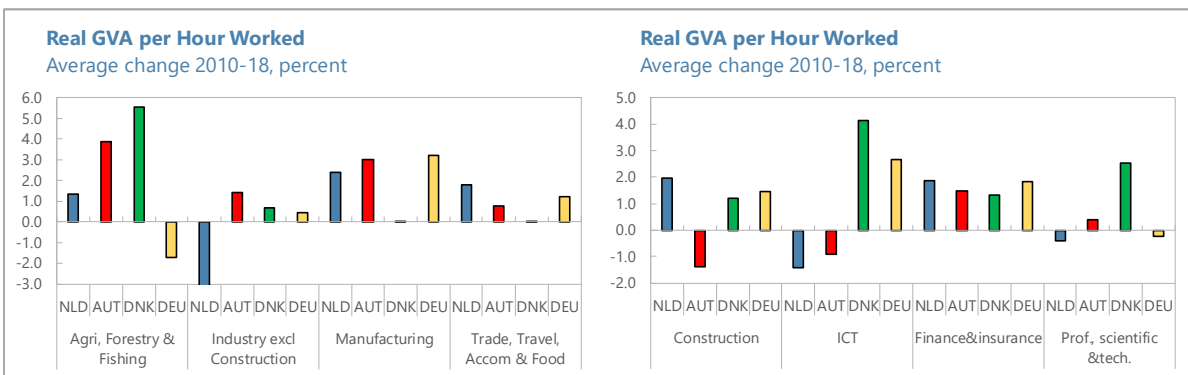
productivity (TFP) developments using Eurostat sectoral data; in section C, we present some stylized facts and report regression estimates on determinants of productivity growth and GVC based on a firm-level panel from an Orbis-based database; in section D we conclude.

### B. Productivity Trends

Labor productivity growth has slowed considerably in the aftermath of the global financial crisis and has not recovered in recent years to pre-crisis levels. Productivity growth was uneven across sectors, with finance and insurance and ICT generally registering higher average annual growth of output per worker. Average labor productivity growth declined in Austria from 2 ¼ percent in the decade spanning from 1997 to 2006, to about 1 percent in the period after the crisis (2010-18), after having slowed down significantly to ½ percent during 2007-09. Other advanced economies have experienced similar trends. Among the countries in our sample, experienced a somewhat higher labor productivity growth than others over the past eight years, albeit below the rates observed before the crisis. More recently, Denmark’s productivity growth over 2015-18 lagged that of Germany.



Sources: Eurostat.

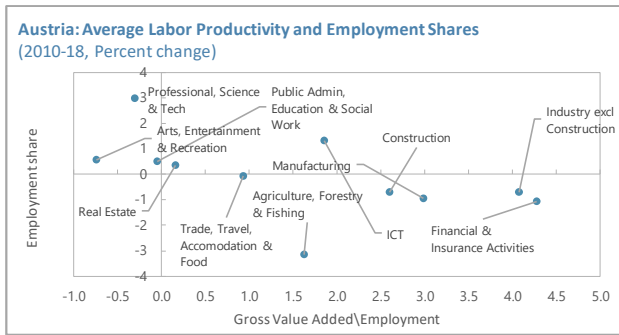


Sources: Eurostat.

The literature on advanced economies has identified several possible explanations for the widespread decline in productivity gains post-financial crisis. Sectoral shifts away from the secondary sectors towards a larger share of tertiary activities in the economy (Dabla-Norris et al., 2015) such as services, with structurally lower productivity, may be one of the explanations relevant

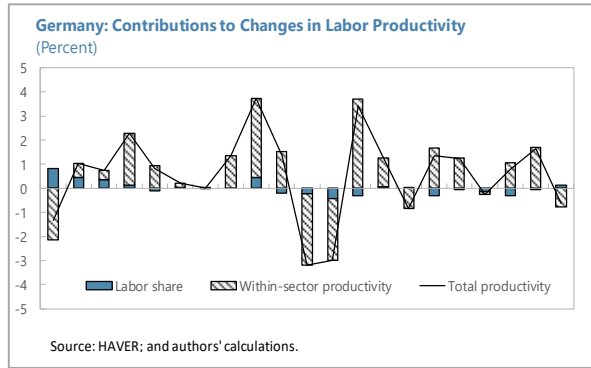
for Austria. Second, stringent labor and product market regulations have been found to be detrimental for efficient resource allocation by Andrews and Cingano (2014). Among other determinants, weak investment (including on infrastructure, IT and research and development - R&D) and inadequate access to finance have also been found to constrain productivity growth (Aghion et al., 2009). Some studies have reported workforce aging and underinvestment in human capital (Feyrer (2007), Aiyar et al. (2016)) as a potential explanation for weaker TFP. Empirical analysis also shows that young and innovative firms in Italy and Spain have contributed more to productivity growth than small firms (Budina et al., 2015).

**i) The role of sectoral shifts:**

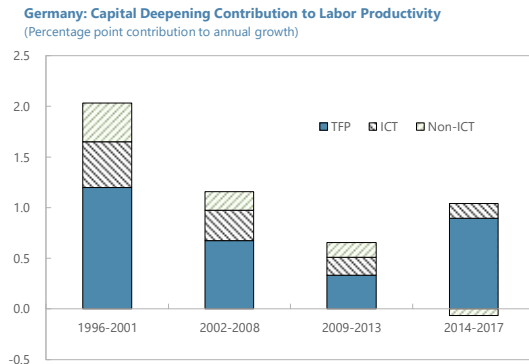
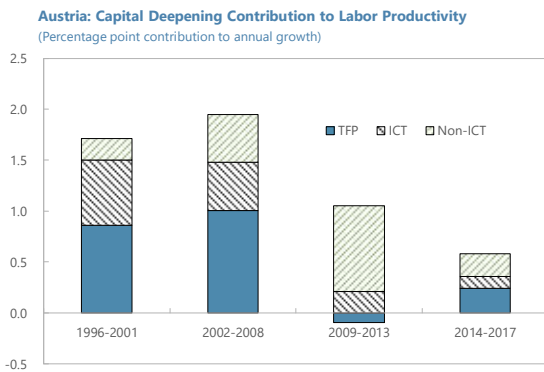


The last two decades witnessed sectoral value-added and employment shifts that affected labor productivity. Employment shares grew strongly in ICT and a more modest growth in employment share was recorded in the real estate sector in a number of countries. The

sectoral employment shifts, explain, however a relatively smaller share of productivity developments in advance economies in recent years where most of the transformation occurred over the previous decades. In the illustrative example, in Germany, the decline in within-sector labor productivity accounted for the largest impact post-crisis and in the most recent period.

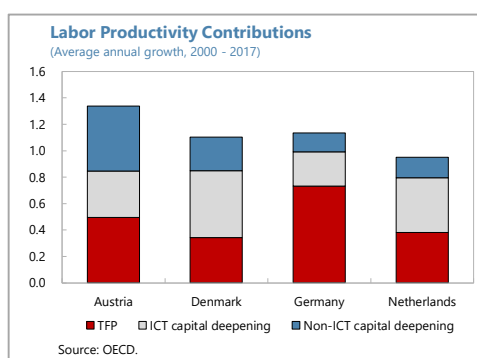
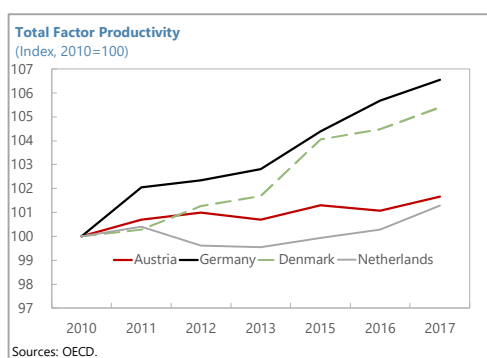
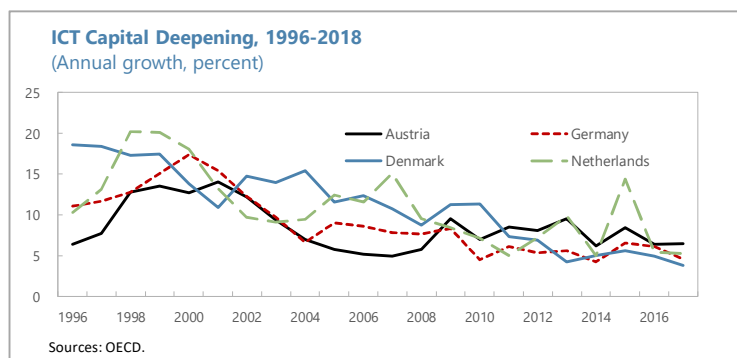


**II) The role of factor contributions: TFP and capital deepening**



Sources: OECD.

In Austria, labor productivity has been predominantly driven by TFP growth in the run up to the financial crisis, but capital deepening was also strong. During the crisis, however, non-ICT capital deepening contribution was, at 0.8 percent, while TFP contributed negatively. TFP recovered somewhat in recent years while non-ICT capital contribution shrank. While Germany's TFP growth declined since the mid-1990s it has strengthened recently contributing to a positive gap with comparators. Average annual TFP contribution to labor productivity in Denmark and Netherlands since 2000 has been below that of Austria and Germany. Total ICT capital deepening has started declining in the beginning of 2000s across advanced Europe following a period of strong growth, from about 10-15 percent to about 5 percent per year on average.



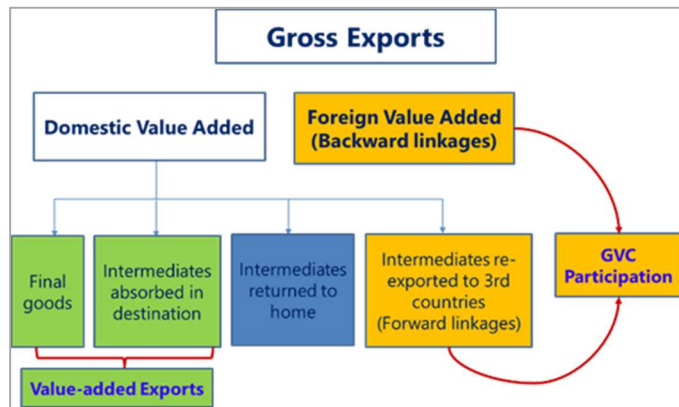
### C. Drivers of Productivity Growth – A Firm-Level Analysis

What could be contributing to labor and total factor productivity growth slowdown in recent years? Has participation in global value chains been beneficial or detrimental for productivity on the four countries? Which other variables have affected productivity? Changes in labor productivity reflect the effects of the complementarity of labor and capital and thus access to finance, but labor force attributes, such as skills and aging also determine productivity trends. TFP in turn reflects the effects of changes in management practices and processes, brand and status effects, organizational changes, network effects, spillovers from production factors, economies of scale, the effects of imperfect competition as well as measurement errors. These affect TFP in how they impact allocation of factor inputs and technology diffusion across firms. Thus, potential areas of policy concern for firm productivity include, among others, the level of trade integration, access to finance, education and training, innovation and aging.

## (i) Stylized facts

### ***GVC participation***

Participation in GVCs can boost productivity through specialization and access to cheaper or higher quality imported intermediate inputs. Firms can specialize in activities along the value chain that are most profitable for them while importing inputs and services that are least cost-effective for their production process. For the upstream industries, integration into GVCs allows gaining access to



technology and foreign knowledge via importing higher quality of intermediate goods. For downstream industries access to cheaper intermediate inputs allows them using additional saving to invest in innovation and a firm's lower technology gap can increase the productivity spillovers from a sector's structural integration in GVCs (Taglioni and Winkler, 2016). Participation in GVCs can affect labor productivity directly as well via its indirect

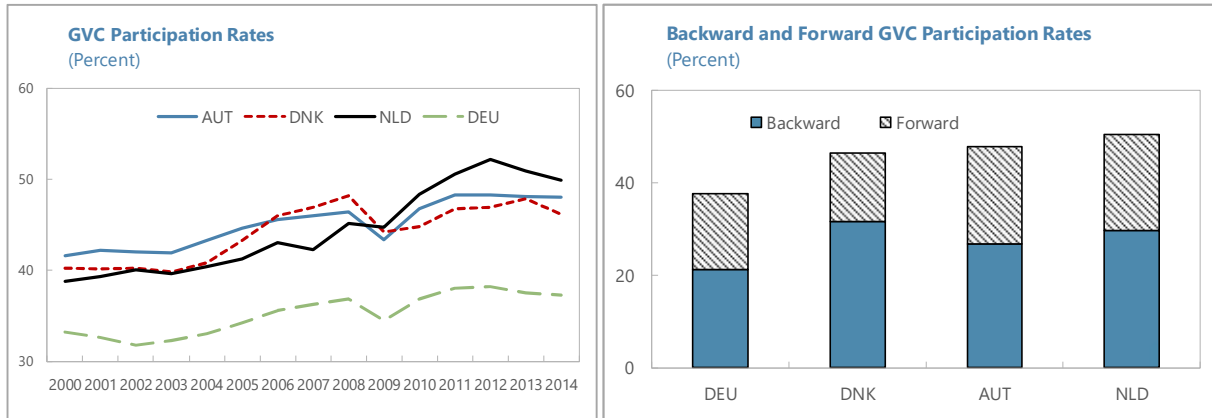
effect on TFP through technological improvement triggered by a greater variety and quality of inputs and greater induced import competition (Formai and Vergara Caffarelli, 2016). We thus expect that a greater share of intangibles in firms who have a higher GVC participation can boost TFP. GVC embeddedness is, however, also a vulnerability given that openness and integration facilitate propagation of risks across industries and countries underlining the need for mitigation strategies and thus potentially raising firm costs.

GVC participation rates in the selected countries, as measured through the world input-output tables, have increased significantly since 2000 but appear to have peaked around 2010. Among the four countries, the Netherlands has the highest overall GVC participation rate while Germany has the lowest which is partly explained by the size of their economies.<sup>2</sup> Considering GVC linkages, the selected countries are more integrated through backward participation as industries such as manufacturing source intermediate inputs from abroad more than supplying intermediate inputs that are exported to the third countries. At sectoral level, manufacturing, industry, and construction are among the most integrated sectors for the selected countries, except for Denmark where the trade sector is also highly integrated. However, these figures potentially understate the level of functional specialization which is different also from the sectoral or industry specialization inasmuch as it measures the fragmentation of the production process of one product into tasks, such as R&D and HQ functions, production, logistics&retail and support services. In advanced economies, functional specialization reveals a stronger concentration in activities away from production and

<sup>2</sup> Small open economies are generally more integrated into GVCs (OECD, 2013).



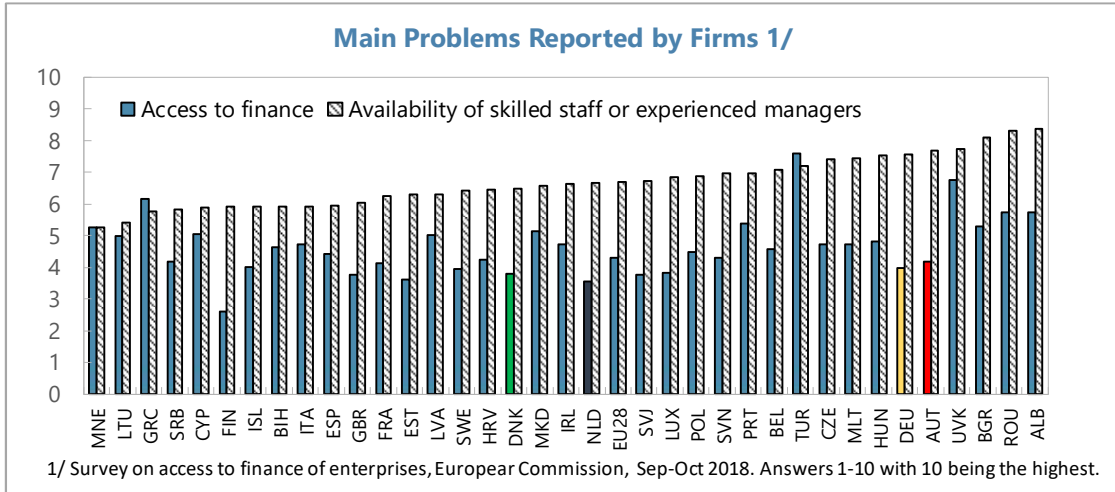
toward initial- and end-stage service activities along the “smile curve” allowing countries to reap higher value-added gains from GVC (Ströllinger, 2019).



Sources: WIOD database.

### ***Access to finance***

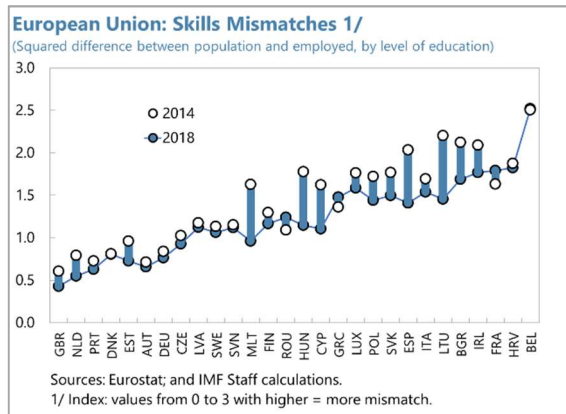
Financial constraints due to weak balance sheets have been particularly important in the Euro Area during and immediately following the global financial crisis (IMF, 2015). Access to finance has generally been more difficult for SMEs. Financing constraints hinder firm growth by limiting investment in innovative activities and human capital accumulation, keeping firms them at sub optimally small and inefficient level and affecting productivity negatively. Financing constraints for SMEs were highlighted for the Netherlands (Hassine, 2014), Austria (European Commission, 2017) and Germany, although less so than in the past (European Central Bank, 2018), as well as other countries in the Euro Area such as Italy, Spain, Portugal and Belgium (Budina et al., 2015; Shabunina, 2018; Ferrando and Ruggeri, 2015). In Denmark, excessively high corporate leverage across all firms has reduced willingness and ability to borrow and invest, hindering increases in the capital stock, productivity and potential output (Poghosyan, 2018).



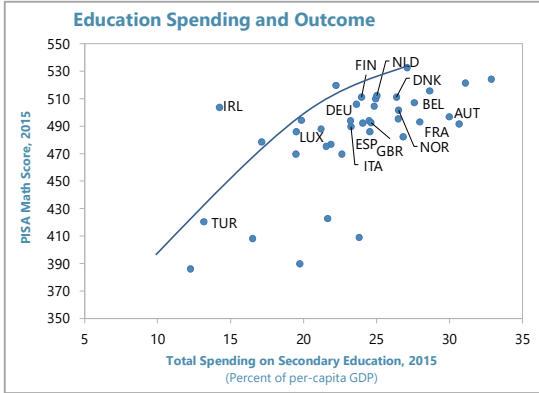
**Skills mismatches**

A symptom of resource misallocation, skills mismatches can undermine employability, raise firm costs (on hiring and training) and put downward pressure on productivity growth which also tends to inflate average labor costs. Empirical evidence consistently points to a wage penalty for overeducated individuals and wage premium relative to matched individuals in the same occupation with lower education. (McGuinness et al., 2017). Workers’ skills are found to be positively correlated with labor productivity at the industry level, in particular for non-cognitive skills such as managing and communication skills, ICT skills and workers’ readiness to learn and to think creatively. While there is no solid theoretical framework to surrounding this phenomenon, empirical studies show that skills are positively associated also with embeddedness into GVCs (Jamet, S. and M. Squicciarini, 2016). In theory, skills mismatches contribute to resource misallocation thus affecting output per worker through their effect on TFP. However, they can also directly impact labor productivity through job satisfaction and individual performance.

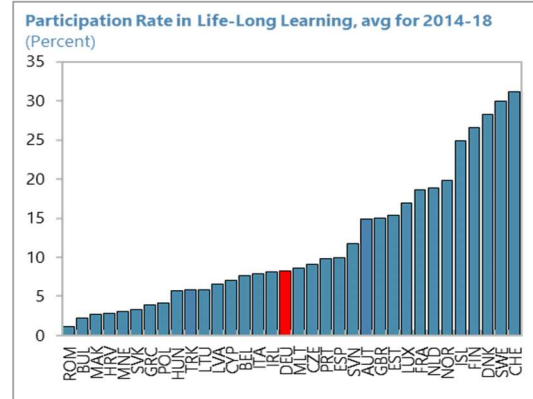
Firms in advanced economies are increasingly reporting the labor skill mix as the main drag on growth, sometimes more relevant than financing constraints. In a survey by Ernst&Young (2019) lack of skilled labor is reported as the main bottleneck to growth by 69 percent of respondents in Austria, up by 10 percentage points since 2018 and nearly twice as high as the second highest ranked constraint. The European Commission also reports availability of skilled staff and managers as the main firms’ problem. While skills mismatches, measured as differences in employment rates across education groups, in Austria, Germany, Denmark and the Netherlands appear lower than elsewhere, the situation has improved only marginally in recent years while other countries in Europe have recorded substantial improvements. There is some scope for upgrading efficiency of education spending based on international



comparisons in all the selected countries, and whereas Austria's number of graduates at doctoral level is low, Germany could promote life-long learning of working population more actively, including by fighting citizen's skepticism about digital technology adoption related to privacy concerns (Beblavý and others, 2019).



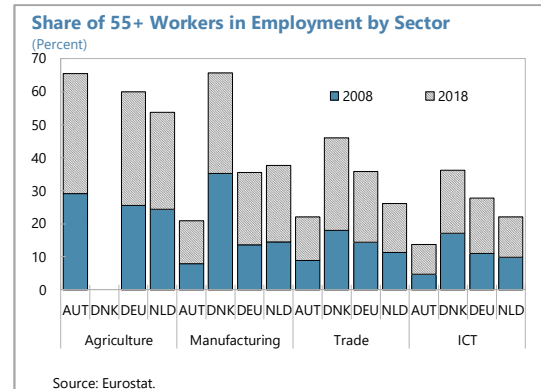
Sources: OECD; and author's calculations.



Sources: Eurostat.

**Workforce aging**

Several studies have found that a growing share of elderly in the labor force hinders productivity growth. The western economies are aging rapidly, a trend observed in also in our selected group. The dependency ratio - the ratio of dependents (people younger than 15 or older than 64) to the working-age population (those ages 15-64), is projected to increase from about 50 percent today in Europe on average, to about 75 percent by 2050 (UN World Population Prospects, 2019). This development has been associated with declining labor productivity (Ariu and Vandenberghe, 2014; Maestas et al., 2016; Shabunina, 2018; Ozimek et al., 2017). Acemoglu and

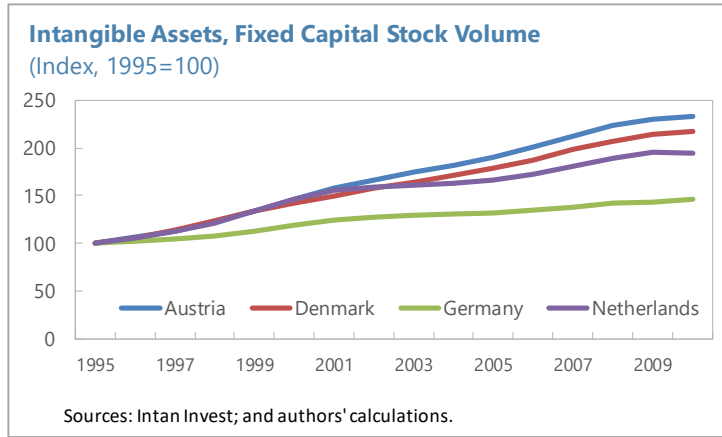


Restrepo (2017), however, document a lack of a strong negative association between changes in age structure and changes in GDP per capita in countries undergoing more rapid demographic change post-1990 which they explain with the adoption of labor-replacing technologies, robotics and artificial intelligence, allowing to automate the production process.

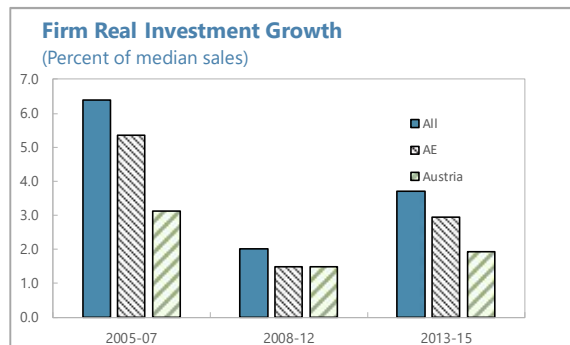
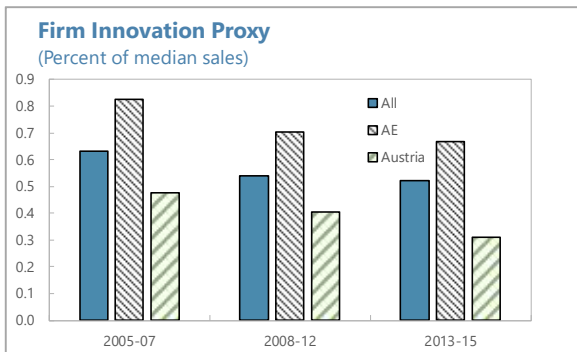
**Innovation**

Investment in R&D and digitalization in firms can foster innovation and automation that create synergies across productive processes in firms and increase productivity. Using a broad classification of intangibles, Corrado et al. (2018) found that intangible capital deepening accounted for as much as 30 percent of labor productivity growth on average for Europe and the U.S. between 2000 and 2013. Austria has increased its public spending on R&D in 2017 considerably (from 2.42 percent of the gross domestic product to 3.16 percent) compared with the level ten years ago and has made progress with digitalizing its public administrations.<sup>3</sup> According to the European Commission (2018), larger companies are well placed to take advantage of the opportunities offered by the digital economy, however, SMEs and micro-enterprises are lagging. Yet, public sector spending on R&D

and digitalization may be loosely connected with firm's own share of intangibles in total assets and adoption of IT processes. Indeed, total real investment growth and innovation at firm level have lagged advanced economy average since 2005. In Denmark, more leveraged firms had lower tangible investment (IMF, 2017a). German firms have boosted investments in intangible



capital from 1995-2006 by 30 percent according to Crass et al. (2015), and intangible assets have stimulated labor productivity growth in all sectors with the strongest contribution in manufacturing. Similar effects were found with firm-level data and more disaggregated intangible measures for a later period, up to 2011 (Crass and Peters, 2015). Innovation is key to counteracting the effects from workforce aging. Providing workers with more capital would increase their productivity and offset at least part of the effect of an aging population on productivity. Labor-saving technological innovation would be an additional way of achieving this goal (Acemoglu and Restrepo, 2017). Thus, we expect that a larger share of intangible assets in firms would push labor productivity up directly.

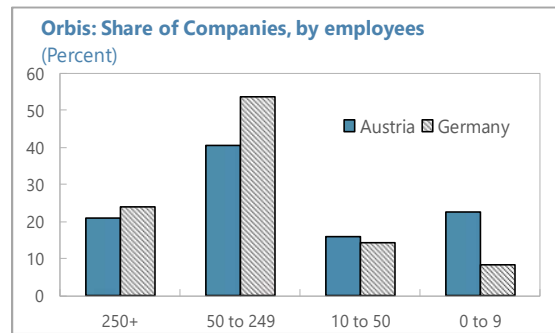
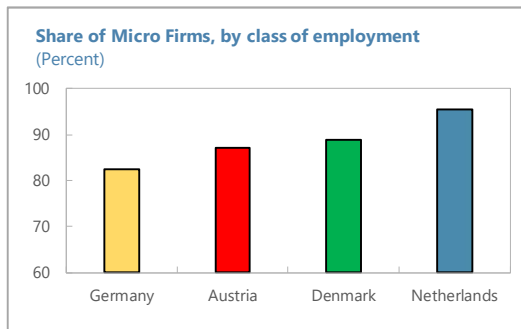


Sources: Orbis; and authors' calculations.

<sup>3</sup> This was the second-highest public spending on R&D in the EU.

## (ii) Regression analysis

We use data from approximately 65,000 to 230,000 companies per year over the period 2004-15 (about 1.5 million observations in total). Firm-level data is from Orbis database of Bureau Van Dijk compiled by the Research Department of the IMF which includes all companies that report to country business registries. Compared to the real economy, large firms with 50 employees or more are overrepresented in Orbis while small firms, with less than 10 employees, which represent between 80 and 95 percent of registered businesses, are underrepresented in Orbis possibly because reporting requirement for such firms are less stringent. German firms represent 2/3 of the sample. The database contains balance sheets, income statements and several productivity, location and sectoral variables and excludes outliers. To complement our analysis, we import into our database the information on the share of elderly in labor force by sector from Eurostat, participation in GVCs as a share of gross exports using data from the World Input-Output database, and skills mismatches calculated as squared difference between population and employed by level of education using data from the OECD.<sup>4</sup> We use the database to analyze trends in labor productivity, gross value added and TFP across heterogeneous firms and establish possible determinants of productivity slowdown including GVCs.<sup>5</sup>



Sources: Orbis; Eurostat; and authors' calculations.

We study the link between various policy and firm-specific factors and firm productivity dynamics. Specifically, we regress several measures of firm performance—total factor productivity, productivity growth, and value-added growth—on various policy and firm-specific variables, exploring both panel and cross-section data driven by data availability.

$$\text{PRODist} = \beta * e55st + \gamma * DAist + \delta * ITAist + \varphi SWist + \psi GVCst + \mu * Xist + ai + at + eist \quad (1)$$

<sup>4</sup> GVC participation rate is measured as a sum of backward and forward participation rates. Backward participation rate refers to the use of foreign inputs in the production of exports or foreign value added in exports. The other component refers to forward participation reflecting domestic value added in exports of intermediate goods re-exported to the third country.

<sup>5</sup> TFP is measured as first difference of logarithm of firm TFP weighted by mean sales. The default estimation follows Akerberg, Caves, and Frazer, 2015, and De Loecker and Warzynski, 2012.

(continued)

Where  $PRODist$  represents TFP level, growth or GVA growth of firm  $i$  operating in sector  $s$  at time  $t$ . The first explanatory variable,  $e55st$ , represents the share of population older than 55 working in sector  $s$  at time  $t$ ,  $DA$  is the debt-to-asset ratio denoting firm leverage or access to finance,  $ITA$  is the share of intangible assets in total fixed assets,  $SW$  is the skills mismatch variable multiplied by the average wage at firm level,<sup>6</sup>  $GVC$  is the sum of backward and forward participation rates by sector,  $Xist$  is a vector of other proxies for firm-specific factors, such as firm size, age, and sector. We include the firm fixed effects and time dummies,  $\alpha_t$ , to control for macroeconomic fluctuations and all other factors that may affect productivity equally across firms.

We estimate the regression with annual data on firms reporting balance sheets in the four EU countries. The regression is estimated with robust standard errors, clustered at the firm level, using TFP growth, labor productivity growth and growth of value added, as dependent variables in several econometric specifications. The full regression includes about 630,000 observation for the period spanning 2008-15 reflecting the availability of firm-level data and the time coverage of the variable denoting the share of elderly workforce. Being confined to the post-GFC years, the data set reflects a period characterized by tighter financial conditions, slower GVC expansion and overall weaker sentiment. Results are reported in the Appendix I Table 1.

The following conclusions can be derived from the model estimates:

- Participation in GVCs at sector level has contributed positively to labor productivity growth in firms in the four countries studied, though the coefficient is rather small. Although the GVC measure is based on aggregate trade flows, the positive effect is also corroborated by studies distilling the relationship between functional specialization and value added created at different stages of the production process (Ströllinger, 2019).
- An elevated *debt-to-asset ratio*, a proxy for firm credit constraints, is negatively and significantly correlated with labor productivity and TFP growth for small firms. This is in line with previous studies suggesting that investment growth is relatively more constrained when small firms face financing constraints, resulting from weaker balance sheets. Investment constraints could prevent firms from growing and result in inefficient resource allocation, thereby affecting productivity level and growth.
- A higher *share of intangible assets* in firms is positively correlated with labor productivity growth and its contribution to explaining overall variation large. This suggest that more innovative firms, as proxied by the share of intangibles to total assets, are more productive and grow faster. Intangible assets share is interacted with GVC participation in the specification where TFP is the dependent variable. It shows that GVC participation is positive for TFP when firms invest in intangible which helps them reap fruit form value chains. This is the case specifically when backward GVC through import integration allows the firm to lower costs through specialization and push up value added through adoption of technology.

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<sup>6</sup> The idea is that a higher average wage associated with a certain level of skills mismatch (as well as a higher mismatch for a certain level of average wage) affects TFP negatively.

- In line with expectation, *skills mismatches* are negative for TFP but the coefficient, while significant, is very small. This variable is, however estimated at country level and multiplied by the average wage at firm level and may be too imprecise a measure of actual firm-level or sectoral mismatches. Moreover, while some of the differences in employment rates across groups of various skill levels may be attributable to skill mismatch, unemployment is also a function of many other factors including unobservable characteristics among members of different groups. In addition, educational attainment as proxy for skill levels is imperfect as there may be differences in skills within broad educational attainment categories.
- The *share of elderly* in total workforce is highly significant and negatively correlated with labor productivity which is in line with most recent literature on workforce aging and growth but, ones scaled by its standard error the coefficient is small.
- *Firm size dummies* suggest that smaller firms with less than 10 employees have generally been more productive than the large ones, as TFP growth tended to be negatively related with firm size. This finding is at odds with empirical findings in some other economies where the presence of numerous small firms is found to be negative for TFP. Productivity growth is negatively correlated with *firm age* with younger firms and startups exhibiting higher TFP growth, pointing to the importance of further reducing entry barriers for firms.

## D. Conclusions

Stagnating labor productivity in Austria, Denmark, Germany and the Netherlands reflects developments in a number of determinants of resource misallocation affecting chiefly TFP but also labor productivity directly. Access to finance, skills mismatches, workforce aging are some of the constraints to firm growth reported in surveys and identified as drivers in our firm-level regression analysis. Investment in intangibles features also as an important contributor to labor productivity together with GVC participation. Intangible assets have also the potential of affecting TFP allowing firms to exploit participation in GVCs by investing in technology. TFP is also affected by skills mismatches which are exacerbated by inadequate pricing of labor.

Going forward, policies should aim at facilitating access to finance, fostering digitalization and innovation, and addressing the skill shortages reported by firms as growth constraints. Although the future of GVCs is at risk, filling gaps in other areas may have the potential to counteract some of the effects from de-globalization. Austria faces challenges in spreading digital technologies among SMEs and high-speed connectivity in rural areas has also been identified as an issue (European Commission, 2018). Stagnating TFP requires, boosting innovation by strengthening science-business links and supporting knowledge-intensive sectors in a number of advanced economies. In many countries, including the Netherlands, startups are also known to lack later stage funding options, such as venture capital, which keeps companies at an inefficiently low size. Policies aiming to provide workers with the necessary skills for the rapidly changing job-content of occupations and promoting life-long learning will be key for addressing mismatches and counteracting the effects of digitalization, even in the case of less pronounced GVC disintegration.

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## Appendix I – Regression Results

<b>Table 1. Determinants of Firm Productivity</b>						
(OLS with Fixed Effects, Robust Standard Errors)						
	<b>Labor Productivity Growth</b>		<b>Value Added Growth</b>		<b>TFP Growth</b>	
Lagged dependent variable	-0.13***	-0.15***	-0.77***	-0.77***	-0.25***	-0.25***
Share of elderly workforce	-0.11***	-0.11***	-0.01***	-0.01***		
Debt-to-assets	0.14***	0.15***	-0.58***	-0.58***	-0.09***	-0.09***
Debt-to-assets*sme	-0.12***	-0.13***	0.40***	0.40***	-0.07***	-0.07***
Share of intangibles	0.13***	0.15***	0.38***	0.39***	0.15***	
Misallocation*avg wage						-0.00**
GVC		0.02***		0.00		
Intangibles*GVC(back)						0.01***
Firm age						
2-5 years	0.02*	0.02**	0.07***	0.07***	-0.08***	-0.08***
5-10 years	0.02**	0.03***	0.15***	0.15***	-0.08***	-0.07***
10-15 years	0.01	0.02*	0.21***	0.21***	-0.07***	-0.07***
15-20 years	0.00	0.01	0.28***	0.28***	-0.07***	-0.06***
Over 20 years	0.00	0.01	0.36***	0.36***	-0.06***	-0.05***
Economic sector						
Energy	-0.23***	-0.23***	0.36***	0.36***	-0.04*	-0.04*
Construction	0.11***	0.39***	-0.37***	0.00	0.12***	0.12***
Trade	-0.16***	0.16***	-0.21***	0.35***	0.71***	0.70***
Market services	0.33***	0.67***	-0.05***	-0.36***	0.27***	0.26***
Basic services	0.31***	0.68***	-0.13***	-0.21***	0.32***	0.32***
Other	1.21***	1.08***	-0.10***	-0.04***	0.25***	0.25***
Firm size						
10-20 employees	0.13***	0.14***	0.69***	0.69***	-0.05***	-0.05***
20-50 employees	0.17***	0.18***	1.35***	1.35***	-0.07***	-0.06***
50-250 employees	0.14***	0.15***	2.07***	2.09***	-0.06***	-0.05***
Over 250 employees	0.15***	0.15***	2.85***	2.89***	-0.08***	-0.08***
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.08***	-1.17***	9.98***	10.00***	1.10***	1.08***
Number of obs.	629,588	581,114	246,928	235,296	201,006	198,531
R-sq between	0.01	0.01	0.24	0.25	0.01	0.01

Notes: the sample includes firms from Austria, Germany, Denmark and the Netherlands for the years 2008-16.