INTERNATIONAL MONETARY FUND

REGIONAL ECONOMIC OUTLOOK NOTES

EUROPE

Europe's Declining Productivity Growth: Diagnoses and Remedies

2024
NOV

Contents

Boxes

Figures

Europe’s Declining Productivity Growth: Diagnoses and Remedies[1]

Europe’s large per capita income gap with the United States primarily reflects a rising productivity shortfall with deep firm-level roots. Compared to those in the United States, Europe’s large leading firms innovate and grow less, while young high-growth firms have a smaller footprint in the economy. With these productivity growth engines being muted, Europe also suffers from an overabundance of stagnant mature firms. This note highlights the roles of smaller markets and limited equity financing as bottlenecks holding back Europe’s large leading firms from scaling up and innovating. This is a particular concern in tech sectors, where Europe has been falling behind the most. As for young high-growth firms, the note underscores the importance of human capital in fostering their formation and the need for a greater availability of risk capital to realize their potential. Over and above long-documented policy priorities, such as improving the design and coordination of public support to research and development, tertiary education systems, and the corporate sector, the note’s findings highlight the critical role of removing intra-Europe barriers to factor and product markets integration for improving business dynamism and reviving Europe’s productivity growth. This regional agenda needs to be complemented by domestic reforms that lower barriers to firm entry, facilitate exit, and remove tax and regulatory disincentives to grow.

Section 1. Europe’s Aggregate Productivity Problem

After an impressive half-century-long convergence spell, including through EU enlargement and deepening, Europe significantly narrowed the distance to the global productivity frontier, with its advanced economies achieving labor productivity levels on par with the United States by the late 1990s (Figure 1.1.1). Yet at the turn of the century, *despite* a wave of product, labor and capital market reforms (Figure 1.1.2), Europe began to fall behind. Today, the per capita income gap with the United States is well over 20 percent for many *advanced* European economies, and it is even larger for others. While somewhat lower capital intensity and fewer total working hours account for some of these gaps, the predominant factor is a lower level of productivity (Figure 1.1.3).[2]

A wide range of forces—from aging to education to macroeconomic policy management in response to shocks—may shape productivity growth patterns (see for example, Adler and others, 2017). Because aggregate productivity growth is ultimately the outcome of firm-level forces, this note’s in-depth diagnosis of Europe’s productivity problem starts with comparisons across the universe of European and US firms (*Section 2*). Two shortcomings stand out. First, Europe’s large leading firms are falling behind in terms of productivity and innovation, with the difference particularly pronounced in tech sectors. Second, at the other end of the spectrum, Europe suffers from a deficit of startups, with too few among them growing fast and eventually making it to the top.

While a host of factors likely explain these deficiencies, the novel analyses in this note focus on the roles played by market size, financing, and human capital.[3] Europe’s comparatively small effective market size and low reliance on equity have held back large leading firms from scaling up and investing massively and consistently in innovation (*Section 3*).

[1] This note was prepared by Oyun Erdene Adilbish, Gee Hee Hong (lead), Luca Mazzone, Hasan Toprak, Maryam Vaziri, Takuji Komatsuzaki and Lorenzo Rotunno, under the guidance of Diego Cerdeiro and the supervision of Helge Berger and Romain Duval. Agnesa Zalezakova provided expert administrative support.

[2] Many of the analyses in this note, including where the main text and figure legends refer to Europe more broadly, cover countries beyond the ones in the European Union.

[3] Among other factors not central to the analyses in this note, higher energy costs can have a bearing on observed labor productivity. While higher energy costs cannot explain the various longer-standing underlying structural deficiencies documented in the note, they can still affect potential output. For example, Germany Article IV (2023) find that a 20 percent increase in energy prices relative to pre-COVID levels can reduce potential output in Germany by 1.2 percent.

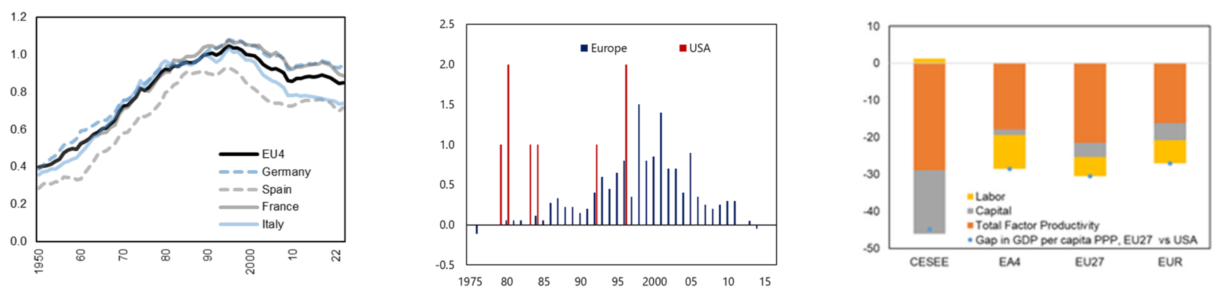
The formation and expansion of European startups are further hindered by adverse demographic trends and lower cross-country labor mobility than seen among US states, which have inhibited talent agglomeration. Lower availability of risk capital, including venture capital, has likely further stifled the growth of these startups—especially those with predominantly intangible assets (*Section 4*). These structural and institutional shortcomings are not new, but they became more penalizing as the information and communication technologies (ICT) revolution unfolded around the turn of the century. In particular, the ICT revolution offered large returns to sustained innovation efforts by large firms and, for younger firms, to scaling up rapidly to exploit economies of scale and network effects, including by tapping capital markets and skilled labor.

Figure 1.1. Europe's Lagging Performance at the Aggregate Level

1. Labor Productivity Ratio
(GDP per hour worked in PPP terms, ratio to United States)

2. Product Market Reforms
(Number of major reforms each year)

3. Decomposition of GDP per Capita Difference with the United States
(in PPP terms, 2024)



Sources: AMECO; IMF, World Economic Outlook database; Eurostat, Long Term Productivity Database, Duval and others (2018) and IMF staff calculations.
Note: In panel 1, Nominal gross domestic product in purchasing-power-parity dollars weighted data for France is available from 1950, while data for Spain, Italy, and Germany begins in 1960. In panel 2, Europe is average of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, and the United Kingdom. In panel 3, the Central Eastern and Southeastern Europe (CESEE) region includes Bulgaria, the Czech Republic, Croatia, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, and Slovak Republic. EUR includes European Union countries (except Romania) and the United Kingdom. EU4 = France, Germany, Italy, and Spain; EU27 = European Union, CESEE = Central, Eastern, and Southeastern Europe; EUR = Europe; USA = United States of America; PPP = purchasing power parity.

The note's findings highlight the critical role of removing remaining intra-EU barriers to factor and product market integration (*Section 5*). Removing remaining barriers to trade within the EU—particularly in services—would incentivize firms to undertake R&D and other investments that pay off disproportionately with a large customer base. Advancing the capital markets union will be critical for innovation-intensive firms, stimulating both the R&D efforts of larger firms and the growth of startups that lack the tangible collateral required by banks. Easing barriers to labor mobility could promote innovation clusters that require talent agglomeration. These region-wide efforts should be complemented by domestic efforts, including to remove remaining barriers to entry for startups, ease their access to credit and better target domestic R&D support schemes to younger innovative firms.

Section 2. The Firm-Level Origins of Europe's Productivity Problem

Much of aggregate productivity growth is driven by innovations from large leading firms and disruptive new entrants, as well as efficiency improvements by mature lagging firms.[4] This dynamic is enhanced when financing and workers move swiftly to businesses that make the most of these resources, in a process that also necessarily entails the downsizing and potential exit of less productive firms. Evidence based on the universe of firms shows that Europe's aggregate productivity problem can indeed be traced back to an underperformance across these dimensions.

[4]The findings in this note also speak to the well-identified issue of resource misallocation, thereby adding to the analysis in Chapter 2 of the April 2024 IMF World Economic Outlook. Section 4, for instance, explores how sub-optimal allocation of capital to gazelle firms hampers productivity.

Specifically, relative to the United States, Europe's business landscape is characterized by large leading firms that innovate less, fewer and less vigorous startups, and—partly as a result, but also due to lower firm exits—an overabundance of small, low-growth mature firms.[5]

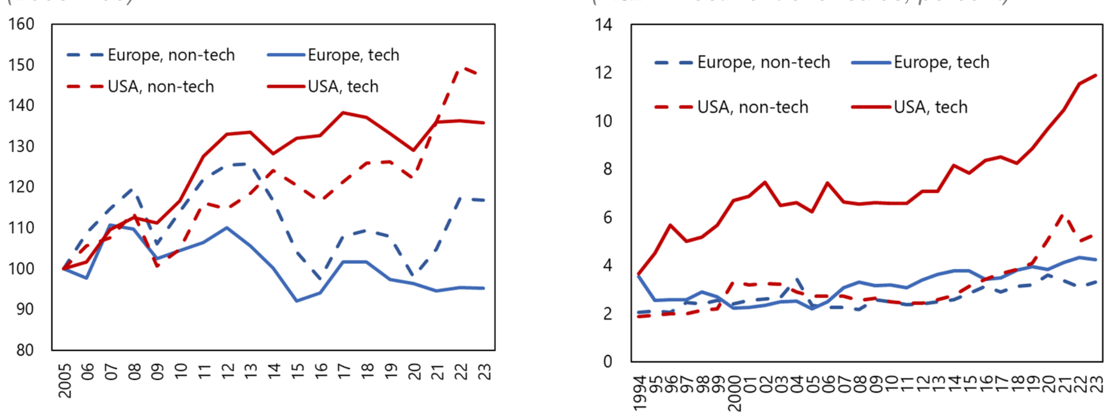
Europe's large leading firms are lagging in terms of productivity and innovation

The (total factor) productivity growth of European listed firms has been trailing their US counterparts' growth (Figure 1.2.1).[6] This divergence is broad-based. Over the last two decades, the annualized productivity growth of Europe's non-tech firms was of 0.9 percent, compared to 2.6 percent in the US If anything, the divergence has been slightly larger among tech firms: European listed firms' productivity in these sectors has *declined* at an annualized rate of 0.3 percent since the mid-2000s, compared to annualized growth of 1.5 percent among US firms. In all, the productivity of US listed tech firms increased by around 40 percent over the past two decades, while that of European tech firms has remained stagnant. The divergence comes hand-in-hand with a widening gap in innovation efforts (Figure 1.2.2). R&D expenditures of European tech firms have been about 3 to 4 percent of sales in recent decades, while they have tripled in the United States, reaching 12 percent of sales in 2023. Considering that US tech firms also enjoyed higher sales growth, the absolute R&D spending gap between the two regions is even more pronounced. This has translated into a widening innovation gap as measured by patenting activity.[7]

Figure 1.2. Productivity and R&D Investment of Leading Firms in Europe and the United States

1. Productivity of Listed Firms *(2005=100)*

2. R&D Intensity over Sales *(R&D investment over sales, percent)*



Sources: Compustat and IMF staff calculations.
Note: In panel 1, productivity estimates are based on non-parametric approach proposed by Gandhi and others (2020), also used in IMF (2019). In panel 1 and 2, Europe includes Belgium, France, Germany, Great Britain, Ireland, Italy, Netherlands, Spain, and Switzerland. R&D = research and development; USA = United States of America

European startups have a smaller footprint in the economy, and too few make it to the top…

At the other end of the spectrum, young firms in Europe also exhibit weaker dynamism than their US counterparts. Entry rates are similar on average, although they vary significantly across European countries, with some countries showing higher rates than the United States (for example, *Denmark*) (Figure 1.3.1). Stripping out the data from

[5] The choice of the United States as a benchmark reflects its status as the technological leader in many sectors. It should be noted, however, that US business dynamism and productivity growth themselves have waned in recent decades. For instance, increases in productivity of some large firms in the United States have also been accompanied by a steep increase in markups, driven by the winner-take-all dynamics and the growing role of superstar firms in the tech sector. Such increase in market power has been pointed out as a reason for waning business dynamism and innovation in the United States (Aghion and others, 2023; Akcigit and others, 2021; Akcigit and Ates, 2021).

[6] Firm-level estimates of total factor productivity are based on the non-parametric approach by Gandhi and others (2020), also used in IMF (2019). This approach addresses endogeneity issue that arise from simultaneity between input choices and productivity shocks by exploiting the non-parametric information contained in the first order condition for the flexible inputs.

[7] In particular, Bergeaud (2024) shows how Europe's patenting activity has been dwarfed by the United States and China's, particularly in high-tech areas crucial for future transformations such as green technologies.

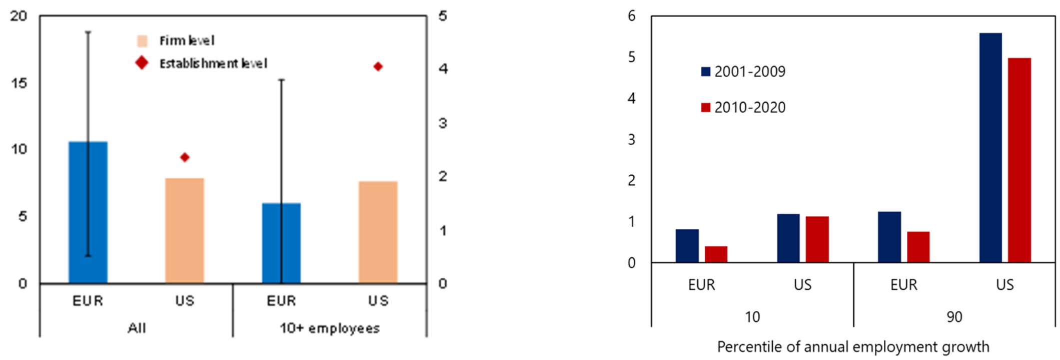
microenterprises (firms with fewer than 10 employees)—which make a markedly low share of total value added compared to their share of employment—the average entry rate in the US is at least about 25 percent higher than in Europe (1.5 in Europe, v. 1.9 for the US at firm-level).[8] Moreover, within this pool of entrants, young high-growth firms tend to have a smaller footprint in the economy. US top-performing young firms (those under the age of five and in the top growth decile) make up around six times the share of total employment of their European counterparts (Figure 1.3.2).

As a result, fewer innovative young firms also end up reaching top-firm status in Europe. Indeed, the median founding year of the top 10 listed firms is 1985 in the United States; for Europe, it is 1911.[9]

Figure 1.3. Dynamism of Young Firms in Europe and the United States

1. Entry Rates
(Percent, 2019)

2. Employment Share of Young Firms: Low-Growth versus High-Growth Firms
(Percent)



Sources: OECD DynEmp; CompNet; Business Dynamics Statistics; and IMF staff calculations.
Note: In panel 1, establishment-level entry rates for the United States are calculated based on BDS-calculated entries and total number firms; firm-level entry rates are calculated as the ratio of age-0 firms to firms in the relevant category. Country-level entry rates for European countries are from the OECD DynEmp database. Out of 30 European countries, 10 report at the firm level, 1 at the establishment level, and for 19 the metadata are not available. The average entry rate for Europe is calculated as the weighted average of country-level entry rates, using the share of firms of each country in the European aggregate as weights. “All” represent the entry rates for employer firms and “10+” reflect entry rates of firms with at least 10 employees. The following countries are covered: Austria, Belgium, Bulgaria, Switzerland, Cyprus, the Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Croatia, Hungary, Iceland, Italy, Lithuania, Luxembourg, Latvia, Malta, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Sweden, and Türkiye. The sample for “10+” excludes Switzerland and Greece. Panel 2 shows the total employment shares of young low-growth firms (those with employment growth at or below the 10th percentile) and young high-growth firms (those with employment growth at or above the 90th percentile) for 2001–09 and 2010–20.. In this chart, Europe includes Belgium, Croatia, the Czech Republic, Denmark, Hungary, Italy, the Netherlands, Slovenia, Spain, and Sweden. USA = United States of America; EUR = Europe; OECD = Organisation for Economic Co-operation and Development.

… which, together with weaker “up-or-out" dynamics, results in an overabundance of small mature low-growth firms

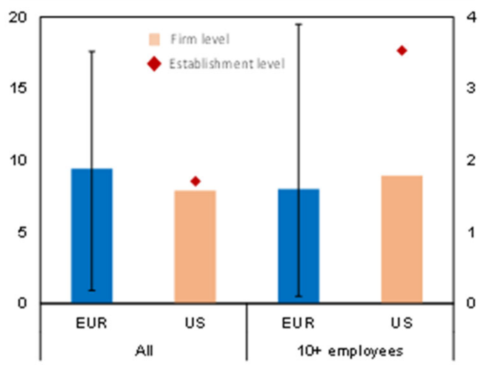
Europe shows a deficit not just of young high-growth firms, but also of exiting *unsuccessful* firms, as evidenced by an overabundance of small mature low-growth firms. As in the case of entry, aggregate exit rates are highly dispersed in Europe, even if comparable to the US level on average (Figure 1.4.1). Excluding smaller firms a slight exit rate gap opens up, with large gaps for some European economies. The scarcity of high-growth young firms and greater survival of low-growth firms result in a narrower firm growth distribution in Europe (Figure 1.4.2) and indicate weak “up-or-out” dynamics—a key characteristic of US business dynamism (Eslava and others, 2022).

[8] The following Europe-US comparisons in this section are based on aggregated data covering the universe of firms in each economy. These comparisons should be interpreted with caution given that national statistical agencies can differ in how they compile business registries. Entry and exit rates are particularly sensitive to the sample choice and the definition (see the discussion in Decker and Haltiwanger, 2024, on various entry rates in the case of the United States). Tracking the exact timing of firms’ entries and exits through business registries can be very challenging and entail measurement error. Importantly, entry and exit in the DynEmp database for Europe are measured at the firm level in some economies while at the establishment level in others.

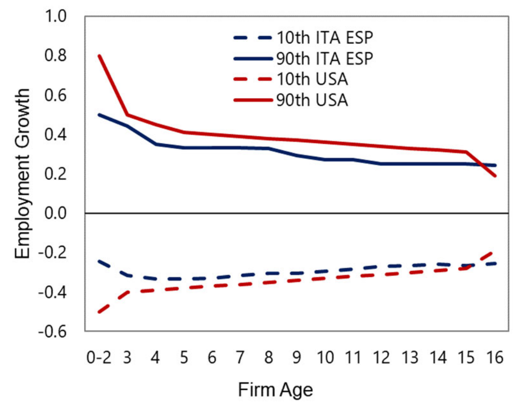
[9] These newer US superstars also account for most of the growing valuation gap between European and US stock markets since the mid-2000s. While US listed firms already present in 1995 collectively outperformed Europe’s stock market by 60 percent since 2005, once firms entering after 1995 are included the overperformance rises to 160 percent.

Figure 1.4. Business Dynamism and Distribution of Employment by Firm Size and Age

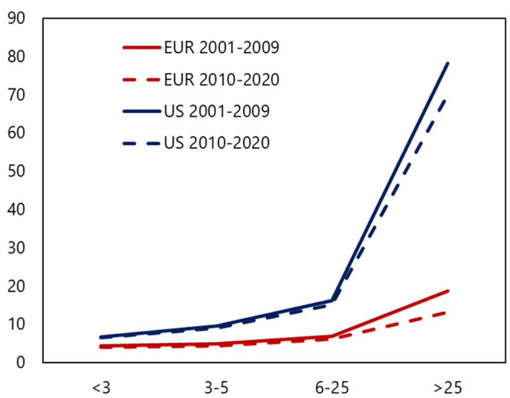
1. Exit Rates
(Percent, 2019 values)



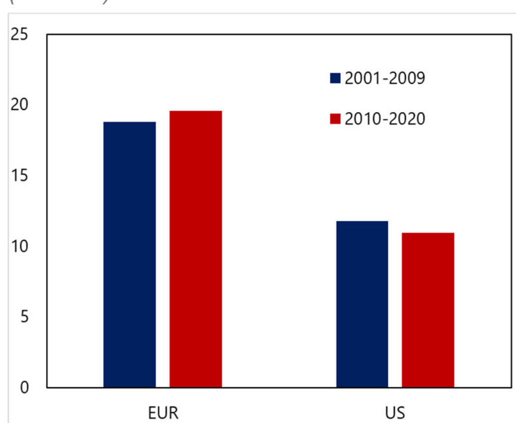
2. Distribution of Employment Growth by Firm Age
(Percent)



3. Average Employment by Firm Age
(Number of persons)



4. Employment Share of Micro Firms
(Percent)



Sources: OECD DynEmp; CompNet; Orbis; Business Dynamics Statistics; Business Dynamics Statistics of High Growth Firms; and IMF staff calculations.
Notes: In panel 1, exit rates for the United States are based on BDS-calculated exits and total number firms or establishments; the exit rates for European countries are from the OECD DynEmp dataset. Out of 30 European countries, 10 report at the firm level, 1 at the establishment level, and for 19 the metadata are not available. "All" corresponds to firm exit rates of all firms and "10+ employees" reflects firm exit rates for firms that have at least 10 employees. The following countries are covered: Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Croatia, Hungary, Iceland, Italy, Lithuania, Luxembourg, Latvia, Malta, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, and Sweden. The sample for "10+" excludes Greece. Firm exit rates for the United States are from Business Dynamics Statistics, which defines exit rates as the "count of firms that have exited in their entirety during the period" divided by the average of the total number of establishments in the current and previous years. Under this classification, exits due to merger and acquisition activity are not classified as firm deaths. In panel 2, the US data are from Eslava and others (2022), where the age of firms is defined as the age of the oldest establishments for that firm in the first year of positive business activity. Annual employment growth for Spain and Italy is weighted by the PPP-adjusted nominal GDP in US dollars. In panel 3, the vertical axis shows the average employment by firm age. CompNet is used for European firms, covering Belgium, Croatia, the Czech Republic, Denmark, Hungary, Italy, the Netherlands, Slovenia, Spain, and Sweden. Business Dynamics Statistics are used for US firms. In panel 4, micro USA = United States of America; EUR = Europe; ITA = Italy; ESP = Spain; OECD = Organisation for Economic Co-operation and Development.

As a result, the difference in average firm size between Europe and the United States grows over a firm's life cycle. An average mature firm (above 25 years old) employs just twice as many workers as the typical firm below the age of three in Europe, versus over eight times in the United States (Figure 1.4.3). In other words, European firms tend to remain smaller. European micro firms (with ten employees or fewer) make up for 20 percent of total employment, nearly twice as much as in the United States (Figure 1.4.4). Further, the employment share of micro firms has risen in the past decade, in line with the stalled productivity growth during this period. This is evidenced by a rising productivity gap between national leaders and the median firm in their industry, especially in Europe's advanced economies (Box 1.1).

Shortcomings at these different levels are interlinked

The following sections turn to the drivers of these various gaps in business dynamism vis-à-vis the United States. While these gaps are studied in isolation, they largely feed off each other. For instance, with fewer disruptive firms entering and making it to the top, leading listed firms may face weaker competitive pressures and thereby decide to invest less in innovation. Conversely, European leading firms' struggle to compete with US counterparts in sectors that exhibit economies of scale and network effects may also discourage potential European entrants, and instead encourage startup formation in other less dynamic sectors where firms can also survive even if remaining small.

Section 3. Why Are Europe's Leading Firms Falling Behind?

What explains subdued productivity growth among Europe's large leading firms? What are the bottlenecks that prevent them from investing more intensely and consistently in innovative activities? This section sheds light on two of the key explanations, Europe's limited effective market size, which hinders firms' ability to scale up, and firms' limited reliance on equity, which results in lumpy and procyclical R&D investment patterns.[10]

These weaknesses can be particularly detrimental to the production and adoption of digital technologies. Entering industries highly reliant on digital technology, such as AI, requires massive upfront investments in R&D, developing a large customer base and/or collecting proprietary data. After entry, firms benefit from low variable production costs and can entrench their first-mover advantage as they further exploit network effects and economies of scale. This creates a "winner-takes-all" dynamic where profits largely accrue to incumbents. To become or remain a dominant player in a highly competitive environment, firms must continually invest heavily in R&D and secure large amounts of capital upfront. This, in turn, requires a financing structure that accommodates large-scale long-term investments in risky intangible assets (Hall and Lerner 2010).

Limited market size impedes innovation and growth among Europe's most productive firms

Even firms within the EU have to cope with a smaller effective domestic market size compared with their US counterparts. A cursory comparison might suggest little difference between the two—each economy represents about 15 percent of the global economy when measured at purchasing-power parity. Yet, the EU's market is much more segmented internally. The intensity of trade across EU countries is less than half of the level of trade across USstates (April 2024 *Regional Economic Outlook: Europe*). Faced with these barriers, European firms have a hard time exploiting economies of scale and network effects as much as US firms do.

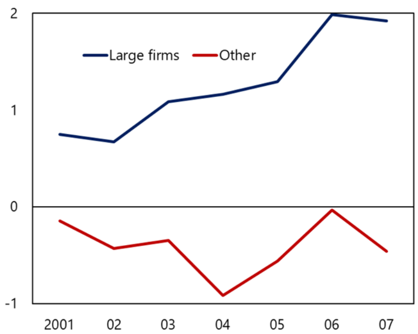
Europe's own history testifies to the productivity benefits of market size. Past EU expansions have driven income convergence by boosting both total factor productivity and capital accumulation (see Note 2 in this report, "Accelerating Europe's Income Convergence through Integration," forthcoming). In line with economic theory, firm-level analysis also confirms that EU accession raised aggregate productivity by incentivizing larger firms to expand relative to smaller, less productive ones (Figure 1.5.1). While large firms saw a steep and steady post-accession rise in sales, smaller firms experienced a more muted increase.[11] Firms experiencing larger increases in sales also saw larger increases in productivity (Figure 1.5.2).

[10] This section relies primarily on the Compustat database compiled by Standard & Poor's. European listed firms refer to companies incorporated in Belgium, France, Germany, Italy, Ireland, the Netherlands, Spain, Sweden, Switzerland, and the United Kingdom.

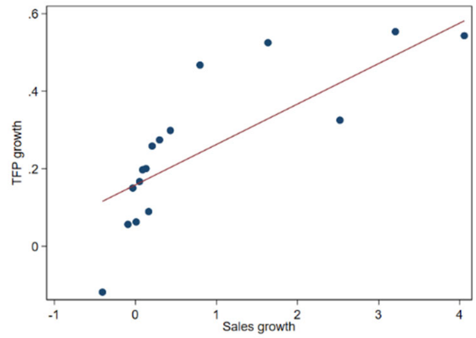
[11] See also Neri-Laine, Orefice and Ruta (2024), who find that signing deep trade agreements (such as accession to the EU) boost the exports of large firms involved in global value chains but can reduce those of smaller (less productive) firms. Note that Figure 1.5. focuses on the impact of accession by firm size rather than by TFP level because the sample for which TFP can be estimated for accession countries around 2004 is too small.

Figure 1.5. Sales and Productivity Growth following 2004 EU Accession Wave

1. Continuing Manufacturing Firms' Sales Growth of 2004 Accession Countries



2. Large Manufacturing Firms: Sales and TFP Growth of 2004 Accession Countries *(2004-07)*



Sources: Orbis; and IMF staff calculations.
Note: Panel 1 shows the log difference of deflated sales of the large manufacturing firms (blue line) and the rest of manufacturing firms (red line). Large firms are defined as those with deflated sales above the 95th percentile of the deflated sales distribution in 2003. Aggregates are constructed using deflated sales as weights. Panel 2 is a binned scatter plot of the log difference of deflated sales (horizontal axis) and the log difference of TFP (vertical axis), pooling all observations over 2004–07 together. The sample of countries in Figure 1.5 includes the Czech Republic, Hungary, Poland, Slovenia, and the Slovak Republic.

Cutting remaining intra-EU trade barriers could raise effective market size and stimulate European firms' productivity. Compared with the evolution of trade costs among non-EU countries, barriers among EU members have decreased by 6 percentage points in goods and 11 percentage points in services over 1995–2010. Yet the ad-valorem equivalent of the remaining barriers constraining intra-EU trade is estimated to remain at around 45 percent for the average manufacturing sector—three times as large as the level estimated among US states—, and at an even higher 110 percent for the average services sector (see Figure 1.6, and Box 1.2).[12] Using average estimates from the literature that map reductions in trade costs to productivity gains, each 10-percentage point reduction in barriers to trade in goods could lead to 1 percent higher productivity (Trefler 2004). Applying these numbers in back-of-the-envelope calculations suggests that the direct impact of reducing estimated intra-EU sectoral barriers to the level observed among US states could potentially increase productivity by 6.7 percent. These gains would be even larger if combined with an increase of the EU's single market at the extensive margin through further EU accession (see "Accelerating Europe's Income Convergence through Integration," forthcoming).

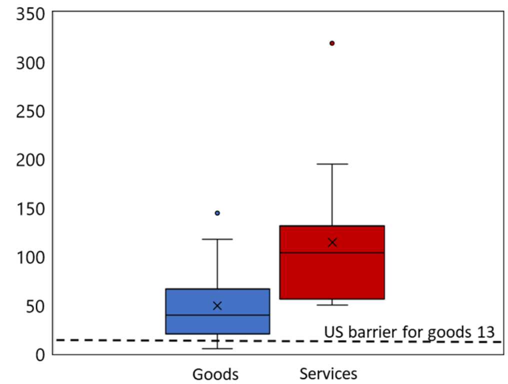
[12] Using a novel dataset of trade flows, Santamaria and others (2023) find significant trade barriers for intra-EU trade, even after controlling for geographic distance and national borders. Consistent with the evidence, 60 percent of European firms in a recent survey by the European Investment Bank report having to comply with different regulatory requirements, standards or consumer protection rules across EU member states (European Investment Bank, 2024b).

Lower reliance on equity compared with US listed firms contributes to lower and more volatile R&D investments

European firms rely less than their US competitors on equity, a critical means of financing more risky investments. Relative to their size, US listed firms have been able to issue about twice as much equity as European ones (Figure 1.7.1). Compared with debt financing, equity financing is generally better suited for intangible investments—which are particularly important in the tech sector—that cannot be pledged as collateral. Indeed, US firms have had less volatile R&D expenses (Figure 1.7.2). Debt financing, on the other hand, exposes firms to bank-related financial stress, as was the case during the global financial crisis and the sovereign debt crisis in Europe, which led more distressed firms to cut investments in intangibles (Duval and others 2020).

Figure 1.6. Estimated Intra-EU Trade Barriers in 2020

(Percent)



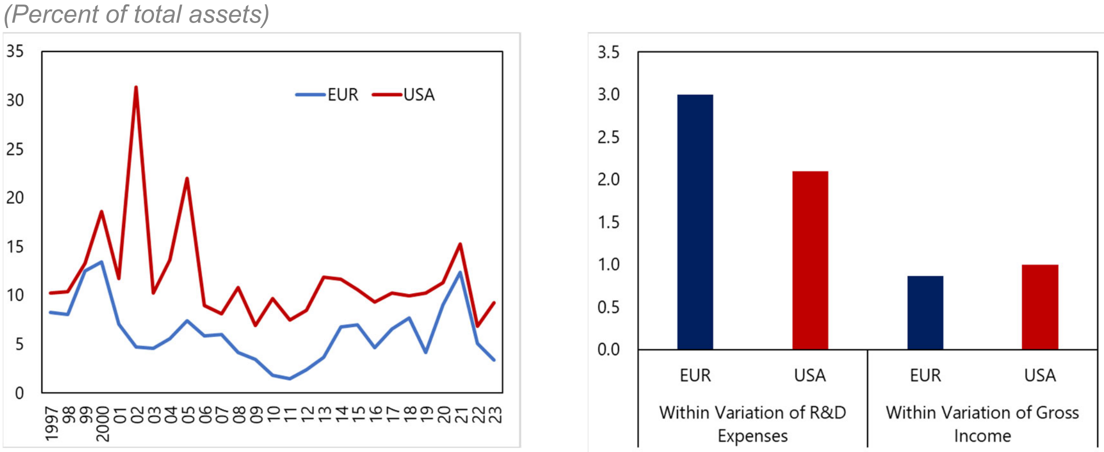
Sources: Head and Mayer (2021); Inter-Country Input-Output Tiva tables; and IMF staff calculations.
Note: Each box represents the distribution of the estimates of intra-EU trade barriers across sectors for goods and services using gravity models for bilateral flows in 2020. The US barrier for goods is from Head and Meyer (2021).

Firms facing more severe financial frictions will be more responsive to temporary liquidity shocks and will, therefore, have a higher marginal propensity to invest (MPI) out of them—investing disproportionately more (less) when liquidity improves (deteriorates). European listed firms indeed exhibit higher MPIs than US listed firms, particularly in tech sectors where a temporary 1 percent increase in sales is estimated to increase investment by 0.36 percent for European listed firms versus only 0.06 percent for US firms (Figure 1.8.1).[13]

Figure 1.7. Financing and R&D Expenses of Leading Firms in Europe and the United States

1. Net Equity Issuance of European and US Listed Firms
(Percent of total assets)

2. Volatility of R&D Expenses and Income among European and US Listed Firms



Sources: Compustat; and IMF staff calculations.
Note: In panel 2, volatility is measured by (within-firm) the standard deviations of respective variables. In panel 1 and 2, Europe includes Belgium, Czech Republic, Germany, France, Israel, Italy, the Netherlands, Sweden, and the United Kingdom. R&D = research and development; USA = United States of America; EUR = Europe.

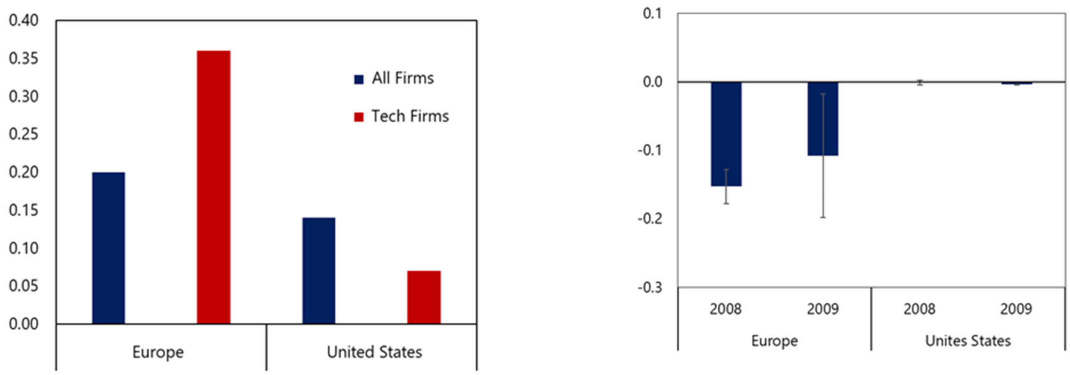
[13] The key assumption of this exercise is that firms that do not face financial frictions will not adjust investment plans, which have long horizons, in response to transitory cash flow shocks. By contrast, financial frictions will prevent firms from smoothing investment plans. To perform this exercise, the estimation procedure proposed by Commault (2022) was used and adapted to the firm context by Martin-Baillon (2021).

A second approach zeroes in on the impact of the global financial crisis on the investment patterns of European and US firms. This analysis shows that, for firms with similar characteristics including research intensity and profitability, the tightening of financial constraints led to a much sharper curtailment of R&D spending for European firms than it did for their US counterparts in 2008 and 2009 (Figure 1.8.2).

Figure 1.8. Investment Exposure to Financial Constraints

1. Marginal Propensities to Invest Out of Temporary Shocks
(Percent)

2. Impact of Financial Frictions on R&D Investment Growth During the Global Financial Crisis
(Percent)



Sources: Compustat; and IMF staff calculations.
Note: In panel 1, higher values of marginal propensity of investment imply that investment is more sensitive to financial conditions, indicating more binding financial constraint on investment. In panel 2, firm-level financial frictions are measured by the Whited and Wu index (2006). Firm-level controls, including external financing dependence, sales, research intensity, leverage, and profitability measures as well as country and sector fixed effects at 2-digit SIC sector level are included. The whiskers represent 90 percent confidence intervals. In panels 1 and 2, Europe includes Belgium, Switzerland, Germany, Spain, France, Ireland, Italy, the Netherlands, Sweden, and the United Kingdom.

Section 4. In Search of Europe's High-Growth Young Firms

Looking beyond top firms, Europe suffers from a broader lack of business dynamism. Most strikingly, as documented in Section 2, Europe's startups have a small footprint in the economy, with too few among them growing fast and eventually making it to the top. Using microdata for a wide range of European countries, this section explores impediments to the formation and expansion of promising young firms.[14]

The performance of Europe's "gazelles" has deteriorated, and while growing, their presence in tech remains limited

Europe's high-growth firms—so-called gazelles—outperform other firms, but less so than they did in the past.[15] Using firm-level data for 22 European countries reveals that annual gazelle births in the sample used have recently risen somewhat but remain below pre- global financial crisis levels (Figure 1.9.1) at about 0.5 percent of total firms, and their sales growth exceeds that of large leading firms by about 10 to 15 percentage points.

[14] Unlike for listed firms, data availability constraints prevent comparing Europe and US firms in this section. This is, in particular, because Orbis has insufficient and non-representative coverage of non-listed US firms.

[15] This section relies primarily on Moody's Orbis database. In this chapter, gazelles are defined as firms that, by age 10: (1) feature at least one three-year period of annualized growth in deflated sales of 20 percent or more; and (2) have at least 100 employees at some point during this period. This definition is broadly similar to that in Sterk and others (2021). The main difference is that the definition used was conditioned on sales growth rather than employment growth; this more factor-neutral definition aims to avoid biasing our analysis of gazelles' productivity patterns below. The countries covered are Austria, Belgium, Bulgaria, the Czech Republic, Denmark, France, Germany, Greece, Iceland, Italy, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

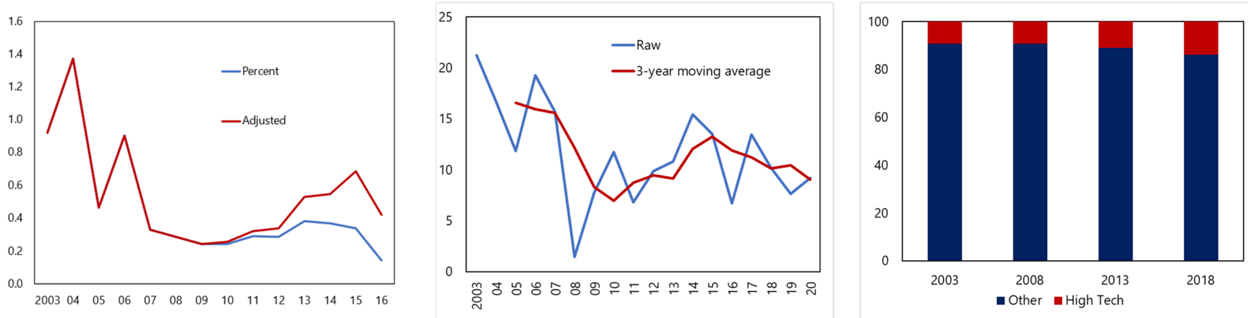
However, this overperformance has somewhat waned since the 2000s (Figure 1.9.2). Further, in terms of sectoral composition, while the share of gazelles found in tech sectors has increased from about 10 percent of gazelle births in 2008 to 19 percent in 2018, it remains small (Figure 1.9.3).[16]

Figure 1.9. In Search of European Gazelles

1.Gazelles by Birth Cohort
(Percent of Firms)

2.Gazelle Sales Growth Overperformance
(Percent)

3. Gazelle Births by Industry
(Percent)



Sources: Orbis; and IMF staff calculations.
Notes: In panel 1, the red line corresponds to a series adjusted for the fact that a firm can become a gazelle until it turns 10 years old, but the sample ends in 2021, so that firms born more recently may become a gazelle in a year that goes beyond the last year of the sample. Both series are in percent of all firms in Orbis with non-missing sales data in that year. Europe includes Austria, Belgium, the Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

To promote gazelle formation, Europe will need to offset its demographic headwinds through enhanced investments in human capital…

Gazelle formation is shaped by many policy and non-policy-related forces. These are explored through a model that exploits variation in gazelle formation across European countries and regions over time.[17] The results indicate that adverse demographic trends can undermine gazelle formation. The number of gazelles is positively correlated with population growth, while negatively correlated with the median age and the old-age dependency ratio (Figure 1.10). While the negative relation between aging and startups has also been documented in the United States—owing for example to lower job mobility and lower propensity to innovate among older workers (Engbom 2019; Hopenhayn and others, 2022), Europe has to contend with overall worse demographic headwinds as well as lower labor mobility that can hamper talent agglomeration.[18]

By contrast, human capital formation as well as higher female labor force participation (which can improve the allocation of talent; see for example. Hsieh and others, 2019) support gazelle formation. This is evidenced by the beneficial impact of young high-skilled workers (share of 25 to 34-year-olds with college degrees), including high-skilled migrant workers.[19]

---

[16] While Orbis' data coverage constraints prevent the benchmarking of these shares with the United States at a relatively high level of aggregation such an approximate comparison is feasible based on CompNet for Europe and Business Dynamics Statistics data for the United States. Over the period of 2010–20,, the share of young firms below the age of two in Europe is low compared with those in the United States in some tech-related sub-sectors such as "management, scientific, and technical consulting services" (around 3 percent in Europe versus 5 percent in the US) and "computer programming, consultancy and related activities" (about 3 percent in Europe versus 4 percent in the United States).

[17] Specifically, the relationship between the count of gazelle presence and demographic factors is modeled through a Tobit model estimated at the level of NUTS2 regions. Further, country fixed effects control, for example, for unobserved differences between countries' educational systems that may lead to unmeasured differences in the effect of educational attainment, while year fixed effects control, *inter alia*, for the right-censoring of the gazelle-birth data.

[18] Even within the EU, workers' cost of migrating between member countries (which can reflect, for example, the lack of portability of pensions or professional licensing requirements) is about eight times higher than for migrating between US states (see *April 2024 Regional Economic Outlook: Europe*).

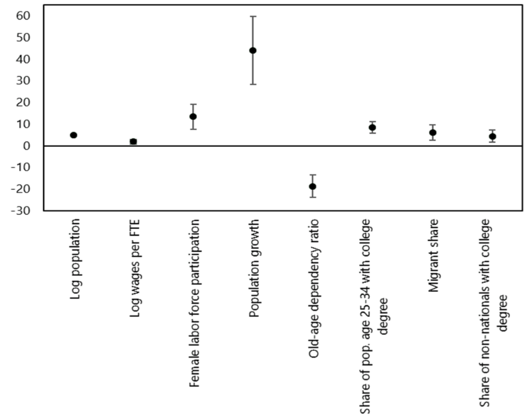
[19] Variation in wages in the cross-section of regions conflates two factors: in part pure labor costs (which would all else equal disincentivize startups) and in part proxy for the quality of human capital (which can spur gazelle formation). The small positive coefficient implies that human capital quality aspect dominates in the data.

…and more risk capital

European gazelles also suffer from under-financing. This is reflected in their high marginal productivity of capital compared with that of large firms, which tends to persist over their life cycle and is indicative of binding investment financing constraints (Figure 1.11.1), consistent with survey-based findings (European Investment Bank 2024a).[20] Financing constraints also manifest themselves as higher borrowing costs, especially for gazelles with larger intangible assets that cannot be pledged as collateral; gazelles in the top quintile of intangible intensity pay on average nearly 2 percentage points more than large incumbents in the same country, sector, and year (Figure 1.11.2).

One particularly damaging aspect of under-financing is the scarcity of venture capital (VC), which can be particularly effective in fostering the growth of young and innovative firms by providing equity-based financing and managerial advice.[21]

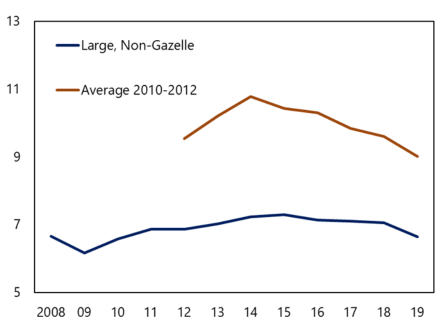
Figure 1.10. Europe: Determinants of Gazelle Formation
(Number of gazelles)



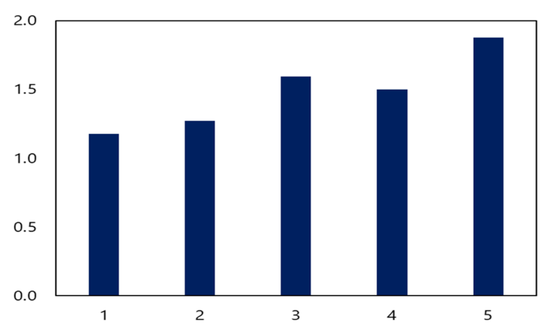
Sources: Orbis; and IMF staff calculations.
Note: Coefficients show the correlation of each variable on the number of gazelles depending on the unit of respective variables. For instance, for regressors in logs, coefficients are interpreted as the change in the number of gazelle formations in response to 1 percent change of the regressor. In figure 1.10, Europe includes Austria, Belgium, the Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. FTE = Full-time equivalent.

Figure 1.11. Financial Constraints for European Gazelle Firms

1. Average Revenue per Unit of Assets: Gazelles versus Large Non-gazelles
(Percent)



2. Interest Rate Gap Between Gazelle and Large Non-gazelle Firms by Intangible Asset Share Quintiles
(Percentage points)



Sources: Orbis; and IMF staff calculations.
Note: In panel 1, higher average revenues per unit of assets for gazelles are indicative of sub-optimal investment and size, and, therefore, of greater financial constraints. In panel 2, interest rates are calculated as financial expenses divided by debt, including loans and long-term liabilities. X-axis shows the quintiles by firm-level intangible asset share. Gazelles with more intangible assets (top quintile, right bar) pay significantly higher interest rates on their debt than gazelles with less intangible assets (bottom quintile, left bar), compared to non-gazelles. In figure 1.11, Europe includes Austria, Belgium, the Czech Republic, Denmark, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Slovenia, the Slovak Republic, Spain, Sweden, Switzerland, and the United Kingdom.

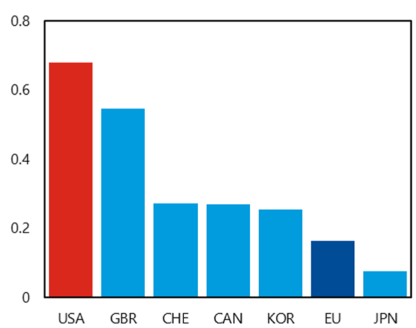
[20] As shown for example in Hsieh and Klenow (2009), under some conditions the average revenue product of capital is proportional to its marginal revenue product.

[21] For an overview of the VC landscape in Europe vis-à-vis the United States, see Arnold and others (2024).

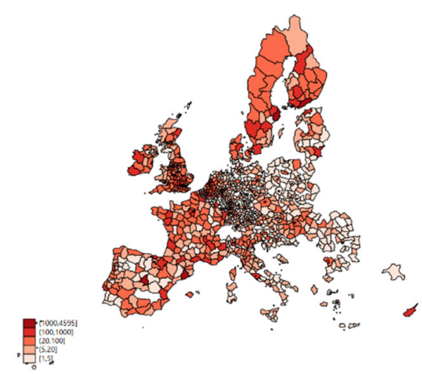
In the past decade, VC investments were less than 0.2 percent of GDP in the EU compared with nearly 0.7 percent in the United States (Figure 1.12.1), and they were concentrated in a few countries such as the United Kingdom or France (Figure 1.12.2). Firm-level analysis finds that European firms vastly improve their performance upon receiving VC backing (Figure 1.12.3). While in principle this result could merely reflect the attractiveness of high-potential firms for VC, the finding is also supported when comparing the performance of VC-backed firms after receiving a capital injection to that of firms that are yet to receive—but will eventually get—VC backing.[22] The analysis also confirms that receiving VC funding increases firms' intangible assets by roughly 100 percent one year after receiving VC funding (Figure 1.12.4). VC funding is also found to persistently raise employment and total factor productivity (see Adilbish and others forthcoming).

Figure 1.12. Current Landscape of Europe's Venture Capital and Its Impact on Intangible Investment

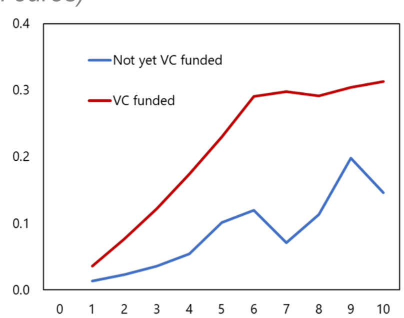
1. Venture Capital Investments, 2013–23
(Average percent of GDP)



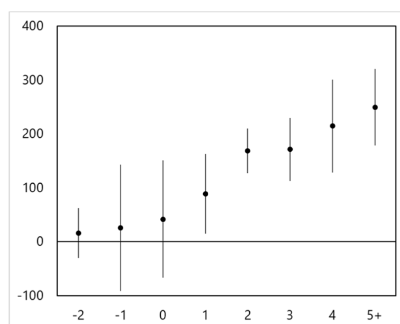
2.VC: Total Equity Invested, 2007–21
(Index; thousands of Euros)



3. Median Intangible Assets of Firms After Receiving VC-Backing Grows Significantly Faster than Not-Yet-Funded Firms of the Same Age
(Million euros)



4. VC Matters for Intangible Investments
(Percent relative to average intangible assets of firms at least three years before receiving VC funding)



Sources: Arnold and others (2024); VICO database; Orbis and IMF staff calculations.
Notes: In panel 1, CAN = Canada, CHE = Switzerland, EU = European Union, GBR = United Kingdom, JPN = Japan, KOR = Korea, and USA = United States. In panel 2, cumulative sum of 2007-21 in NUTS3 region. In panel 3, the horizontal axis In panel 4, the horizontal axis shows the time before and after venture capital funding, with time=0 showing the moment that a firm receives VC funding. The vertical axis shows the change in intangible assets (in percent) relative to average intangible assets of the reference years (three or more years pre-VC funding). In panel 2, Europe includes Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, and the United Kingdom. In panels 3 and 4, Europe includes France, Germany, Italy, Spain, Sweden, and the United Kingdom.

[22] The identification strategy is predicated on the fact that firms predominantly receive their VC-funding before they reach the age of five, with the event of receiving funding at a particular age before five—at age two versus three, for example—assumed to be random.

Section 5. Policies to Rekindle Productivity Growth in Europe

The analyses in this note suggest that the divergence between the United States and Europe productivity trajectories has deep firm-level roots. Europe's large and leading firms have fallen behind in terms of both productivity and innovation efforts, and the continent also less dynamic startups. A smaller market size, a more limited role of equity financing (including through venture capital) and lower availability of human capital (also affected by more rapid aging) are among the factors that constrain Europe's most productive firms from scaling up and investing consistently in innovation.

Addressing these and other underlying structural deficiencies, which became more penalizing with the advent of the ICT revolution, should guide Europe's growth-enhancing reform agenda. This will require major efforts at both regional and domestic levels.

Continued efforts towards a deeper single market would support firm growth by lifting constraints related to market size. Removing remaining barriers to trade within the EU would incentivize firms to undertake R&D and other investments that pay off when the customer base is large. For example, there is scope for expanding firms' market access within Europe by addressing underinvestment in border infrastructure, opening up protected sectors, pursuing further services trade liberalization, and harmonizing regulations. Many non-EU countries, most notably in the Central, Eastern, and Southeastern Europe (CESEE) region, feature higher barriers to trade than EU members (see the *April 2024 Regional Economic Outlook: Europe*). Lowering these barriers would promote scaling up and can also help incentivize foreign direct investment.

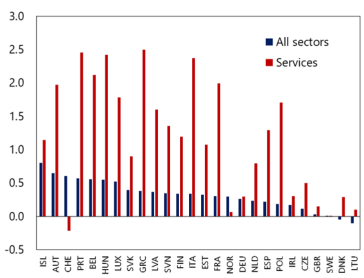
Efforts to lower trade barriers should be accompanied by advancements towards the EU capital markets union. Many of the required reforms, such as the review of the prudential regime for insurers and steps toward greater EU harmonization of capital markets' oversight, would better harness Europe's considerable savings and increase the availability of equity financing for firms of all sizes. Easing the constraints that inhibit VC growth and closing the VC-funding gap vis-à-vis other advanced economies would unlock equity financing for startups and young firms that lack tangible collateral, which would promote entry and innovation. Concrete measures include, among others, harmonizing VC regulations to incentivize the development of larger funds, and having the European Investment Fund play a catalytic role and provide due diligence as a public good (Arnold and others 2024). A fully-harmonized "28th corporate regime" could also reduce constraints that inhibit VC, including across borders. Finally, increasing the portability of pensions and mutual-recognition agreements for professional services requiring licensing can promote innovation clusters requiring talent agglomeration.

Measures at the European level should be complemented by ambitious domestic reforms (Figure 1.13). There is scope for promoting entry by easing administrative barriers to entry, especially in service sectors. Labor market regulations can facilitate worker reallocation towards young innovative firms if they protect workers rather than jobs. As in Denmark's so-called *flexicurity* system, such an approach would combine more flexible layoff procedures with adequate unemployment benefits and strong active labor market policies that support job search and employability. In some economies, closing performance gaps in tertiary education, skill upgrading including through vocational training, and addressing skill mismatches will also help foster idea creation, formation of high-growth firms and, together with investments in digitalization, the adoption of frontier technologies by European firms.

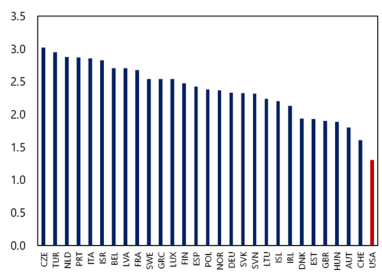
Further improvements in insolvency frameworks could facilitate exit of less productive firms and remove barriers that may discourage investors—particularly foreign ones—to take equity participations in innovative firms (Peter 2021). R&D tax incentives can be designed to support young, innovative firms. Currently, fewer than a quarter of EU countries implement such systems, with most instead using size-based taxes that may discourage firm growth (see Benedek and others 2017; Mitchell and others 2020). To better encourage firm growth, firm size-based tax and regulatory incentives should be avoided. To encourage R&D, tax incentives should narrowly target firms' R&D investments—for instance, through accelerated depreciations and R&D investment tax credits—rather than take the form of broad reductions in corporate tax rates. They should also ideally be harmonized across countries so that R&D investments take place where their expected returns are highest. EU members should be wary, on the other hand, of national industrial support measures that are wasteful and can fray the single market (see October 2024 *Regional Economic Outlook: Europe*). Closing performance gaps in education will also help foster ideas creation, the formation of high-growth firms and, together with investments in digitalization, the adoption of frontier technologies by European firms.

Figure 1.13. Structural Impediments to Productivity Growth

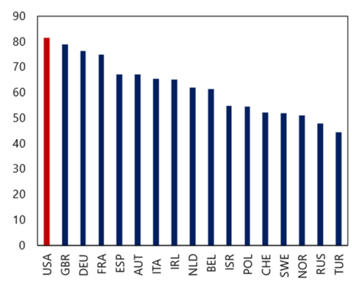
1.Stringency of Barriers to Entry
(Relative to average of best five OECD countries)



2.Strictness of Employment protection
(2019, Index)



3. Crisis Preparedness of Insolvency Systems
(Index)



Sources: OECD; Araujo and others (2022); IMF staff calculations.
Note: Country abbreviations are International Organization for Standardization (ISO) country codes. OECD = Organisation for Economic Co-operation and Development.

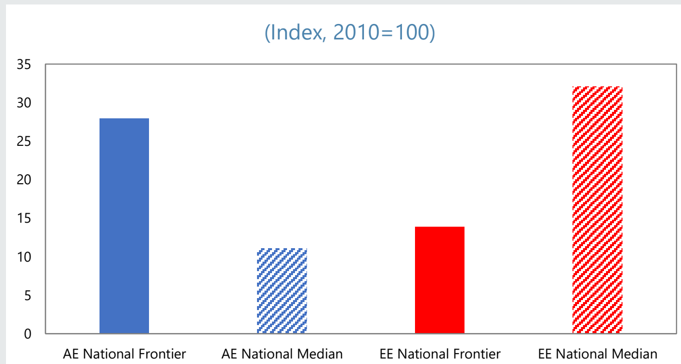
A thriving business sector is key to reducing, and eventually closing Europe's large productivity and income per capita gap. There is no magic wand to make it happen. Instead, this is a multifaceted agenda that will require European policymakers' years of sustained efforts cutting across multiple areas, from education to regulation to the innovation ecosystem. But this is a clear starting point: deepening the single market, supported by domestic regulatory reforms.

Box 1.1. Europe's Weakening Within-Country Productivity Convergence[1]

Europe's widening productivity gap with the United States, which dates back to the information and communication technology (ICT) revolution, has raised questions not just about the region's innovative capacity—as discussed in Section 2—but also about its ability to swiftly adopt new technologies. Most European businesses—predominantly non-leading firms—have struggled to fully leverage existing productivity-enhancing innovations, highlighting the importance of within-country technology diffusion.

Firm-level analysis reveals deteriorating technological diffusion in Europe's advanced economies. The extent of within-country technology diffusion is measured by the productivity gap between a country's frontier firms, defined as the top 10 most productive firms, and the country's median firm for each sector, similar to Andrews and others (2016). For advanced economies, this gauge of within-country technological diffusion has widened over the past 10 years: While national frontier firms enjoyed annual productivity gains of about 2-3 percent, the productivity of median firms barely increased. For emerging market economies, the productivity gap narrowed over the same period, but this improvement came alongside a moderate productivity increase of national frontier firms. Since national firms are the "anchors" of within-country technology diffusion—as global productivity leaders or firms aspiring to catch up to them, this stagnation does not bode well for future productivity growth for these countries.

Figure 1.1.1. Percentage Difference of Labor Productivity in 2021 from Their 2010 Levels



Source: Orbis, and IMF staff estimates.
Note: AE stands for Advanced Economies and includes Austria, Belgium, Czechia, Denmark, Germany, Estonia, Ireland, Spain, Finland, France, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Slovakia and Sweden.
EE stands for Eastern Europe and includes Bulgaria, Hungary, Poland and Romania. Productivity of a "national frontier" is calculated as the sector-level average labor productivity of the top 10 firms of each country, weighted by labor share of each sector at the NACE2 level. Productivity of a "national median" is calculated as the sector-level labor productivity of a median firm in each country, weighted by labor share of each sector at NACE2 level. Labor productivity is measured in value-added per employee. Country-level time series are aggregated using PPP GDP shares for AEs and EEs. PPP=purchasing power parity; NACE=industry standard classification system used in the European Union.

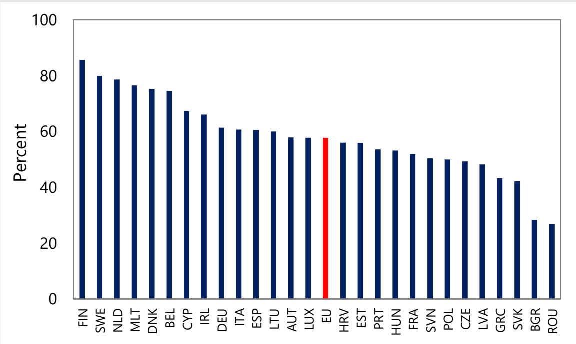
Several factors have contributed to sluggish firm-level technology adoption in Europe. While recent improvements have been observed in areas such as electronic information sharing and social media use, European businesses—particularly smaller and medium-sized enterprises (SMEs)—still demonstrate significant room for growth in ICT integration with a significant variation across countries. While heterogenous across European countries, the adoption of key digital technologies, such as artificial intelligence or cloud computing, has been slow overall, partly because of structural weaknesses including a shortage of digital skills, deficiencies in digital infrastructure, stringent (services) product and labor market regulations and insufficient availability of equity (Andrews and others, 2020; European Commission 2022). Slow technology adoption has been accompanied by a tepid accumulation of ICT-related capital stock, which empirical analysis finds to have hindered labor productivity growth. An instrumental variable approach based on sectoral panel data for Europe estimates that a 1 percentage point increase in real ICT stock intensity (the ratio of the ICT capital stock to the total capital stock in real terms) leads to a 1.4 percent increase in labor productivity compared with the sector and country average.[2]

1/ The authors of this box are Gee Hee Hong and Takuji Komatsuzaki.
2/ The instrument variable approach is similar to Bergeaud (2024), utilizing country-sector exposures to the ICT revolution of the United States. The data cover 30 European countries as well as Japan and the United States from 1995 to 2019.

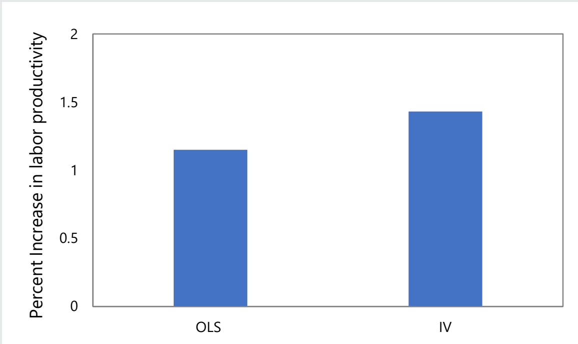
Box 1.1. (continued)

Figure 1.1.2. Europe's Deficient Digital Technology Adoption and Its Impact on Productivity

1.1.2. Share of SMEs with at Least a Basic Level of Digital Intensity: 2023



1.1.3. A Higher ICT Intensity of the Capital Stock Raises Productivity



Source: 1. Eurostat, European Union Survey of ICT Use and E-Commerce in Enterprises. Digital Economy and Society Index, 2023. 2. EU KLEMS-INTAN Prod, OECD patent statistics, and IMF staff calculations. Note: In panel 2, the bars represent the percent increase in labor productivity in response to a 1 percent increase in the share or real ICT capital stock over total capital stock. 'OLS' represents the results from ordinary least squares, regressing log of labor productivity on the share of real ICT stock over total capital stock. 'IV' represents the results from an instrument variable approach as noted in footnote 2. Firm-level and year fixed effects are included in both regressions.

Box 1.2. Unfinished Business: Trade Barriers within the EU[1]

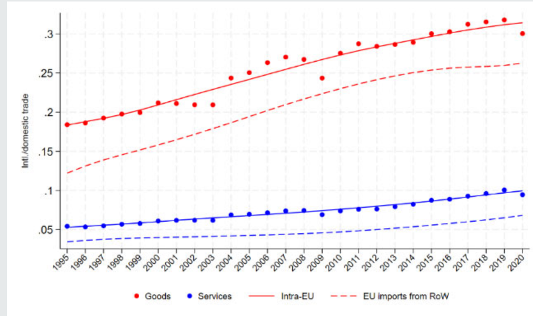
As governments in the EU strive to implement policies to boost productivity, barriers to further integration of the single market have received increasing attention (see, for example, April 2024 *Regional Economic Outlook*: Europe; Draghi, 2024; and Letta, 2024). To what extent have intra-EU trade barriers fallen in the past three decades, and are they still sizeable today?

A first gauge of barriers to trade is the ratio of international trade flows to domestic trade flows, which are by definition unaffected by cross-border frictions. As shown in Figure 1.2.1 this ratio has been on a trend rise, signaling a fall in trade barriers among EU countries, for both goods and services–by 2020, the value of intra-EU trade was 30 percent that of domestic (within-EU-country) sales for goods, and 10 percent for services. Over the same period, EU imports from non-EU countries increased at a similar rate, indicating a concomitant decline in external trade barriers.

However, the ratio of international to domestic trade can be kept low by forces unrelated to trade policies, such as higher geographical distance for international trade and consumers' stronger taste for domestic goods and services. To purge the data from these non-actionable barriers, a standard gravity model of trade at the sector level for domestic and international trade flows is estimated. The model controls for time-invariant factors, from which *changes* in the costs of both intra-EU and external-EU trade over time can then be inferred.[2]

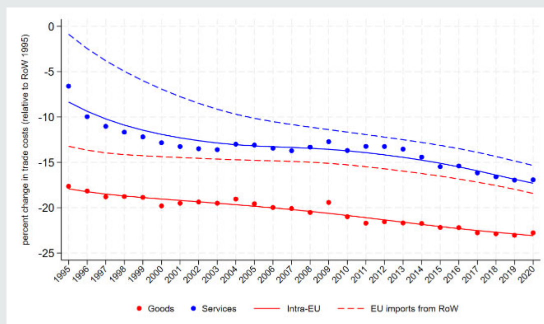
The costs of intra-EU trade have fallen in the past three decades, although those of external-EU trade also declined as international trade liberalization proceeded. Figure 1.2.2 shows the evolution of estimated output-weighted average trade costs that EU members impose on each other and on non-EU countries for both goods and service sectors. Figure shows that, in 1995, intra-EU trade costs were estimated to be already 17.6 percent lower than trade costs among non-EU countries in goods, and 6.6 percent lower in services (see solid lines). EU market integration then further lowered trade barriers, both internally and towards non-EU countries. For goods, intra-EU trade costs went down by 6 percent over 1995–2020, while in services the drop was 11 percent—which was however less than the estimated 16 percent decline for services imports from non-EU countries. These average changes however mask profound heterogeneity among sub-sectors.

Figure 1.2.1. Intra-EU and EU-Rest of the World (RoW) Trade Relative to Domestic Trade



Source: Inter-Country Input-Output TiVA tables and IMF staff calculations.
Note: Each dot denotes the ratio of trade between EU-28 countries to domestic sales within EU-28 countries. The lines are local regressions fitted values of the ratios on a year variable. Solid lines are for intra-EU trade flow and dashed lines are for EU imports from non-EU (RoW) countries.

Figure 1.2.2. Estimates of Changes in Intra-EU and EU-Rest of the World (RoW) Trade Costs



Source: Estimations are from gravity models for bilateral trade flows.
Note: Each dot denotes output-weighted averages of coefficients on interactions between a dummy for trade between EU countries and year dummies. The lines are local regressions fitted values of the averages of coefficients on a year variable, where the excluded trade category is trade among non-EU countries in 1995. Solid lines are for intra-EU trade flows and dashed lines are for EU imports from non-EU (RoW) countries.

1/ The author of this box is Lorenzo Rotunno.

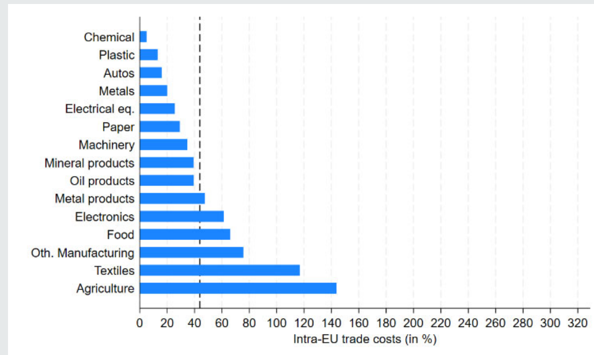
2/ This sector-level model of bilateral trade flows includes a dummy for trade among EU countries, one for EU imports from outside the EU and one for trade among non-EU countries (Head and Mayer, 2021). Each of these dummies is interacted with year dummies. The excluded category is domestic trade of both EU and non-EU countries. To identify the year-specific coefficients, , the non-EU trade coefficient for 1995 was excluded.The coefficients of interest are those on the yearly dummies for intra-EU and external-EU trade, which identify how the ratio of these trade flows to domestic trade evolves over time relative to non-EU trade in 1995. These coefficients varying by sector *k* and year *t* (for intra-EU trade, note them by $\beta^k_{EU,t}$) are converted into ad-valorem equivalent trade cost using the formula $\left[\exp\left(\frac{\beta^k_{EU,t}}{\epsilon_k}\right)-1\right]\times 100$, where ϵ_k is the elasticity of trade with respect to trade costs (its values were sourced from Fontagne and others [2022]). The sector-level regression is estimated using OECD TiVA data and controls for country-pair fixed effects, importer- and exporter-year fixed effects and dummies for participation in Free Trade Agreements and membership to the World Trade Organization.

Box 1.2. (continued)

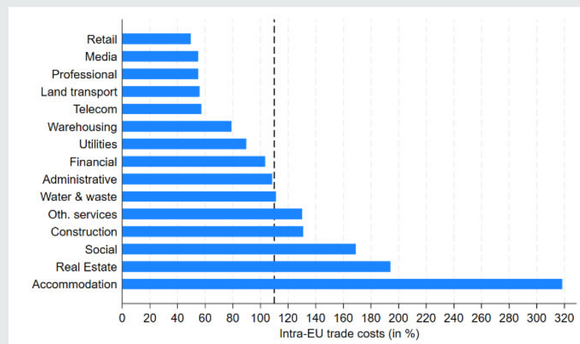
Despite significant progress toward market integration, the level of trade barriers within the EU is estimated to remain significant in both goods and—particularly—services. Figure 1.2.3 displays the ad-valorem equivalent of intra-EU trade costs derived from the trade gravity regressions for different industries in 2020. Average intra-EU trade costs for goods are estimated to be around 44 percent (excluding agriculture), with wide heterogeneity across individual industries. These estimates should be taken as an upper bound for tariff equivalents, since they might not fully strip out the data from non-policy factors.[3] For comparison, however, in their estimates based on aggregate (not sectoral) goods trade data, Head and Mayer (2021) find intra-US barriers to be about 13 percent. Intra-EU trade barriers remain even higher in service, at 110 percent on average, with all individual services sectors suffering higher barriers than those of the average goods sector. This is suggestive evidence of significant remaining impediments to intra-EU trade in goods, for example, because of poor border infrastructure (in the case of goods trade), procurement rules, or lack of harmonized rules.

Figure 1.2.3. Estimates of Intra-EU trade Barriers in 2020

1. Goods



2. Services



Source: Estimations from gravity models for bilateral trade flows in 2020.
Note: Each bar denotes the coefficient on a dummy for intra-EU trade. The vertical dashed lines are output-weighted averages within manufacturing (Panel (a)) and services (Panel (b)).

These empirical results underscore the potential for further EU market integration to support productivity growth. Using estimates from effects of the US-Canada trade agreement (CUSFTA) in 1988, each 10-percentage point reduction in goods tariffs could lead to a 1 percent increase in labor productivity (Trefler 2004). Applying these numbers in back-of-the-envelope calculations suggests that reducing estimated intra-EU sectoral barriers to the level observed among US states could potentially increase productivity by 6.7 percent.[4] Broader evidence unpacking these effects points to productivity gains through enhanced innovation, which would be more pronounced for already more productive firms (see the review by Shu and Steinwender 2019).

3/ To identify the *level* of trade barriers based on the difference between international and domestic trade, the gravity specification replaces the country-pair fixed effects with time-invariant trade cost shifters such as distance (in logs, internal and international) and dummies for sharing a border, an official language, and the origin of the legal system. The implicit identifying assumption is that these barriers fully absorb the influence of country-pair and time-invariant determinants of bilateral trade flows. This assumption is likely to be violated as other bilateral determinants of trade such as home bias in consumer preferences whose influence is not controlled for can enter the estimated levels of the trade costs. The regressions are estimated by industry and year, and include dummies for intra-EU trade, EU imports from RoW and RoW trade, and importer and exporter fixed effects.

4/ In the case of goods sectors (including agriculture), the calculation assumes that the average ad valorem trade barriers in 2020 (53 percent) fall to 13 percent, the level estimated by Head and Mayer (2021) to prevail in the United States in the aggregate of all goods sectors. For service sectors, it assumes that barriers among US states are higher than for goods in the same proportion as in the case of the EU. The aggregate increase in productivity equals the output-weighted average of the simulated increases across the goods (4 percent) and service (8.3 percent) sectors.

References

Adler, Gustavo, Romain Duval, Davide Furceri, Sinem Kilic Celik, Ksenia Koloskova, and Marcos Poplawski-Ribiero. 2017. "Gone with the Headwinds: Global Productivity." IMF Saff Discussion Note, SDN/17/04, International Monetary Fund, Washington, DC.

Aghion, Philippe. 2023. "An innovation-Driven Industrial Policy in Europe." In *Sparking Europe's New Industrial Revolution: A Policy for Net Zero, Growth, and Resilience*, Edited by Simone Tagliapietra and Reinhilde Veugelers. Brussels: Bruegel.

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.

Akcigit, Ufuk, Wenjie, Chen, Federico Diez, Romain Duval, Philipp Engler, Jiayue Fan, Chiara Maggi, and others. 2021. "Rising Corporate Market Power: Emerging Policy Issues." IMF Staff Discussion Note Series, SDN/21/01, International Monetary Fund, Washington, DC.

Andrews, Dan, Chiara Criscuolo, and Peter Gal. 2016. "The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy." OECD Productivity Working Paper 5, OECD Publishing, Paris.

Andrews, Dan, Giuseppe Nicoletti, and Christina von Rueden. 2020. "Digital Technology Diffusion: A Matter of Capabilities, Incentives or Both," *European Economic Review* 128: 103513.

Araujo, Juliana, Jose Garrido, Emanuel Kopp, Richard Varghese, and Weijia Yao, 2022. "Policy Options for Supporting and Restructuring Firms Hit by the COVID-19 Crisis." IMF Departmental Paper, 2022/002, International Monetary Fund, Washington DC.

Arnold, Nathaniel, Guillaume Claveres, and Jn Frie. 2024. "Stepping Up Venture Capital to Finance Innovation in Europe." IMF Working Paper 24/146, International Monetary Fund, Washington, DC.

Benedek, Dora, Pragyan Deb, Borja Garcia, Sergejs Saksonovs, Anna Shabunina, and Nina Budina. 2017. "The Right Kind of Help? Tax Incentives for Staying Small." IMF Working Paper 17/139, International Monetary Fund, Washington, DC.

Bergeaud, Antonin. 2024. "Monetary Policy in an Era of Transformation: The Past, Present and Future of European Productivity." Proceedings from the ECB Forum on Central Banking.

Commault, Jeanne. 2022. "Does Consumption Respond to Transitory Shocks? Reconciling Natural Experiments and Semistructural Methods." *American Economic Journal: Macroeconomics* 14(2): 96–122.

Decker, R.A., and J. Haltiwanger. 2024. "Surging Business Formation in the Pandemic: A Brief Update." Mimeo.

Diez, Federico, Jiayue Fan, and Carolina Villegas-Sanchez. (2021). "Global Declining Competition?" *Journal of International Economic*s 132: 1–17.

Draghi, Mario. 2024. "The Future of European Competitiveness—A Competitiveness Strategy for Europe." European Commission, Brussels.

Duval, Romain, Davide Furceri, Bingjie Hu, Joao Tovar Jalles, and Huy Nguyen. 2018. "A Narrative Database of Major Labor and Product Market Reforms in Advanced Economies." IMF Working Paper 18/19, International Monetary Fund, Washington, DC.

Duval, Romain, Gee Hee Hong, and Yanick Timmer. 2020. "Financial Frictions and the Great Productivity Slowdown." *The Review of Financial Studies* 33(2): 475–503.

Engbom, Niklas. 2019. "Firm and Worker Dynamics in an Aging Labor Market." Mimeo.

Eslava, Marcela, John Haltiwanger, and Alvaro Pinzon. 2020. "Job Creation in Colombia versus the USA: 'Up-or-out Dynamics' Meet 'the Life Cycle of Plants'" *Economica* 89(355): 511–539.

European Commission. 2022. Digital Economy and Society Index.

European Investment Bank. 2024a. "The Scale-Up Gap: Financial Market Constraints Holding Back Innovative Firms in the European Union."

European Investment Bank. 2024b,.“EIB Investment Survey 2024: European Union Overview.”

Fontagné, Lionel, Houssein Guimbard, and Gianluca Orefice. 2022. "Tariff-Based Product-Level Trade Elasticities." *Journal of International Economics* 137: 103593.

Gandhi, Amit, Salvador Navarro, and David Rivers. 2020. “On the Identification of Gross Output Production Functions.” *Journal of Political Economy* 128(8): 2973–3016.

Hall, Brownyn, and Josh Lerner. 2010. “Chapter 14: The Financing of R&D and Innovation.” *Handbook of the Economics of Innovation, p.* 609–39.

Head, Keith and Thierry Mayer. 2021. “The United States of Europe: A Gravity Model Evaluation of the Four Freedoms.” *Journal of Economic Perspectives* 35(2): 23–48.

Hopenhayn, Hugo, Julian Neira, and Rish Singhania. 2022. “From Population Growth to Firm Demographics: Implications for Concentration, Entrepreneurship and the Labor Share.” 90(4): 1879–1914.

Hsieh, Chang-Tai, and Peter Klenow. 2009. “Misallocation and Manufacturing TFP in China and India.” *The Quarterly Journal of Economics* 124(4): 1403–48.

Hsieh, Chang-Tai, Erik Hurst, Charles Jones, and Peter Klenow. 2019. “The Allocation of Talent and US Economic Growth.” *Econometrica* 87(5): 1439–74.

International Monetary Fund (IMF). 2019. “The Rise of Corporate Market Power and Its Macroeconomic Effects.” *World Economic Outlook*, April.

International Monetary Fund (IMF). 2023. “Germany: 2023 Article IV Consultation: Selected Issues.” IMF Country Report 23/259, International Monetary Fund, Washington DC.

Karahan, Fatih, Benjamin Pugsley, and Aysegul Sahin. 2024. “Demographic Origins of the Start-up Deficit.” *American Economic Review* 114(7): 1986–2023.

Letta, Enrico. 2024. “Much More Than a Market.”

Martin-Baillon, Alais. 2021. “Firm’s Marginal Propensities to Invest.” Mimeo.

Mitchell, Jessica, Giuseppina Testa, Miguel Sanchez Martinez, Paul N. Cunningham, and Katarzyna Szkuta. 2020. “Tax incentives for R&D: supporting innovative scale-ups?” *Research Evaluation* 29(2), pp. 121–134.

Neri, Matteo, Gianluca Orefice Laine, and Michele Ruta. 2023. “Deep Trade Agreements and Heterogeneous Firm Exports.” World Bank Policy Research Working Paper 10277, World Bank, Washington, DC.

Peter, Alessandra. 2021. “Equity Frictions and Firm Ownership.” Mimeo.

Santamaria, Marta, Jaume Ventura, and Ugur Yesilbayraktar. 2023. “Exploring European Regional Trade.” *Journal of international Economics,* 146, 103747.

Shu, Pian and Claudia Steinwender, 2019. “The Impact of Trade Liberalization on Firm Productivity and Innovation,” *Innovation Policy and the Economy* 19(1): 1–191.

Sterk, Vincent, Petr Sedlacek, and Benjamin Pugsley. 2021. “The Nature of Firm Growth.” *American Economic Review* 111(2): 547–79.

Trefler, Daniel. 2004. “The Long and Short of the Canada-US Free Trade Agreement.” *American Economic Review* 94 (4): 870–95.