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ORIGINAL ARTICLE

Business dynamism and the life cycle of firms: a firm-level analysis of Spain

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Abstract
This paper examines Spain's productivity slowdown, a trend particularly acute since the 2000s. While global productivity stagnation has drawn significant attention, Spain's experience presents notable divergences from economies such as the USA. In contrast to the USA, where narratives center on declining business dynamism and increasing market concentration, Spain shows no clear evidence of market power consolidation among incumbents. Instead, analysis of firm dynamics uncovers a distinct pattern: mature Spanish firms experience simultaneous declines in size and productivity growth. The study highlights the importance of identifying country-specific barriers—regulatory, financial, or technological—that influence firm performance and aggregate productivity.

Keywords Productivity · Firm dynamics · Spain

Mathematics Subject Classification D24 · E23 · L11 · O47

1 Introduction

Spain's productivity performance in recent decades has been notably weak, set against the broader slowdown in productivity growth observed across advanced economies. As Fig. 1 illustrates, total factor productivity (TFP) in Spain has been on a clear downward

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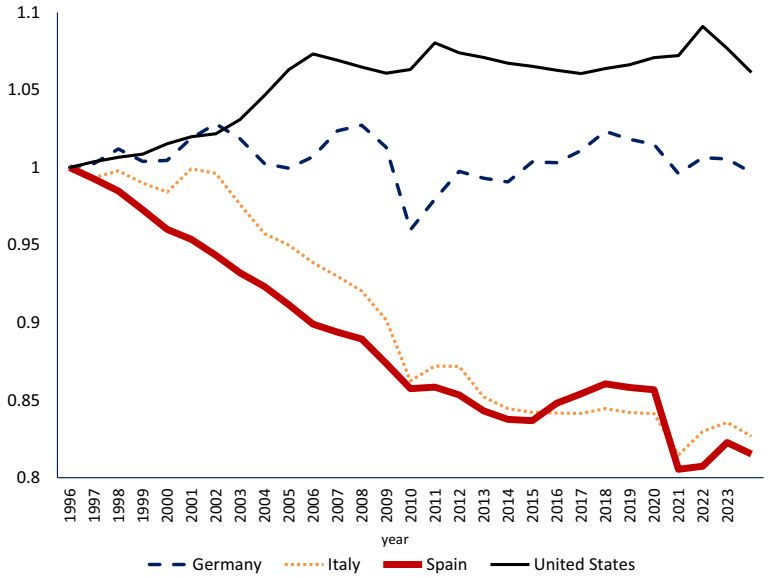


Fig. 1 TFP evolution. *Note*: Figure 1 shows the evolution of total factor productivity (TFP) in four countries: Germany, Italy, Spain and the USA. Data are normalized to one in 1996. *Source*: Conference Board. The Conference Board estimates TFP as a residual from a Cobb-Douglas production function. In practice, they first measure inputs—labor and capital—by aggregating data from national accounts. Labor is quantified by hours worked while capital is estimated using the Perpetual Inventory Method to capture various asset types. Factor shares (the proportions of output attributed to labor and capital) are taken from national accounts, and then TFP is computed as the portion of output growth that cannot be explained by the weighted growth of these inputs

trend since at least the late 1990s, in stark contrast to the relatively stable trajectories observed in the USA and Germany. Although Spain experienced a modest recovery following the 2012 sovereign debt crisis, the subsequent downturn—particularly after the Covid-19 shock—has left Spanish TFP far below pre-crisis levels as of 2023. This persistent stagnation is emblematic of the global productivity slowdown, while also reflecting structural challenges that are unique to Spain, and maybe other Southern European economies.

The worldwide productivity slowdown has prompted extensive debate about its underlying causes. In the USA, several interrelated explanations have emerged. First, the "ideas are getting harder-to-find" hypothesis, as argued by Gordon (2016) and Bloom et al. (2020), suggests that breakthroughs are becoming increasingly elusive, thereby requiring ever-greater research investments to sustain historical productivity gains. Second, inefficiencies and resource misallocation—particularly in the allocation of capital and managerial resources—can significantly drag down aggregate productivity (Gopinath et al. 2017; García-Santana et al. 2020; Guner et al. 2018). A third perspective focuses on declining business dynamism and its implications for resource allocation, as emphasized by Decker et al. (2016b). This view argues that reduced business churning, fewer startups, and declining "creative destruction" have weakened a crucial engine of productivity growth. High business dynamism historically

drove productivity gains through two channels: facilitating resource reallocation from less to more productive firms and incentivizing innovation through competitive pressure. The observed decline in these dynamic forces may therefore explain a significant portion of the productivity slowdown. These various channels—harder-to-find ideas, misallocation, and institutional rigidity—are deeply interconnected. As technological complexity increases, larger incumbent firms may gain comparative advantages in managing such complexity, thereby further dampening entry and overall dynamism (Akcigit and Ates 2023).

Focusing on declining business dynamism, the literature identifies several interconnected explanations for the observed slowdown across advanced economies. Market structure factors feature prominently, with Autor et al. (2020) and De Loecker et al. (2020) documenting rising market power and industry concentration that create "superstar firms" with competitive advantages over potential entrants. This trend may partly reflect technological shifts toward intangible capital and platform economies that generate increasing returns to scale (Crouzet and Eberly 2019; Brynjolfsson et al. 2021). Simultaneously, demographic trends pose headwinds, as Hopenhayn et al. (2022) and Karahan et al. (2024) demonstrate that slowing population growth reduces both the supply of entrepreneurs and the demand for new businesses. Institutional factors further exacerbate these issues; for instance, Gutierrez and Philippon (2022) highlights how regulatory strictness has disproportionately affected European firms, while post-crisis financial constraints (Decker et al. 2016a; Siemer 2019) and labor market frictions inhibit entrepreneurship.

A seminal contribution in this area is provided by Akcigit and Ates (2021), who document ten stylized facts on declining US business dynamism. Their analysis reveals that rising entry costs, increased market power of incumbents, and slower technological diffusion have jointly contributed to a significant drop in entrepreneurial activity and resource reallocation, identifying slow knowledge diffusion as a key mechanism that both limits technological catch-up by laggard firms and reinforces incumbent advantages. Following this framework, I study a similar set of facts for the Spanish economy, comparing these trends to other European countries and the USA while accounting for Spain's distinct institutional and economic context. Spain is a valuable case study given its unique institutional and economic characteristics—such as a dual labor market, a high density of small and micro firms, and pronounced regional disparities—that distinguish it from the US experience. When comparing Spain with the USA, two broad sets of observations emerge.

In terms of similarities with the USA, like other advanced economies, Spain has experienced patterns that parallel certain US trends, though often with different timing or magnitude. Both countries show a widening productivity dispersion between frontier and laggard firms. The labor share declined in both economies, with Spain experiencing this reduction from 2000 to 2012 before stabilizing after 2013, similar to the US decline after the 2008 financial crisis. Another shared pattern is the declining economic importance of young firms, with both countries experiencing a reduction in the contribution of firms under 5 years old to total employment, reflecting broader challenges in business dynamism. The adverse effects of the 2008 global financial crisis continue to influence both economies, with post-crisis recovery in business dynamism remaining incomplete in Spain as well as in the USA. This persistent scarring effect

underscores how severe economic shocks can fundamentally alter the entrepreneurial landscape for extended periods, potentially creating a "lost generation" of firms.

At the same time, Spain diverges from the USA in several crucial dimensions that challenge the applicability of the "superstar firm" narrative. While US markups have steadily increased since 2000, Spanish markups remain lower and show a distinct pattern: constant from 2000–2006, increasing during 2006–2009, and only modestly growing after 2009. Market concentration trends also differ significantly—Spain (and broader European) concentration remained largely stable, with only a mild increase during 2007–2009. Notably, when decomposing this trend, foreign-owned companies increased their market share at the expense of domestic firms, contrasting with the USA where domestic companies primarily drive concentration increases. Spain's profit share has remained remarkably stable from 1995 to 2023, with only slight variations across economic cycles, while the USA has experienced increases. The dispersion of firm growth rates in Spain has remained constant since 2000 (with a temporary increase only during 2008–2009), whereas the USA has seen a secular decline since the 1980s. Entry rates in Spain stabilized after 2009, contrasting with consistently declining US entry rates.

A unique aspect of the Spanish case is the simultaneous decline in both the size and productivity growth of mature firms. The employment age profile has flattened—in 2005, a 40-year-old firm was 10 times larger than a 5-year-old firm, but by 2016, this ratio reduced to 7, with stagnant employment growth among young and middle-aged firms. Whereas US incumbents have generally maintained or expanded their market presence, mature Spanish firms have become relatively smaller and less productive over time. This may reflect Spain's distinctive business structure, with a higher prevalence of small firms compared to other EU countries and the USA, accounting for a larger share of total employment. These observations suggest that Spain's increase in productivity dispersion without corresponding market concentration increases may be explained by productivity improvements of laggards that leapfrog industry leaders, rather than the US pattern of leaders widening productivity gaps with laggard companies (e.g., Caggese et al. (2024)).

Furthermore, building on the insights of Hsieh and Klenow (2014), it is important to consider the role of size-dependent policies that limit firms' incentives to invest. Bento and Restuccia (2017) and Guner et al. (2018) argue that regulatory frameworks, which impose increasing burdens as firms grow, can stifle both investment in human capital and technological upgrading. This is particularly relevant to the Spanish context, where such policies may further hinder the ability of mature firms to scale up and innovate, thereby exacerbating the productivity slowdown and contributing to the observed divergence between Spain and other advanced economies.

In sum, while the global slowdown in productivity appears to be driven by interconnected forces—namely harder-to-find ideas, resource misallocation, and declining business dynamism—the Spanish experience reveals additional layers of complexity. The absence of pronounced market concentration, the post-crisis partial reversal in dynamism, and the weakening performance of mature firms suggest that Spain faces unique institutional and structural challenges. These findings underscore the need for tailored policy interventions that address not only the diffusion of technology and the allocation of resources, but also the regulatory and size-dependent barriers

that uniquely affect the Spanish business landscape. In line with these observations, the Draghi (2024) report highlights the critical role of regulatory barriers and size-dependent obstacles in impeding business dynamism in Europe.

The remainder of this paper is organized as follows. Section 2 documents empirical trends in business dynamism, while Sect. 3 examines the life cycle of Spanish firms and explores the specific challenges facing mature firms. Finally, Sect. 4 concludes with a discussion of the policy implications arising from these findings.

2 Empirical trends in business dynamism

This section follows Akcigit and Ates (2021) and documents empirical trends in business dynamism for Spain.[1]

2.1 Fact 1: Spanish firms show limited markup growth

Figure 2 illustrates the evolution of markups across our sample economies, revealing distinct patterns between Europe and the USA. While US markups have shown sustained growth since 2000—with De Loecker et al. (2020) documenting an increase from 1.21 in 1980 to 1.61 in 2016 (approximately 33%)—European markup dynamics present a different picture. In Europe, average markups remained stagnant from 2000 to 2006, followed by increases in Spain and Italy during 2006–2009, while Germany maintained stable levels. Post-2009, markup growth across European economies was modest at best. This divergence between USA and European markup trends requires careful interpretation. While Díez et al. (2021) find significant markup increases among listed and large European firms, these increases are less pronounced than in the USA. This pattern aligns with Kalemli-Ozcan et al. (2024), who document similar differences in industry concentration trends between the USA and Europe.[2]

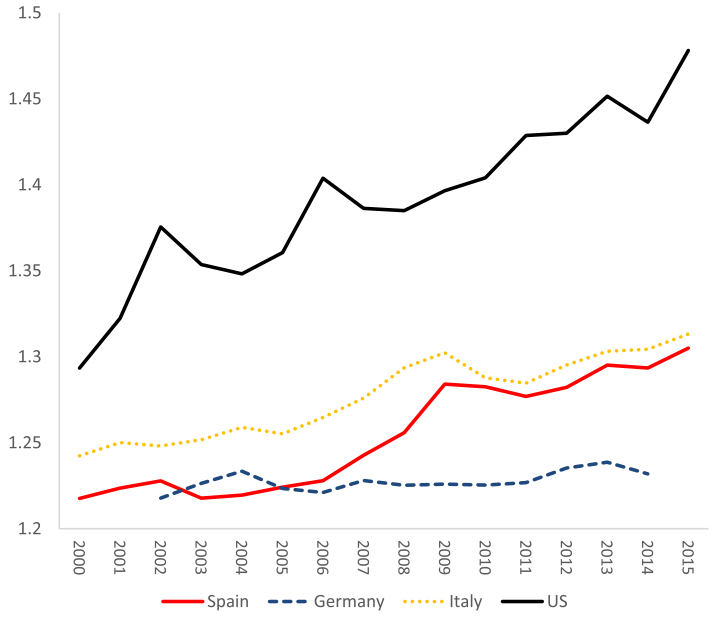
2.2 Fact 2: No evidence of increasing market concentration

Figure 3 reproduces findings from Kalemli-Ozcan et al. (2024), showing that average industry concentration in Europe remained stable during 2001–2007, with an apparent increase in 2007 attributable to a change in accounting standards.[3] Panel A reports

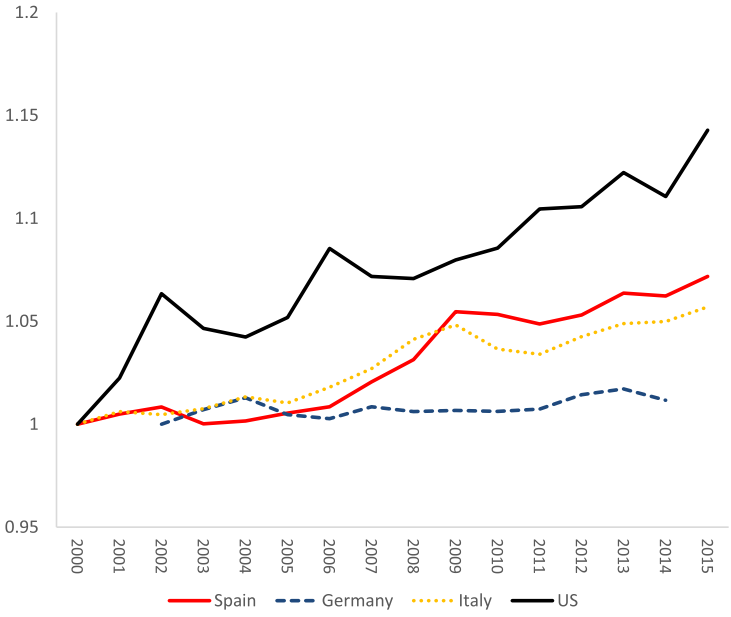
[1] While Akcigit and Ates (2021) document ten stylized facts regarding the decline in US business dynamism, in what follows I focus on seven key facts for the Spanish context. One of the omitted facts is the decline in productivity, which is already documented in Fig. 1. Another fact—the negative association between market concentration and labor share—is not central to our discussion, especially given the mixed evidence on market concentration in Spain. Finally, the fact that job reallocation and churn have slowed is not reported here because the necessary data are lacking.

[2] The measurement of markup trends has faced substantial methodological criticism. Key concerns include the treatment of "selling, general and administrative expenses" in variable input costs (Karabarbounis and Neiman (2018), Traina (2018)), the choice of variable inputs (Raval (2023)), and other measurement challenges. See De Ridder et al. (2022) for a comprehensive review of these debates.

[3] This shift resulted from the European Commission's adoption of International Financial Reporting Standards (IFRS), which introduced new rules for consolidated and unconsolidated account reporting to promote global accounting convergence.



(a) Markup Levels



(b) Markup Growth

Fig. 2 Markup evolution. *Note*: Figure 2a, b shows the level and evolution of markups relative to 2000. Markup estimation follows De Loecker et al. (2020) weighted by firm sales. *Source*: Díez et al. (2021)

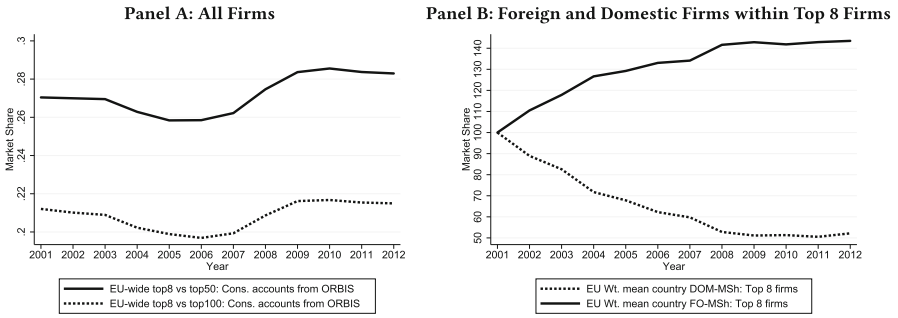


Fig. 3 Industry concentration in Europe. *Note*: The figure plots market concentration based on firm consolidated statements. Panel A pools all firms while Panel B distinguishes between foreign and domestic firms within top 8 firms. Foreign firm is determined based on official threshold of more than 10% foreign ownership in the initial year. Panel B shows the evolution relative to 2001. *Source*: Kalemli-Ozcan et al. (2024)

a standard measure of industry concentration, which is the market share of the top 8 (henceforth, MS8) firms in a given two-digit industry s2, country k, and year t relative to the population of top 50 and top 100 firms in the s2, k, t triplet. The top 8 firms are the largest eight firms based on operating revenue. The figure reports an "EU-wide" average measure based on consolidated accounts (see Kalemli-Ozcan et al. (2024) for further details).[4] Panel B decomposes European concentration trends between domestic and foreign firms, revealing patterns that parallel recent findings from US markets.[5] The analysis computes separate concentration ratios for each group while maintaining a common denominator of total industry sales, calculating the share of industry sales held by the top 8 foreign firms and, separately, by the top 8 domestic firms. Panel B shows the evolution relative to the baseline year in 2001. Kalemli-Ozcan et al. (2024) show that the modest increases in European concentration are primarily driven by foreign firms rather than domestic enterprises. This finding resonates with recent work by Amiti and Heise (2024), who demonstrate for the USA. that while domestic concentration in manufacturing has increased, overall market concentration remained stable once foreign firms' sales are included. These parallel findings suggest that accounting for foreign firms' market presence is crucial for understanding concentration dynamics in advanced economies.

2.3 Fact 3: The profit share is flat

Figure 4 illustrates the evolution of gross profit shares in Spain. Overall there is little variation however, we can distinguish three economic cycles. Prior to the 2008 financial crisis, profit shares showed little variation, consistent with broader European trends (Kalemli-Ozcan et al. (2024), Díez et al. (2021)). The post-2008 period saw a marked

[4] The average uses the market shares of the largest eight firms in the pool of EU countries in a given sector-year.

[5] Firms are classified as foreign-owned or domestically owned based on their 2001 ownership status, with their market shares tracked subsequently.

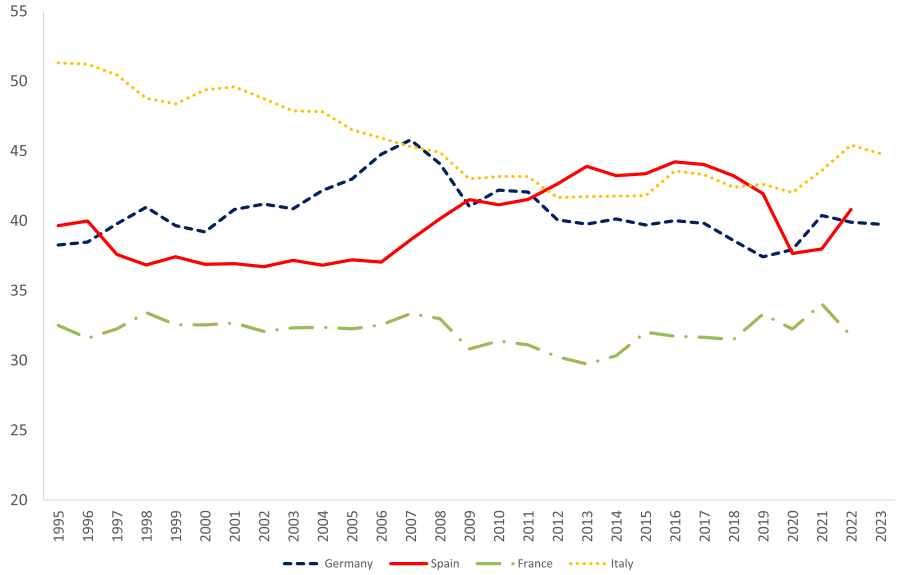


Fig. 4 Profit. *Note*: Figure 4 shows Gross profit share of non-financial corporations in GDP. *Source*: Eurostat

increase in profit shares, potentially reflecting survival bias as less profitable firms exited during the crisis (Foster et al. (2016)). This elevated level persisted until the Covid-19 crisis, when profit shares declined again, highlighting the distinct impact of different crises on business profitability.[6]

2.4 Fact 4: Spanish labor share decline mirrors global trend, but shows recent stagnation

Figure 5 documents the evolution of Spain's labor share, showing a pronounced decline from 2006 to 2012, before stabilizing around 0.56 from 2013 onward.[7] The coexistence of stable markups with declining labor share, while seemingly paradoxical, can be reconciled through several channels. Autor et al. (2020) argue that globalization and technological advances disproportionately benefit more productive firms. They document a positive relationship between firm productivity and labor intensity (measured by payroll-to-sales ratio), along with a positive association between industry-level productivity (measured by output per worker, patents per worker) and concentration (measured by sales share of top 20 firms). This suggests that the decline in aggregate labor share might reflect a reallocation of market share toward more productive, albeit less labor-intensive, firms rather than a uniform increase in markups. Complementing this view, De Ridder (2024) demonstrates how rising fixed costs—particularly from intangible investments—can drive wedges between markups and labor share.

[6] Akcigit and Ates (2021) report an increase in corporate profits of non-financial domestic US firms adjusted for inventory valuation and capital consumption.

[7] A similar stagnation of the labor share can be observed in the US after the 2008 financial crisis.

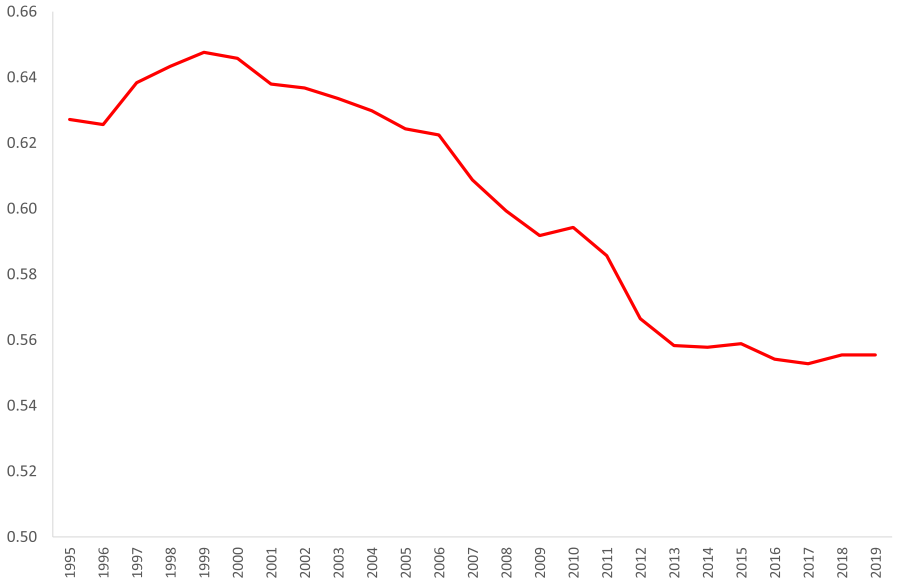


Fig. 5 Labor share. *Note*: Figure 5 shows the evolution of the labor share in Spain. Share of Labour Compensation in GDP at Current National Prices for Spain, Ratio, Annual, Not Seasonally Adjusted. *Source*: FRED St. Louis Fed. University of Groningen; University of California, Davis

Moreover, Oberfield and Grossman (2022) catalog multiple contributing factors: (1) capital-biased technological change, (2) globalization and China's impact, (3) market concentration, (4) reduced union power, and (5) demographic shifts. Importantly, they highlight that these mechanisms' combined explanatory power exceeds the observed decline, suggesting complex interactions that challenge clean identification of individual effects.

2.5 Fact 5: The labor productivity gap between Frontier and Laggard firms widened following the great financial crisis

Figure 6 examines the evolution of the average productivity gap between frontier and laggard firms in Spanish manufacturing sector. Frontier firms are defined as those in the top 5% of the labor productivity distribution within each industry-year,[8] with labor productivity measured both as real value-added per worker (Panel A) and real value-added per unit of labor cost (Panel B). Value-added is computed as the difference between operating revenue and expenditure on intermediate inputs. Both panels A and B plot the difference in the log of average productivity between year t and the baseline year 2002. While previous multi-country studies like Andrews et al. (2015) document a steady widening of the productivity gap since the early 2000s, the Spanish data reveal a distinct pattern: significant divergence emerges especially after the 2008

[8] Following Andrews et al. (2015), frontier firms are identified using a fixed number of firms over time—specifically, the top 5% of the median number of firms across years within each industry.

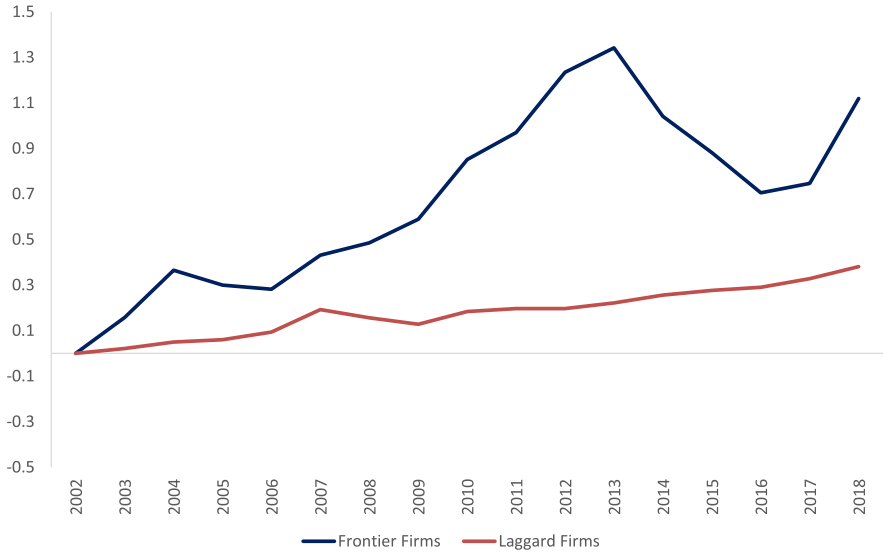
financial crisis. The widening productivity dispersion between frontier and laggard firms following the Great Financial Crisis (GFC) in Spain can be attributed to several interconnected mechanisms. First, the GFC led to a contraction in credit markets, which disproportionately affected laggard firms. Frontier firms, often larger and more financially resilient, typically had better access to credit due to stronger relationships with banks and greater perceived stability. In contrast, laggard firms faced more significant financing challenges, limiting their ability to invest in productivity-enhancing technologies, training, or innovation. Second, the crisis forced the exit of smaller firms, so that frontier firms could acquire or outcompete smaller, weaker competitors. This dynamic may have allowed frontier firms to expand their market share and realize productivity gains through economies of scale, further amplifying the TFP gap. Finally, it is interesting that the widening gap between frontier and laggard firms is more evident when using value-added over compensation. This measure is more likely to take into account differences in human capital and skills which suggests that frontier firms were better positioned to attract and retain top talent, even during the economic downturn. Access to skilled labor is a crucial component of productivity growth, especially in industries with high knowledge and technology intensity. Lagging firms might have been less able to offer competitive wages or job security, leading to talent drain and further productivity setbacks.

2.6 Fact 6: Firm entry rate and the economic share of young firms

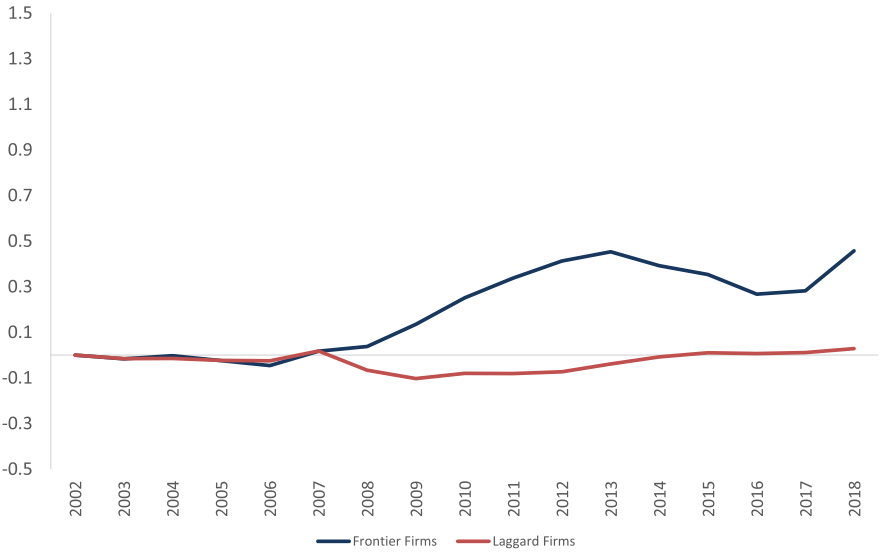
Figure 7 plots the birth rate of enterprises between 2008 and 2020 using official information from Eurostat.[9] The three groups considered, total economy, manufacturing and services, display similar patterns: following the global financial crisis the birth rate of enterprises increased until 2016 and has remained constant thereafter. Therefore, while entry rates might have decreased prior to the 2008 financial crisis, new firms have joined the economy since then.

Similarly, we can observe a change in the contribution of young firms to total employment over time. The declining contribution of young firms to total employment represents a significant structural shift in the business landscape. Figure 8 shows the employment share of firms younger than 5 years old has steadily decreased from 2001 until the sovereign debt crisis, with a modest reversal thereafter. This trend, documented by Decker et al. (2016b) in the US context, reflects broader concerns about market competition, innovation, and aggregate productivity growth. Several theoretical channels help explain this phenomenon: First, higher entry barriers and regulatory burden may discourage firm creation and early-stage growth. Second, increased market concentration and the rise of superstar firms create an environment where young firms face greater difficulties in achieving scale (Autor et al. (2020)). Third, financial constraints, particularly amplified during the Great Recession and subsequent sovereign debt crisis, disproportionately affect young firms that typically rely more heavily on external financing (see Siemer (2019), Bentolila et al. (2017) or Mehrotra and Sergeyev (2021)). These patterns have important implications for economic

[9] It is very challenging to find consistent information on firm entry rates going back in time due to changes in methodology.



(a) VA over Employment



(b) VA over Wagebill

Fig. 6 Labor productivity of Frontier and Laggard firms. *Note*: Figure 6 shows the average labor productivity evolution of frontier and laggard firms. Both panels A and B plot the difference in the log of average productivity between year t and the baseline year 2002. *Source*: Own calculation using SABI data and following Andrews et al. (2015)

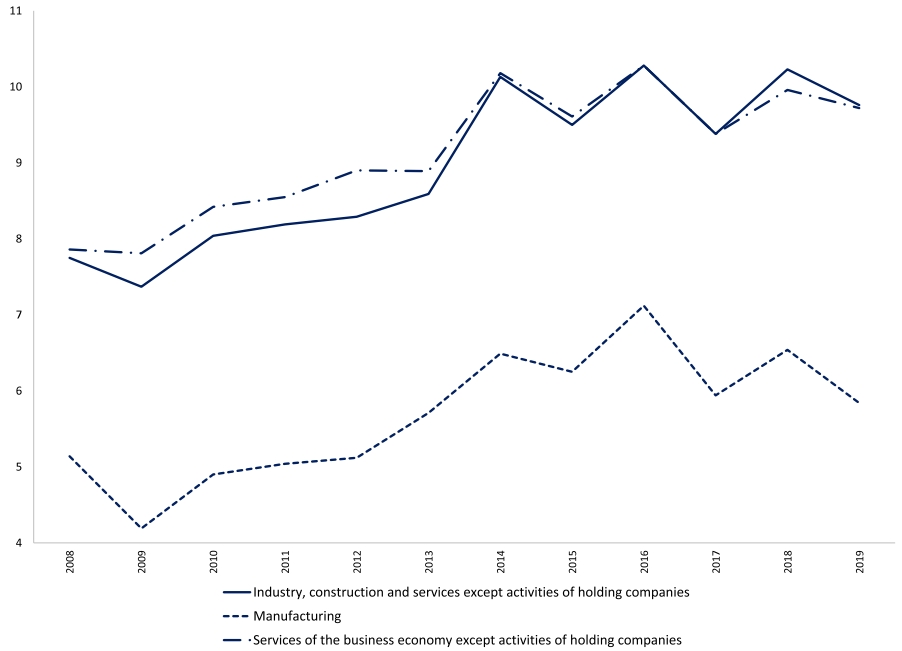


Fig. 7 Firm birth rates, Spain. *Note*: The enterprise birth rate of a given reference period is the number of births as a percentage of the population of active enterprises. An enterprise birth occurs when an enterprise (for example a company) starts from scratch and begins operations, amounting to the creation of a combination of production factors with the restriction that no other enterprises are involved in the event. An enterprise birth occurs when new production factors, in particular new jobs, are created. *Source*: Business demographics from Eurostat

dynamism, as young firms have historically served as key drivers of job creation and creative destruction (Haltiwanger et al. (2013)). Moreover, as highlighted by Akcigit and Ates (2021), this trend might reflect a slowdown in knowledge diffusion, where new firms struggle to adopt and improve upon existing technologies.

2.7 Fact 7: The dispersion of firm growth rates remained constant

I measure firm-level employment growth following the methodology of Decker et al. (2016b), who use the Davis–Haltiwanger growth rate definition:

$$\gamma_{it} = \frac{E_{it} - E_{it-1}}{Z_{it}} \tag{1}$$

where $Z_{it} = 0.5 \times (E_{it} + E_{it-1})$. This measure has several advantages over conventional growth rates: it accommodates firm entry and exit, is symmetric around zero, and is bounded between -2 and 2, making it less sensitive to outliers (Davis et al. (1996)).

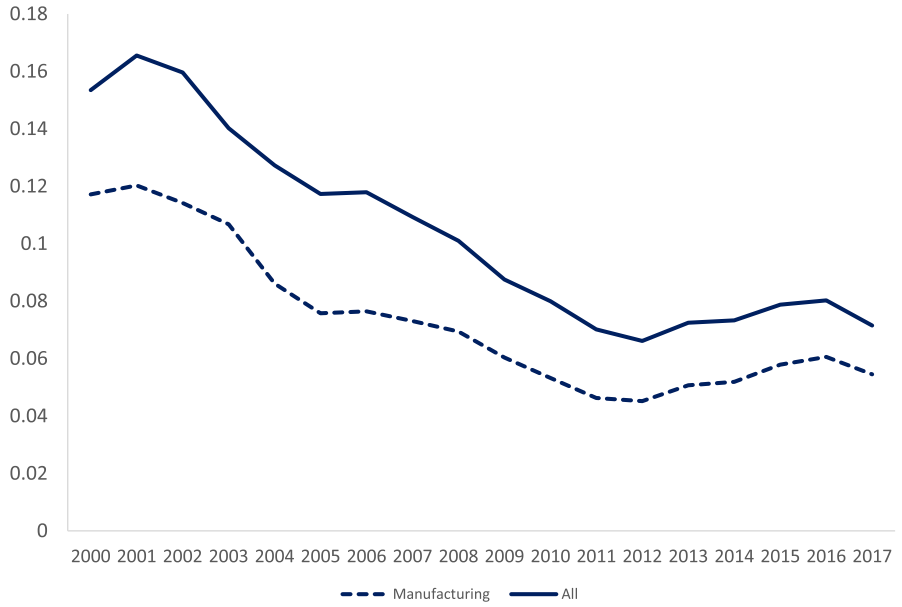


Fig. 8 Employment share of < 5- Year-Old Firms, Spain. *Note*: Figure plots, for each year, the employment share of young firms (defined as those with 5 or fewer years of age) in total employment. *Source*: Own calculation based on firm-level information from SABI

The cross-sectional standard deviation of these growth rates, shown in Fig. 9, provides a comprehensive measure of employment reallocation dynamics in the Spanish economy from 2001 to 2016. Our findings reveal a pattern that differs notably from those documented for other developed economies. While the USA has experienced a secular decline in employment growth dispersion since the 1980s (Decker et al., 2020), suggesting decreasing business dynamism, Spain maintained relatively stable dispersion levels except for a marked increase during the financial crisis. This spike in dispersion during the crisis period aligns with theories that suggest that recessions typically amplify differences in firm-level employment adjustments, particularly between young/small and large/mature firms.

2.8 Taking stock

In the US case, evidence suggests that superstar firms increasingly dominate the market, driving productivity differences between the top and bottom firms. This dominance is reflected in lower business dynamism, seen through lower firm entry rates and reduced growth dispersion. Based on these observations, Akcigit and Ates (2021) argue that a potential mechanism for the productivity slowdown in the US is that top firms have greater incentives to innovate due to larger profits, while bottom firms lag behind due to a slowdown in technology diffusion.

However, this explanation does not fully apply to the Spanish case. If we focus on the post-2008 period, markups and profit rates have remained constant in Spain.

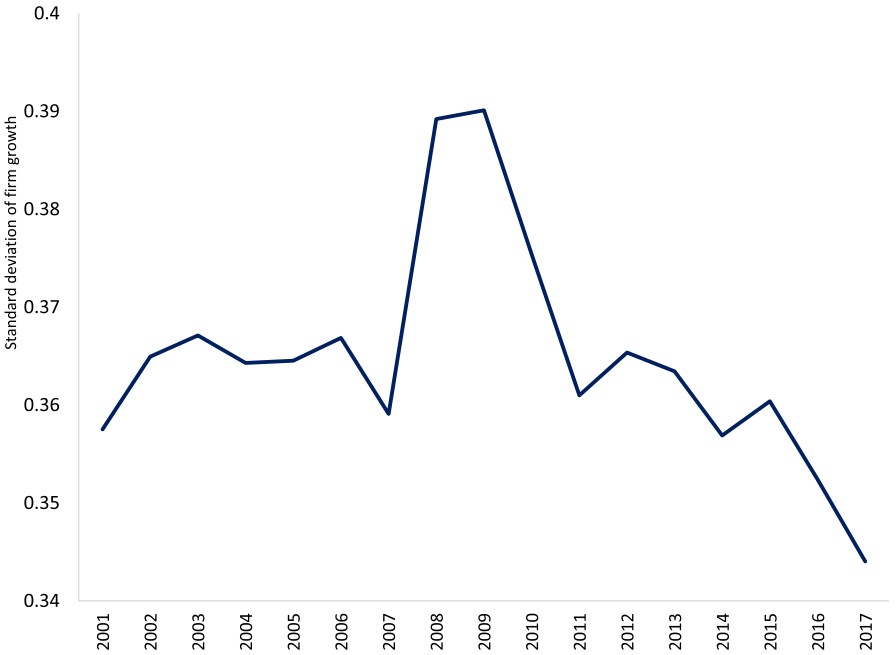


Fig. 9 Growth rate dispersion. *Note*: The figure indicates the evolution of the standard deviation of firm employment growth rates constructed as in Decker et al. (2016a). The figure refers to all sectors in the economy. *Source*: Own calculation based on firm-level information from SABI

Meanwhile, entry rates have increased, and the productivity growth of top firms has risen while the bottom firms' productivity has stagnated. This suggests that the dynamics affecting productivity in Spain differ from those in the USA, potentially requiring alternative or additional explanations beyond the slowdown in technology diffusion. In a recent paper, Caggese et al. (2024) we document a widespread increase in productivity dispersion (polarization), particularly pronounced in the services sector and, to a lesser extent, in manufacturing industries, aligning with patterns observed in other developed economies during this period. Notably, we find preliminary evidence that this rising polarization exhibits distinct characteristics from traditional narratives about market concentration: industries with larger increases in polarization did not experience corresponding increases in top-firm persistence or declines in firm entry, challenging common assumptions about market dynamics. Perhaps most striking is our decomposition of polarization trends, which reveals that productivity improvements among laggard firms, rather than further advances by industry leaders, drove the increased dispersion. This is particularly evident in the services sector, where the rise in polarization primarily stemmed from within-industry dynamics characterized by lower-productivity firms leapfrogging incumbent leaders, rather than from top firms pulling further ahead. Specifically, firms moving from the bottom to the top of the productivity distribution tended to replace incumbent firms that exhibited lower sales-weighted productivity, suggesting a more dynamic and competitive environment than previously understood.

The evidence on declining business dynamism paints a complex picture, suggesting that while factors such as rising market concentration, higher entry barriers, and slower knowledge diffusion are influential, they do not fully capture the mechanisms driving the overall slowdown. To gain a more comprehensive understanding, it is essential to examine the evolution of firms over their life cycles. In particular, studying firm cycle dynamics—how firms grow, mature, and sometimes contract—provides critical insights into the specific obstacles that hinder firm growth and innovation. The next section delves into these dynamics, exploring how changes in firm size and age interact with regulatory, financial, and technological barriers to shape overall productivity trends.

3 The life cycle of firms

It is well established that new firms typically start small and grow as they age. Some researchers argue that this growth is largely driven by increasing demand for the firm's products over time, highlighting the importance of developing a solid customer base (see Foster et al. (2016) and Gourio and Rudanko (2014)). Others suggest that growth is more broadly due to the accumulation of establishment-specific intangible capital throughout the firm's life cycle, such as plant-specific organizational capital or technological advancements. According to this perspective, firms expand as they invest in new technologies, explore new markets, and produce a diverse range of higher-quality products (Atkeson and Kehoe (2005)).

In the study by Hsieh and Klenow (2014), the role of establishment-specific intangible capital accumulation over the life cycle is analyzed to understand differences in aggregate manufacturing total factor productivity (TFP) between the USA, India, and Mexico. They find that 40-year-old plants in the US manufacturing sector are more than seven times larger than 5-year-old plants. In contrast, in India and Mexico, this size increase is much lower, with older plants being only up to two times larger than younger ones. Why might it be more challenging for firms in India or Mexico to invest in organizational capital? Several factors could contribute to this difficulty: higher taxes or higher labor costs; difficulties in hiring skilled managers; higher financial constraints and greater difficulties in accessing foreign or distant markets, to name a few.

In the Spanish economy, a distinctive feature is the predominance of micro firms and their outsized contribution to aggregate employment. Figure 10 compares the employment contribution by firm size between Spain and Germany for 2022, revealing stark structural differences between these two major European economies. While Spain exhibits a significantly higher concentration of micro establishments, which contribute approximately 80% more to total employment than their German counterparts, Spanish firms in other size categories (small, medium, and large) show approximately 20% lower employment contributions compared to similar-sized German firms. Most of the discussion thus far about this evidence has focused on comparing the cross-sectional distributions. However, less is known about the life cycle dynamics of Spanish firms, the potential barriers to firm growth and the implications for aggregate productivity.

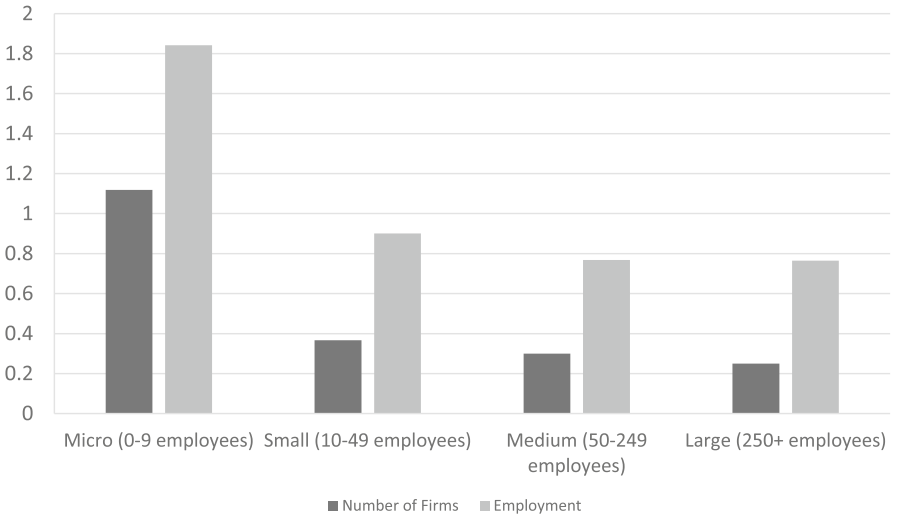


Fig. 10 Firm size contribution to employment (Spain relative to Germany) 2022. *Note*: The figure refers to all sectors in the economy. Plots the employment contribution by each firm size category in Spain relative to that of the same size category in Germany. *Source*: Structural business statistics from Eurostat

Following Hsieh and Klenow (2014) we compute for each 4 digit industry the median employment by firm age group; we then normalize group values based on average employment of firms younger than 5 years old and finally; compute the average in the economy using industry value-added shares. Figure 11 replicates the findings in Hsieh and Klenow (2014) for USA, Mexico and India on the life cycle of plants and adds similar information for Spain computed based on firm-level information from SABI. The red solid line reports information based on the 2005 cross section while the red dashed line reports information based on the 2016 cross section. There are three main observations. First, in 2005, a 40-year-old firm in Spain was, on average, nearly ten times larger than a 5-year-old firm. However, by 2016, the median employment of older firms relative to younger firms had decreased, with older firms being about seven times larger. Second, In the USA, the life-cycle profile of firms is concave, indicating diminishing returns on size premia as firms age. In contrast, Spain's life-cycle profile is convex, showing very small employment premia for younger firms but exponential growth in size premia for older firms. Finally, by 2016, the employment profile of Spanish firms less than 25 years old more closely resembled those in Mexico and India rather than the USA, indicating different growth dynamics.

Is it that over time older firms have reduced their median employment or rather younger firms have increased their median employment? Or a combination of both? Figure 12 shows the evolution of the mean and median employment for each age category. While the median number of employees for young firms (less than five years of age) remained constant at four employees prior to the 2008 crisis and dropped to three employees thereafter, the age categories of more than 25 employees experienced a sustained decrease in the median number of employees that especially accelerated after the 2008 financial crisis. Figure 13 considers differences in firm size across

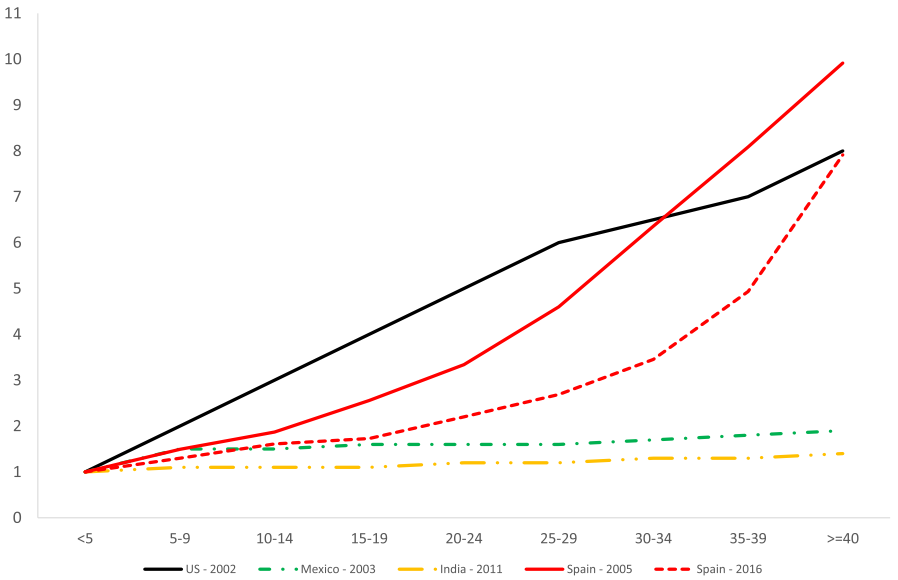
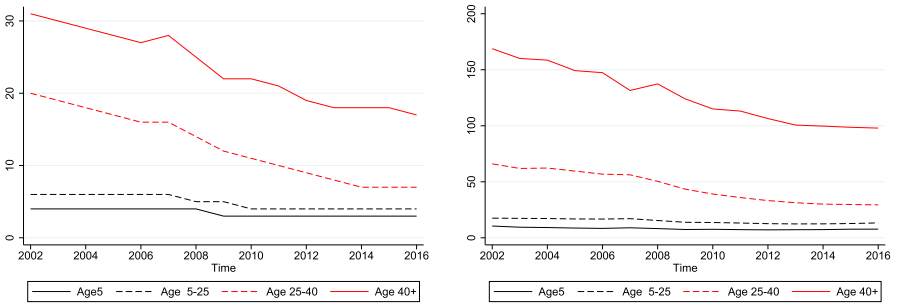


Fig. 11 Employment by age. *Note*: The figure follows Hsieh and Klenow (2014) and computes for each 4-digit industry the median employment by firm age group; then normalize group values based on average employment of firms younger than 5 years old and finally; compute the average in the economy using industry value-added shares. The figure refers to all sectors in the economy. *Source*: Data for Spain based on own calculation using firm-level information from SABI. Data for USA, Mexico and India are reproduced from Hsieh and Klenow (2014)

sectors. In particular, Fig. 13a computes the yearly average of the median firm size by four-digit industry and age category using sectoral value added as weights. The figure plots the log difference relative to year 2002 and shows a clear sustained decline for all age categories except very young firms that experienced a trend reversal after the 2012 sovereign debt crisis. A similar pattern emerges in Fig. 13b that focuses on output. What is striking from these two figures is the poor performance of firms between 25 and 40 years of age.[10] Finally, Fig. 14 shows the clear decline in labor productivity (value added over wage bill) in this group of firms and the relatively better performance of young firms since the crisis.

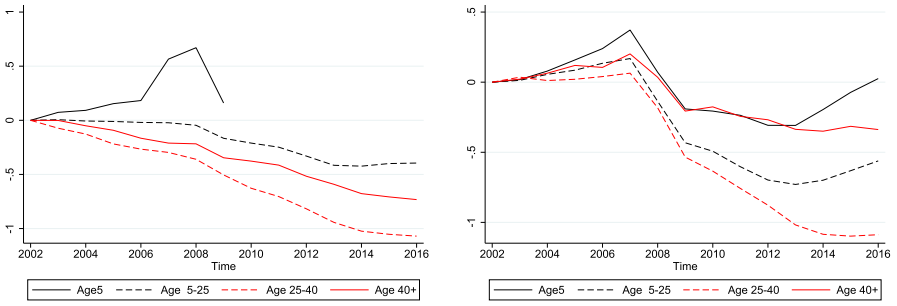
A firm's capacity to innovate, export, and drive productivity growth critically depends on the accumulation of intangible capital throughout its life cycle. This process of building organizational knowledge, developing client networks, and investing in proprietary technologies is particularly important for middle-aged firms, which typically serve as engines of growth in advanced economies. However, in Spain, these firms were disproportionately affected by the economic crisis and have shown limited signs of recovery. The weak performance of middle-aged firms represents a significant structural challenge for the Spanish economy, as they traditionally bridge the gap between young, dynamic enterprises and established market leaders. Understanding the specific obstacles hampering their recovery—whether financial constraints, regu-

[10] One concern could be sample attrition or better coverage of companies over in SABI. Figure A.1 shows similar results when a balanced sample of firms is used.



(a) Median **(b) Mean**

Fig. 12 Mean and median employment by age category. *Note*: Unweighted median and mean across all sectors by age category. *Source*: Own calculation using firm-level information from SABI data



(a) Employment **(b) Revenue**

Fig. 13 Evolution of the average median employment and revenue by age category. *Note*: Computed as median by four-digit industry–age category and year and then aggregated as a weighted average by year with industry value added as sector weights. *Source*: Own calculation using firm-level information from SABI data

latory barriers, or market frictions—is therefore crucial for developing policies that support their recovery and promote sustainable economic growth.

In exploring potential causes of this pattern, one might hypothesize that middle-aged firms were inherently less efficient before the crisis, which should have triggered a market-driven reallocation of resources toward more productive younger firms. However, the empirical evidence presents a different story. Figure 15 reveals a declining employment share of younger firms (those under fifteen years old), coupled with a marked increase in the employment weight of older firms (those exceeding twenty years). This shift is particularly worrisome as these older firms are simultaneously experiencing declining productivity which might drive aggregate productivity down.

Another potential explanation could be that middle-aged firms have undergone a process of capital deepening, substituting labor with capital to increase efficiency. However, the evidence shown in Fig. 16 challenges this hypothesis. While there was a modest increase in the capital-to-wage bill ratio for these firms following 2012, this uptick was neither substantial nor sustained throughout the period under analysis.

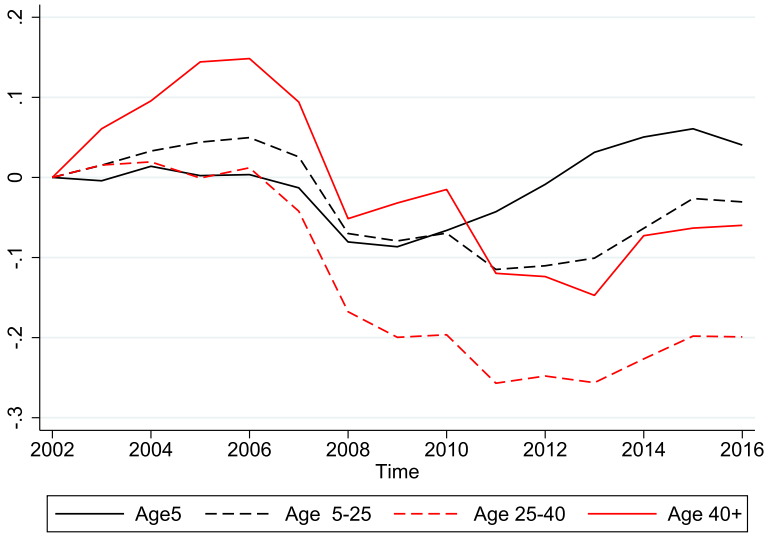


Fig. 14 Evolution of the average median labor productivity by age category. *Note*: Computed as median by four-digit industry–age category and year and then aggregated as a weighted average by year with industry value added as sector weights. *Source*: Own calculation using firm-level information from SABI data

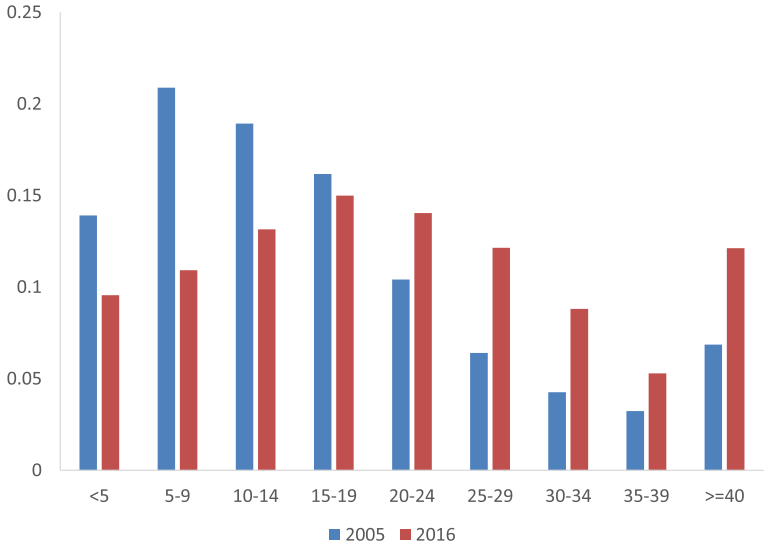


Fig. 15 Employment share by age in the cross section. *Note*: The figure shows the employment share of each age category relative to total employment for two periods, 2005 and 2016. The figure refers to all sectors in the economy. *Source*: Own calculation based on firm-level information from SABI

Fig. 16 Evolution of the average median capital to labor ratio by age category. *Note*: Computed as median by four-digit industry–age category and year and then aggregated as a weighted average by year with industry value added as sector weights. *Source*: Own calculation using firm-level information from SABI data

The limited and inconsistent nature of capital deepening suggests that technological transformation or automation cannot fully account for the observed patterns in middle-aged firm dynamics.

A third explanation focuses on the innovation capacity and technology adoption of Spanish firms. The evidence suggests significant weaknesses on both fronts. Figure 17 reveals that patent application growth has experienced a marked slowdown since the 2008 financial crisis, pointing to declining innovation dynamics. This pattern is particularly concerning as it coincides with a period of accelerating technological change globally, suggesting Spanish firms, especially middle-aged ones, might be falling behind in the adoption of new technologies and digital transformation. The slow pace of innovation is consistent with broader structural challenges in the Spanish innovation system, including relatively low R&D investment rates, limited collaboration between industry and research institutions, and constraints in human capital development. Additionally, companies frequently cite a shortage of skilled workers as a significant impediment to firm growth and technology adoption. This lack of education and skills in the workforce may hinder these firms' ability to innovate and expand.

The evidence on human capital accumulation in Spain reveals several structural challenges. First, despite significant improvements in educational attainment over the past decades, in Spain there is still a high concentration of workers with either very low (without upper secondary education) or very high qualifications (university degrees). Instead, the intermediate skill level, particularly vocational training, remains underdeveloped compared to other European countries. In addition, Cabrales et al. (2014) show that Spanish firms invest less on on-the-job training for temporary workers and

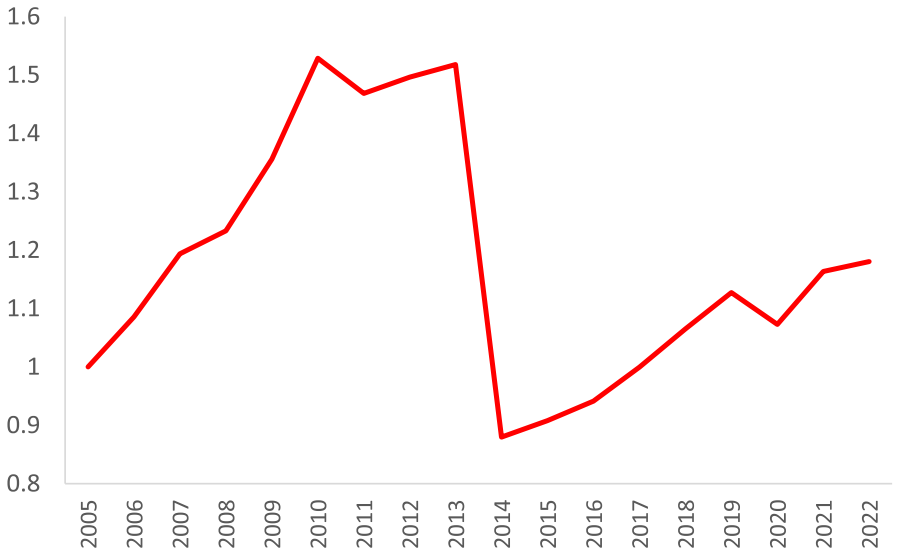


Fig. 17 The role of intangibles: patent application growth. *Note*: Figure shows the growth rate in patent applications in Spain relative to 2005. Patent applications to European Patent Office (EPO). *Source*: Statista

the drag that the skill mismatch composition represents for aggregate productivity is often discussed. When workers are mismatched with jobs—either overqualified or underqualified—the economy fails to maximize returns from its human capital investments. Over-qualified workers in jobs below their skill level may experience skill depreciation and reduced motivation, leading to lower productivity than their potential would suggest. Conversely, underqualified workers might struggle to perform their tasks efficiently, requiring more resources for training and supervision, and potentially producing lower quality outputs. This mismatch also creates negative spillovers: firms might underinvest in technology adoption when they cannot find workers with appropriate skills, while workers might underinvest in skill acquisition when they observe others failing to secure jobs matching their qualifications. Guner et al. (2018) show that in high-income countries, the mean earnings of managers tend to grow faster than those of non-managers, and this relative earnings growth corresponds closely to output per worker. Their findings imply that stronger incentives to invest in managerial skills—evident in countries like the USA—can lead to higher productivity. Similarly, McGowan and Andrews (2015) estimate that reducing skill mismatch to best-practice levels could boost Spain's labor productivity by up to 10%.

Finally, institutional barriers and size-dependent policies likely play a crucial role in explaining these patterns. Several mechanisms may be at work. First, mature firms might have faced greater difficulties in rolling over debt following the financial crisis. This financing constraint could have forced otherwise viable firms to initiate costly restructuring processes, leading to inefficient downsizing. Second, the labor market reform implemented in the aftermath of the 2008 financial crisis might have had heterogeneous effects across firm age groups. While the reform aimed to increase labor

market flexibility, mature firms, which typically have a higher proportion of permanent workers and greater union presence, might have faced higher adjustment costs. Third, Spain's size-dependent regulations, including tax and administrative requirements that become more stringent as firms grow, may create "regulatory cliffs" that discourage firms from expanding beyond certain thresholds. Garicano et al. (2016) document similar effects in France, where firms bunch below size thresholds to avoid additional regulatory burdens. These institutional factors, combined with the previously discussed technological and human capital challenges, suggest that the struggles of mature firms reflect both cyclical shocks and deeper structural impediments in the Spanish business environment.

4 Conclusion

This paper examines the persistent productivity slowdown in Spain, a phenomenon that has become particularly pronounced since the 2000s. While earlier research established that factor misallocation played a significant role in this decline, our understanding of Spanish productivity dynamics and challenges in the aftermath of the 2008 financial crisis remains incomplete. The productivity slowdown is not unique to Spain but rather a widespread phenomenon across advanced economies, including the USA, where it has attracted substantial academic and policy attention. Scholars have proposed various explanations for this trend: the depletion of readily available innovation opportunities, inefficient resource allocation across firms, declining business dynamism, and increasing market concentration through the emergence of superstar firms. This analysis contributes to this literature by providing new evidence on the Spanish experience, where these general patterns interact with country-specific institutional features and structural challenges.

Unlike the USA, where declining business dynamism and increasing market concentration are well documented, Spain exhibits distinct patterns in recent years. Most notably, we observe rising entry rates without clear evidence of market power consolidation among incumbent firms. This departure from US trends suggests that the Spanish productivity puzzle cannot be fully explained by standard narratives of slow technology diffusion or the rise of superstar firms. The divergence highlights the importance of examining country-specific factors and institutional features that might shape firm dynamics differently across economies, even when facing similar technological challenges.

Analysis of Spanish firms' life cycles reveals two distinct patterns: mature firms have experienced both size reduction and lower-productivity growth over time. This simultaneous decline in scale and efficiency of established firms deviates from standard firm dynamics models, where firms expand and increase productivity as they accumulate knowledge and capital. The observed pattern among mature firms appears to be a significant factor in Spain's aggregate productivity evolution, indicating that analyses focused exclusively on entry barriers or young firm dynamics may omit important mechanisms. These findings point to the relevance of identifying specific obstacles—regulatory, financial, skills or technological—that affect mature firms' growth trajectories. Future research should quantify how these barriers influence

firm-level decisions and aggregate productivity, with emphasis on policy-relevant parameters that could affect established firms' growth paths.

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