EUROPEAN BUSINESS DYNAMISM, FIRM RESPONSIVENESS, AND THE ROLE OF MARKET POWER AND TECHNOLOGY[§]

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ABSTRACT

We study the changing patterns of business dynamism in Europe using representative and comparable micro-aggregated data from 19 European countries. We document a widespread reduction in job reallocation rates in Europe, accompanied by a decline in the number and the share of activity of young firms. This decline concerns all economic sectors and appears to be driven mainly by within-sector dynamics, rather than cross-sectoral reallocations. We rationalize these new findings, which are consistent with existing evidence in the US (Decker, Haltiwanger, Jarmin and Miranda, 2020), with a firm-level framework relating market power and technology to firms' labor adjustments.

***Keywords**: Business Dynamism, Productivity, Responsiveness of labor demand, European Cross-Country Data*

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1 Introduction

One of the most debated secular trends in the past decades is the decline in US business dynamism that has been documented with a variety of measures and data sources (e.g. Decker, Haltiwanger, Jarmin and Miranda, 2014; Decker et al., 2016; Akcigit and Ates, 2021; Dent et al. (2016), Guzman & Stern (2020), De Loecker et al. (2021)). The decline in US business dynamism has been interpreted as a sign of a decreasing pace of Schumpeterian creative destruction with far-reaching implications for innovation (Haltiwanger et al. 2013; Acemoglu et al., 2018), productivity growth (Haltiwanger et al. 2017; Decker et al. 2020; Alon et al., 2018), and the pace of economic recoveries (Pugsley & Sahin, 2014). The slowdown in business dynamism and reallocation dynamics has been tied to a declining responsiveness of firms to productivity shocks exerting a significant drag on aggregate productivity growth (Decker et al., 2020) and a rise in firm market power (De Loecker et al., 2021).

While the decline in business dynamism is well established for the US and the recent literature began to unravel the drivers of business dynamism in the US, we still face a dramatic lack of evidence for European economies. This is mainly because comparable and representative data on indicators of business dynamism across multiple European countries are not readily available to researchers.[1] On one hand, each country hosts its own National Statistical Institute which collects and stores representative firm-level data. Combining administrative firm-level country datasets is legally prohibited and accessing any of these datasets is tied to significant administrative costs. On the other, the existing publicly available European firm-

[1] One notable exception is the work coming out of the OECD's DynEmp project (Criscuolo et al. 2017; Calvino et al., 2015). These studies make use of micro-aggregated cross-country data contributed by a network of researchers. The micro-aggregated OECD data is accessible at the OECD.

level databases (e.g. ORBIS) do not represent a viable source, given their low cross-country comparability (Bajgar et al., 2020).

The lack of evidence on business dynamism for European economies is critical in the context of the recent productivity slowdown in Europe and the ongoing challenges posed by slow job growth and lackluster innovation. Causes for the decline and the role played by rising market power (De Loecker, Eeckhout, and Mongey, 2021), declines in knowledge diffusion (Akcigit & Ates, 2021; Andrews, Criscuolo, and Gal, 2015), rise in capital intangible (De Ridder, 2019) or more broadly rising adjustment costs (Decker et al., 2020) continue to be debated.

In this study, we collect a unique micro-aggregated dataset to study business dynamism across 19 European countries. We gathered data by distributing harmonized data collection protocols (i.e. program codes) across multiple administrative and highly representative firm-level databases located within National Statistical Institutes and Central Banks. These data collection protocols generated a series of relevant statistics for business dynamism and related factors at the industry-country level that are comparable across countries and which we can use to study business dynamism in Europe. Our data covers the time span from 1999 to 2018, although with some differences for a few countries. Given its administrative nature, our data is representative of the firm population in each country. We publish the data as part of the 8th vintage of the CompNet database. In a related project, the previous data vintage has been also used to study firm concentration in Europe (Bighelli et al., 2021).

We use this data to document how job reallocation rates and young firm activity have changed in recent years in Europe, finding a widespread and strong decline in business dynamism metrics across almost all countries under analysis.

We observe a structural aging of European firms: firms are getting older and growth rates of young firms have slowed down. As young firms are typically more dynamic, these composition effects lead to an overall decline in dynamism. The decline in European business dynamism is common to all economic sectors and is mainly driven by within-sector dynamics rather than cross-sectoral reallocations. All these findings are consistent with existing US evidence (Decker et al., 2020).

Having established these patterns for Europe, we focus on job reallocation rates and derive a simple framework that extends work by Decker et al. (2020) and shows how job reallocation rates are affected by market power and production technology. As business dynamism is ultimately determined by individual firm actions, we plan to employ firm-level data for the German manufacturing sector in future extensions of this study, to which we have direct access. We will use this data to test our hypothesis for the importance of market power and technology in shaping business dynamism in the German manufacturing sector to learn about the general mechanisms that drive business dynamism. This is our second contribution.

The remainder is structured as follows: Section 2 reviews the literature. Section 3 discusses the data. Section 4 presents stylized facts on European business dynamism. Section 5 studies mechanisms behind declining business dynamism. Section 6 concludes.

2 Literature review

Interest in business dynamics is not new going back at least to Schumpeter's notion of the dynamic "creative destruction" process. Since then economists have understood, in broad strokes, the way in which new and superior ideas, processes, and goods replace obsolete ones in modern market economies, and new and more productive firms are born or expand while less productive ones fail. However, the last few years have seen a renewed interest and empirical applications as a result of advances in economic measurement and specifically the development of new firm and establishment level administrative datasets in the United States (Jarmin and Miranda, 2002; Pivetz, Searson and Spletzer, 2001; Abowd, Stephens, Vilhuber, Andersson, McKinney, Roemer, and Woodcock, 2009; Guzman and Stern, 2017).

One of the most striking and now well-established patterns to have emerged from these new datasets is the secular decline in business dynamism. Decker et al. (2014) document trend declines in the rate of business startups and the pace of employment dynamism in the US economy over recent decades and a trend acceleration after 2000. A key to this decline is the decreasing role of dynamic young businesses in the economy accounting for 26% of the decline in job reallocation.[2]

The decline in the startup rate and young firm activity in the U.S. is concerning since this population disproportionally contributes to jobs and productivity growth (Haltiwanger, Jamin, Kulick and Miranda, 2017). Evidence from the US population of employer businesses indicates that 12% of them are high growth --defined as those that exhibit growth rates in excess of 25%. They account for 50% of gross output amongst continuing firms. In terms of employment, 17% of businesses are

[2] Declines have been documented across a broad range of datasets and both at the establishment and firm level. Citation here.

high growth and they account for 60% of gross job creation. Young firms are more likely to be high growth and startups alone contribute disproportionately to output and employment growth accounting for an additional 25 percent of gross job creation and a 15 percent of output creation.

Declines in dynamism are broad-based and not limited to startup activity. They are pervasive across all types of firms regardless of age and size, and across industries, and geographies. Compositional shifts account for about 15% of the overall decline in business dynamism (Decker et al., 2016).[3]

Patterns of business dynamism are however sector-specific and the high-tech sector is of particular interest given the role young firms play in the innovation process - conditional on being innovative young firms are more R&D intensive than large mature firms (Acemoglu, Akcigit, Alp, Bloom, Kerr, 2018). In this regard, Haltiwanger, Hathaway, and Miranda (2014) document the declines in business dynamism that occurred broadly across the U.S. economy also occurred in the high-tech sector in the post-2000 period.[4] Of concern is the fact that the high-tech sector which used to exhibit a relatively large amount of startup and high-growth activity now exhibits patterns similar to those of less innovative sectors. Not only has the pace of startup activity declined since 2000, businesses that do enter are less likely to be high-growth firms (Decker et al., 2016). The decline in business dynamism in the high tech sector can be interpreted through the lens of the theory of diffusion of product innovations (Gort & Kepler, 1982). In these models periods of rapid innovation are characterized by a growth in startup activity, and significant experimentation which is followed by growth in productivity dispersion, as well as

[3] Industry effects work against and compensate for the decline in dynamism due to age composition effects.

[4] Prior to 2000 the U.S. high-tech sector bucked the overall trend and experienced a significant growth in dynamism driven in part by a surge of startups and reallocation activity.

productivity growth after a shakeout period. Evidence from the US indicates innovation dynamics have changed in the high-tech sector post-2000 with less entry, less within-firm productivity growth and less reallocation (Foster et al. , 2021). The decline in dynamism and productivity growth in the U.S. has been interpreted as a return to a less innovative period as a result of the maturity of the IT revolution (Gordon, 2016, 2021; Byrne, Oliner and Sichel, 2013).

Whether these patterns will be reversed in the future is the subject of continued research. Evidence from state business registers suggests quality-adjusted measures of entrepreneurial startup activity follow a cyclical pattern sensitive to economic and capital market conditions and may have experienced a reversal in the last few years (Guzman and Stern, 2017, 20120. Interestingly this research indicates that the probability of a successful exit for these high-quality startups has declined in the U.S.. In any case and by all appearances, innovative activity in the U.S. remains strong and the decline in productivity growth from technological innovations might be due to temporary lags in their observed productivity impact (Brynjolfsson and McCaffee, 2014; McCaffee and Brynjolfsson, 2017; Mokyr, 2014).

The decline in business dynamism is unlikely to have a single cause given industry-specific patterns on the one hand and common economy-wide patterns on the other.[5] Drawing insights from canonical models of business dynamics Decker et al. (2020) explore the role adjustment costs play in the decline in business dynamism and the impact on the aggregate productivity decline. In these models reallocation arises as a business response to their individual productivity and

[5] Citations from the Retail Sector.

profitability realizations. A decline in business dynamism will result from either a decline in innovations or a decline in responsiveness from an increase in adjustment costs. These authors find productivity dispersion has actually increased during this period in the U.S. whereas business employment responsiveness to productivity innovations has declined. They show distinct patterns for the high-tech sector consistent with patterns of growth and decline in aggregate productivity. They find the decline in responsiveness is responsible for a considerable drag on productivity growth of about -2.3 log points.

The decoupling of productivity dispersion and business dynamism can alternatively be interpreted as a decline in knowledge diffusion between frontier and laggard firms (Andrews, Criscuolo, and Gal, 2015; Akcigit & Ates, 2019, 2021). The decline in knowledge diffusion (e.g. due to more intense use of intellectual property protection or firm-specific customer data) implies higher concentration as market leaders are shielded from competition, higher markups, higher productivity dispersion, and less reallocation. Another mechanism possibly at play is the increase in market power in product markets over this period (De Loecker et al., 2021). These authors emphasize the effects of technological change and changing market structure as the primary drivers for the increase in market power which in turn drive the decline in reallocation. Finally, an increase in the use of intangible inputs in production (such as information technology) can also drive the decline in business dynamism through its effects on production and competition (De Ridder, 2019). In this framework intangibles reduce marginal costs and raise fixed costs, which gives firms with low adoption costs a competitive advantage and deters competitors from entering the market.

While much of the research focus has been on the U.S., an economy for which we have had detailed microdata for a few years now, there is a growing literature on business dynamics across several developed countries. Bravo-Biosca, Criscuolo and Menon (2013) find that the large contribution of young firms and high-growth firms to job creation that has been documented in the U.S. also hold in many European and other developed countries. Using a similar cross-country sample, Criscuolo, Gal and Menon (2014) find that young firm activity fell between 2001 and 2011 in most countries, though the Great Recession makes inference of secular trends difficult. More recently Calvino et al. (2020) analyse the trends in business dynamism across 18 OECD countries and 22 industries over the last two decades. They show pervasive declines in most industries. They find these declines are more strongly associated with factors related to market structure such as market concentration and productivity dispersion.

Our paper expands on this literature in two ways. First, we document patterns of business dynamism in European economies using a new aggregated micro dataset. Second, we explore the impacts on productivity growth from the decline in business dynamism in the European context and the role played by market power and adjustment costs using a simple integrated model of labor demand.

3 The CompNet data

The basis of our analysis is the 8th vintage of the Competitiveness Research Network dataset (henceforth, CompNet). CompNet contains micro-aggregated firm-level-based information at the industry-country level for 19 European countries. We collected the data ourselves by running harmonized data collection protocols across administrative *firm-level* databases that are *representative* of the population of firms and which are located within national statistical institutes and national banks across European countries. The data collection protocols calculate various firm and market performance measures aggregated at the industry, sector, regional, and country level. Most notably, this contains information on firm productivity, aggregate job reallocation rates, the number of young firms by size classes and other relevant statistics for studying business dynamism. We weigh all these statistics using population weights from Eurostat to recover population statistics when we only observe a sample of firms in the underlying firm data. Importantly, although CompNet is a micro-aggregated database, it contains rich information on the distribution of various statistics (i.e. various percentiles and standard deviations of variables). In total, the database contains over 400 variables.[6]

The data covers the years 1999-2019 and the NACE rev. 2 industries 10-33 (manufacturing), 41-43 (construction), 45-47 (wholesale/retail trade and repair of motor vehicles and motorcycles), 49-53 (transportation/storage), 55-56 (accommodation/food services), 58-63 (ICT), 68 (real estate), 68-75 (professional/scientific/technical activities), and 77-82 (administrative/support service activities). Time and industry coverage differ between countries and years, with complete coverage for all countries and sectors (with exception of Real Estate

[6] For details on the variables, we refer to CompNet's User Guide (CompNet 2021).

for some countries) from 2009 to 2015.[7] For our analysis, we drop the Real Estate sector as it is not consistently reported for all countries and we aim for a comparable set of countries and sectors. Moreover, we exclude the sectors i) wholesale/retail trade and repair of motor vehicles and motorcycles and ii) accommodation/food services for Germany due to several unexplainable jumps in the underlying firm data.

As CompNet is not a firm-level database but only contains aggregate statistics, we can circumvent legal issues that prevent combining administrative firm-level databases across national statistical institutes and national banks in Europe. To ensure representativeness and comparability of the data, variables are weighted by firm population weights and, in the case of monetary variables, deflated by PPP-adjusted deflators.[8] The dataset comes in two versions. One contains firms with at least 20 employees (20e sample), the other features firms with at least one employee. We focus most of our analysis on the 20e sample as this is available for all countries. In an accompanying study, the 7th vintage of our data has been recently used to study firm concentration in Europe (Bighelli et al., 2021).[9] We refer to CompNet's User Guide for an in-depth discussion. Table 1 provides an overview of the sample of countries, sectors and years we cover. As can be seen, our data includes the largest European economies and, with the exception of few countries, provides a wide coverage of the last two decades. Table 1 also compares the number of firms in the firm-level data underlying CompNet with official firm numbers from

[7] When aggregating results at the sector level, we remove France from the analysis in order to have a longer time series. We present results for France just in the country-level analysis for the years 2009-2015, the ones unaffected by the changes in the definition of the firm in France.

[8] CompNet's User-Guide (CompNet, 2020) provides details on the deflation.

[9] Additionally, older vintages of our data have been already used by several researchers (e.g. Autor et al., 2020; Gutiérrez & Piton, 2020).

Eurostat. In most countries, our data covers a significant share of firms, but even when the data is based on smaller samples, all country datasets are representative of the underlying firm population and comparable over time. This is ensured by the administrative nature of our firm-level data.

TABLE 1

COUNTRY AND SECTOR COVERAGE, 20E SAMPLE

Panel A: Country Coverage

Country	Years	Available sample	Number firms first year CompNet	Number firms last year CompNet	Population number firms First year	Population number firms Last year
	(1)	(2)	(3)	(4)	(5)	(6)
Belgium	2000-2018	20e/all firms	6,833	11,109	15,748	14,399
Croatia	2002-2019	20e/all firms	3,604	5,328	6,775	6,320
Czech Republic	2005-2019	20e/all firms	10,361	8,995	19,855	20,992
Denmark	2001-2018	20e/all firms	10,317	10,771	14,900	12,672
Finland	1999-2019	20e/all firms	5,581	8,692	8,503	9,926
France	2009-2015	20e	68,781	67,043	72,944	70, 607
Germany*	2005-2018	20e	D	D	143,585	185,341
Hungary	2003-2019	20e/all firms	10,791	11,094	16,001	14,750
Italy	2006-2018	20e/all firms	45,484	53,876	93,853	71,941
Lithuania	2000-2019	20e/all firms	3,469	5,874	5,847	6,661
Netherlands	2007-2018	20e/all firms	18,565	22,924	10,884	27,286
Poland	2002-2019	20e/all firms	19,267	25,605	35,935	56,446
Portugal	2005-2018	20e/all firms	17,339	16,930	19,125	19,000
Romania	2007-2019	20e	24,575	21,786	27,906	24,775
Slovenia	2002-2019	20e/all firms	2,269	3,060	2,814	3,840
Slovakia	2000-2019	20e	1,687	5,866	4,747	7,443
Spain	2008-2018	20e/all firms	45,851	34,357	76,999	62,835
Sweden	2008-2018	20e/all firms	10,640	13,279	15,752	20,329
Switzerland	2009-2018	20e/all firms	5,809	6,561	18,337	20,607
TOTAL	2009-2016		311,223	333,150	629,681	656,170

Panel B: Macro – Sector Coverage (balanced sample excluding France)

Macro-sector	Number firms 2009 CompNet	Number firms 2018 CompNet	Population number firms 2009	Population number firms 2018
	(1)	(2)	(3)	(4)
Manufacturing	90,381	86,782	162,779	158,149
Construction	35,184	29,083	66,136	61,742
Wholesale and retail trade	59,776	59,826	125,195	125,615
Transportation and storage	16,269	19,791	38,489	46,247
ICT	10,399	13,102	20,731	26,012
Accommodation and food service activities	14,909	21,609	41,429	59,840
Professional Activities	14,100	16,739	33,829	42,573
Administrative and service	15,975	19,757	41,509	52,097
TOTAL	256,993	266,689	530,097	572,275

Note: Table 1 shows firm coverage information for the firm-level data underlying the CompNet data based on data covering firms with at least 20 employees. Panel A displays country-level statistics using the first and last year of observation for each country. Panel B shows statistics for each sector using the balanced set of countries and sectors from 2009 to 2018 (excluding France). CompNet data, excluding the sector "Real Estate".

* Germany does not contain sample number information for confidentiality reasons. .

4 Business Dynamism in Europe

4.1 Measurement

We rely on two measures to study business dynamism in Europe. We calculate these measures via our data collection protocols on the representative firm data underlying CompNet for various aggregation levels. Our main measure of interest is the job reallocation rate (JR_{nt}), defined as in Davis et al. (1994) as the weighted average firm growth rates, $\varphi_{it} = \frac{|L_{it} - L_{it-1}|}{Z_{it}}$, with $Z_{it} = 0.5(L_{it} + L_{it-1})$. Defining the aggregation weight as $s_{it} = \frac{Z_{it}}{\sum_n Z_{it}}$ the job reallocation rate is given by:

$$JR_{nt} = \sum_n s_{it}\varphi_{it} \quad (1)$$

where $n = \{c, k, j\}$ indicates the country, sector, and two-digit industry level respectively.

Our second measure is the share of young firms. We define firms as young if they are not older than five years. Whereas we can calculate the job reallocation rate for all countries, the share of young firms can only be defined for a subset of countries as several countries do not report the birth year of firms in their data. When calculating these measures at the country level, we start from sector-level results in our data and aggregate them to the country level.[10] This allows us to address differences in the sector coverage across countries.

[10] The share of young firms can be readily aggregated by using information on the total number of firms in the population. We aggregate job reallocation rates using sector employment weights consistent with the definition of sit above.

4.2 Facts on Business Dynamism in Europe

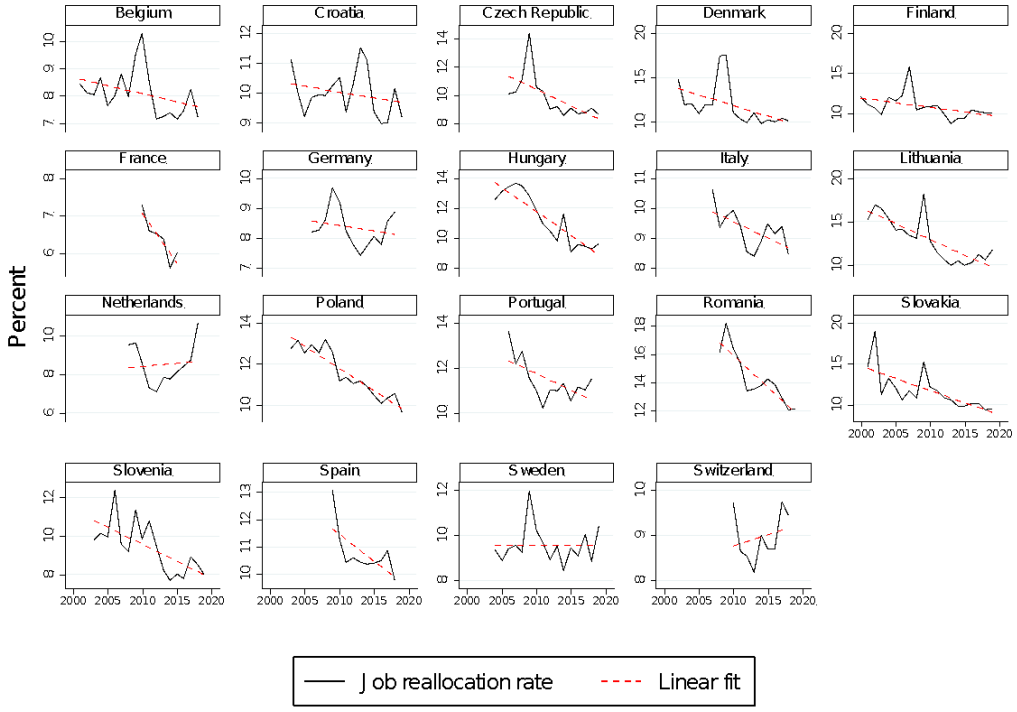
Fact 1: There is a pervasive decline in job reallocation rates and young firm activity in Europe.

Figure 1 and 2 display job reallocation rates and the share of young firms out of the total number of firms by country for our sample of firms with at least 20 employees, respectively. 15 out of 19 countries show a declining trend in job reallocation rates. Only Switzerland and the Netherlands show a weakly positive trend. In levels, changes range from -35 percent for Romania to + 5 percent for Switzerland. When we rely on the full sample data (i.e. including smaller firms), we find similar results.

Similar to the job reallocation rate, there is a strong decline in the share of young firms. When we study the full sample, the trend estimate(s) turn positive for Croatia and Slovenia, strongly increases for the Netherlands, and becomes more negative for other countries such as Italy. For other countries, the picture is qualitatively unchanged. In some countries, the share of young firms with at least 20 employees falls by 30 percentage points and reaches almost zero in recent years.

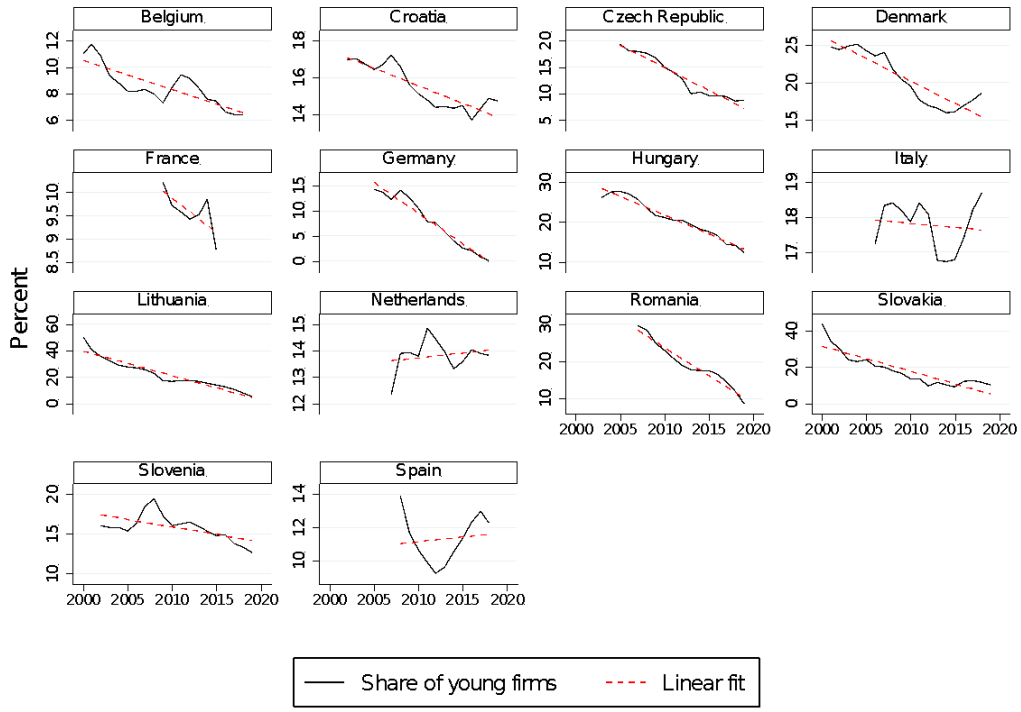
Figure 3 shows that the decline in the share of young firms is also associated with a severe decline in the share of workers employed in young firms.

FIGURE 1. JOB REALLOCATION RATES IN EUROPE



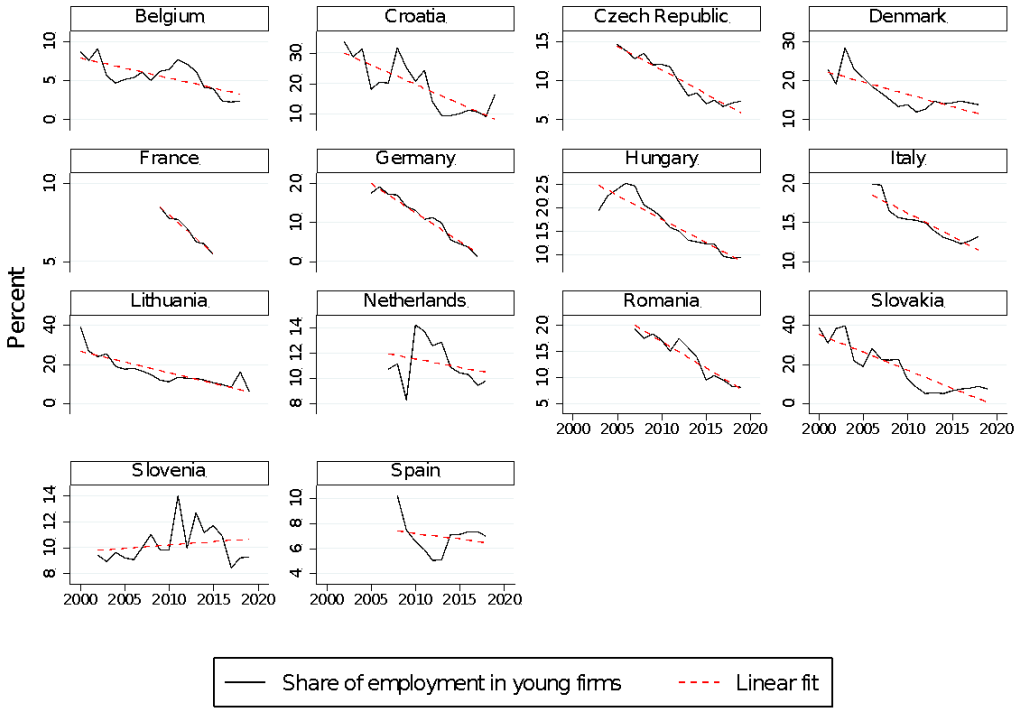
Notes: the black solid line shows country-level job reallocation rates as defined in equation (1). Real estate sector excluded. CompNet data. Firms with at least 20 employees.

FIGURE 2. SHARE OF YOUNG FIRMS IN EUROPE



Notes: the black solid line shows country-level shares of young firms in total firm counts. Real estate sector excluded. Young firms are firms not older than 5 years. CompNet data. Firms with at least 20 employees.

FIGURE 3. EMPLOYMENT SHARE IN YOUNG FIRMS IN EUROPE



Notes: the black solid line shows country-level shares of employment in young firms in total employment. Young firms are firms not older than 5 years. Real estate sector excluded. CompNet data. Firms with at least 20 employees.

Fact 2: The decline in business dynamism is accompanied by a decline in high-growth young firms.

Figure 4 shows the share of young firms by firm size-classes using data on all firms (i.e. we exclude Germany, France, Romania, Slovakia) and aggregating our results to the European level. We divide firms into 5 size classes: 0-9, 10-19, 20-49, 50-249, and larger than 250 employees. Due to differences in covered years, countries enter and exit our sample in Figure 4. To account for this, the shaded area indicates the years for which we have a balanced panel. We find a particularly strong decline in young firm activity among the larger size classes. This implies that young firms became smaller over time and that the share of high-growth young firms declined in past years.

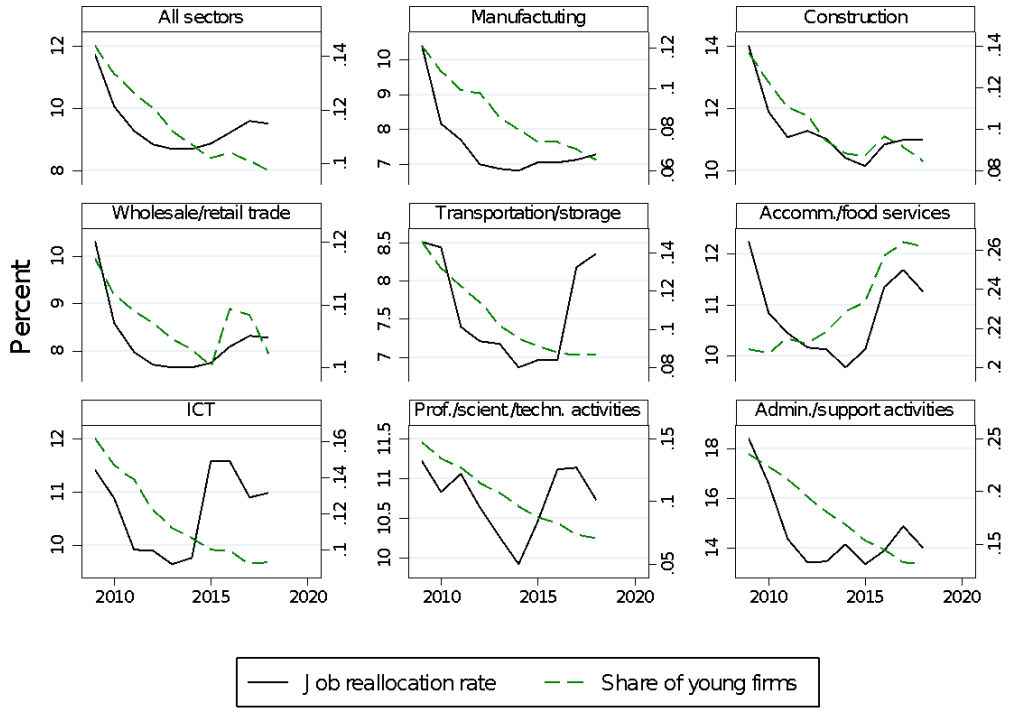
FIGURE 4. YOUNG FIRM SHARE BY SIZE-CLASSES

Notes: the black solid line shows European-level shares of young firms in total firm counts by size classes. Young firms are firms not older than 5 years. Real estate sector excluded. CompNet data for Belgium, Croatia, Czech Republic, Denmark, Hungary, Italy, Lithuania, Netherlands, Slovenia, Spain. Firms with at least 20 employees.

Fact 3: The decline in business dynamism is evident across all economic sectors in Europe

Figure 5 displays job reallocation rates and young firm activity by economic sectors, using our balanced sample of countries and sectors. The results are aggregated to the European level. With the exception of the ICT sector, there is a clear negative trend in job reallocation rates across all sectors. Young firm activity declined consistently across all economic sectors.

FIGURE 5. EUROPEAN BUSINESS DYNAMISM, BY SECTORS



Notes: the black solid (green dashed) line shows European-level job reallocation rates (shares of young firms in total firm counts) by sectors. Young firms are firms not older than 5 years and not defined for Finland, Poland, Switzerland, Portugal, and Sweden. Real estate sector excluded. CompNet data. Firms with at least 20 employees.

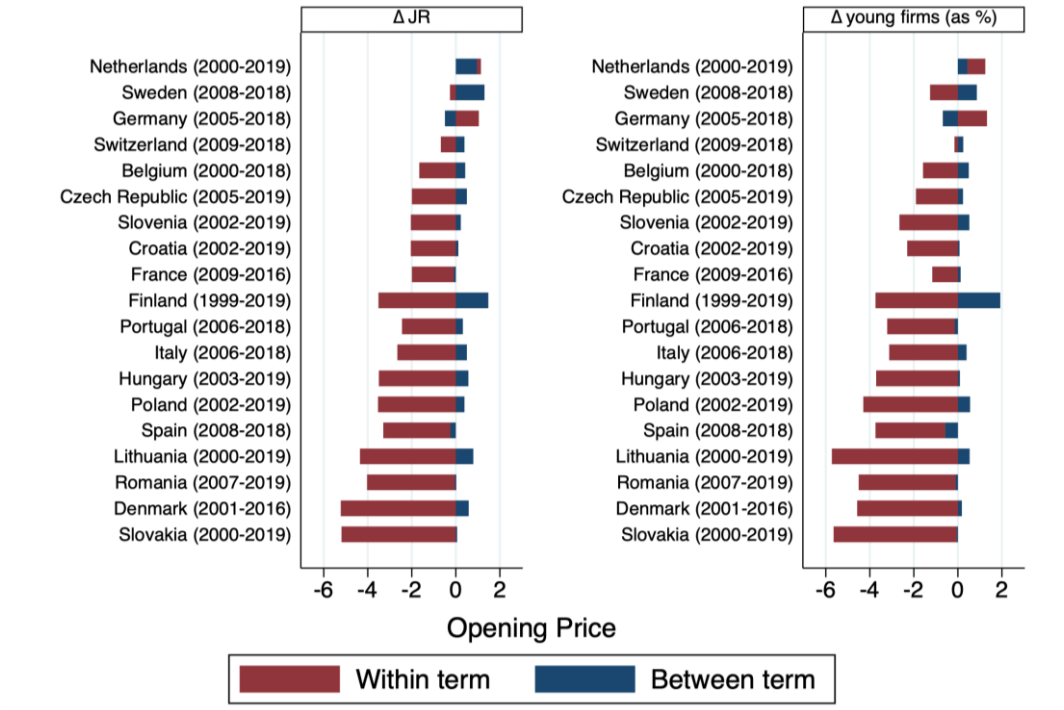
Fact 4: The decline in business dynamism is driven by within-sector dynamics.

The decline in European business dynamism can be driven by changes within sectors or by reallocation processes from more dynamic to less dynamic sectors. To study the role of such dynamics, we apply the following shift share decomposition:

$$JR_{nt} - JR_{nt-1} = \Delta JR_{nt} = \sum_{n} s_{j0}\Delta JR_{jt} + Reallocation_{nt}, \quad (2)$$

where j and n indicates the sector within aggregation level n (e.g. sectors within countries). s_{g0} is a fixed weight in the base period. $\sum_n \; s_{g0}\Delta JR_{gt}$ indicates within-group changes, whereas $Reallocation_{nt}$ measures all changes in aggregate job reallocation rates due to shifts in economic activity between sectors. We can apply a similar shift-share decomposition for the share of young firms. Figure 6 shows the results of the shift-share decomposition by country.

FIGURE 6. SHIFT-SHARE DECOMPOSITION OF JOB REALLOCATION RATES AND SHARE OF YOUNG FIRMS



Notes: results from the sector-level shift-share decompositions (equation (2)) for job reallocation rates and shares of young firms by country.

Summing up, we document a widespread and strong decline in business dynamism across almost all 19 countries in our database. The fall in European business dynamism is accompanied by a decline in high-growth young firms. It occurs in all economic sectors and is mainly driven by within-sector dynamics. Overall, the European evidence is consistent with findings for the US (e.g. Decker et al. (2020)).

5 Understanding business dynamism

5.1 Firms' responsiveness in Europe

In the following, we focus on job reallocation rates to study potential mechanisms behind changes in business dynamism. Job reallocation rates can be related to individual firms' labor demand. Decker et al. (2020) use a general framework that shows that firms' labor demand can be expressed as a function of firms' revenue-productivity (or, more generally, profitability). Under a wide set of models, firms will increase (decrease) their labor demand if they experience a positive (negative) shock to their revenue-productivity, where revenue-productivity is a composite of technical efficiency and product demand.

Formally, Decker et al. (2020) motivate a growth policy function that relates firm $i's$ labor growth (g_{it}) to revenue productivity ($TFPR_{it}$) and their labor force (L_{it}): $g_{it} = f_t(TFPR_{it}, L_{it-1})$, where $\frac{\partial f_t}{\partial TFPR_{it}} > 0$. That is, holding initial labor fixed, firms with a higher $TFPR_{it}$ realization will have a higher growth rate. Using this setting, Decker et al. (2020) run the following reduced-form firm-level regression:

$$g_{it} = \beta_0 + \beta_1 tfpr_{it} + \beta_2 l_{it-1} + \varepsilon_{it} \quad (3)$$

where lower case letters denote logs and β_1 measures the responsiveness of firms to productivity and demand shocks. The key result in Decker et al. (2020) is that declining business dynamism in the US can largely be explained by a decline in the responsiveness of firms' employment growth to productivity shocks (i.e. a decline in β_1 conditional on controls).

As our data is already aggregated at the industry-level, we cannot exactly replicate the analysis of Decker et al. (2020) across multiple European countries. Therefore, we therefore transfer their analysis to the two-digit industry level (j) by

relating job reallocation (i.e. the weighted sum of firms' employment growth rates) to productivity dispersion:

$$JR_{jt} = \beta_0 + \beta_{disp} Disp_{jt} + X'_{jt}\beta + \varepsilon_{jt}, \quad (4)$$

where $Disp_{it}$ measures productivity dispersion and X is a vector of controls. β_{disp} measures the responsiveness of job reallocation rates to productivity dispersion. Given the growth policy function in (3), β_{disp} should be positive, holding constant the initial size distribution of an industry. That is, for a given size distribution, a larger variation in productivity leads to a larger variation firms' labor demand and hence higher job reallocation rates.[11] To approximate the initial size distribution of an industry, X contains the average firm size, the skewness of size distribution and the percentiles 1,5,10,25,50,75,90,95, and 99. In addition, we include country-sector and year fixed effects into the regression. This identifies our coefficients from changes within country-sector pairs. As productivity measure, we rely on labor productivity (log of value-added per worker) and measure productivity dispersion as the 90-10 percentile ratio.

Table 2 presents the results. We include all available years and countries into this regression, i.e. use an unbalanced panel of country industry and years. Column 1 relates job dynamism to a linear trend. Consistent with fact 4, we find a statistically significant decrease in job reallocation rates within industries: every year, the job reallocation rates decline on average by 0.2 percentage points within European industries.[12] Column 2 shows a positive association between productivity dispersion and job reallocation rates, which measures the pass-through from

[11] This is consistent with models showing that revenue-productivity dispersion implies room for productivity enhancing reallocation (e.g. Hsieh & Klenow (2009)).

[12] Similarly, the share of young firms also shows a statistically significant decline within industries.

idiosyncratic firm productivity shocks to labor adjustments at the industry level. Column 3 shows the main result, where we interact productivity dispersion with a linear time trend. The coefficient on these interaction terms tells us that the pass-through from productivity shocks to job reallocation rates has declined in past years. We find that Labor flows between firms became less responsive to productivity shocks. This is consistent with findings in Decker et al. (2020) for the US. Columns 4-5 show that this also holds when we introduce productivity dispersion with a lag, i.e. allow for labor adjustments to take place. Finally, column 6 shows that productivity dispersion is itself declining within sectors. This is an important result, which contrasts with the findings in Decker et al. (2020) for the US. In Europe the decline in business dynamism is not only a phenomenon of a decline in firms' responsiveness, but also of a business environment where productivity became less dispersed across firms.

TABLE 2

JOB REALLOCATION AND PRODUCTIVITY DISPERSION, 2-DIGIT-INDUSTRY-LEVEL ANALYSIS, USING THE P90-P10 RATIO OF VALUE-ADDED PER WORKER AS A PRODUCTIVITY DISPERSION MEASURE

	JR_{jt} (1)	JR_{jt} (2)	JR_{jt} (3)	JR_{jt} (4)	JR_{jt} (5)	$Prod.dispersion_{jt}$ (6)
$Trend$	-0.0021***		-0.0002		-0.0004	-0.0091***
	(0.00022)		(0.0005)		(0.0005)	(0.00099)
$Productivity\ dispersion_{jt}$		0.0358***	2.151***			
		(0.00605)	(0.763)			
$Productivity\ dispersion_{jt} * trend$			-0.0011***			
			(0.0004)			
$Productivity\ dispersion_{jt-1}$				0.0358***		
				-0.00605		
$Productivity\ dispersion_{jt-1} * trend$					-0.001***	
					(0.0004)	
Size distribution controls	YES	YES	YES	YES	YES	YES
Year FE	NO	YES	NO	YES	NO	NO
Country-industry FE	YES	YES	YES	YES	YES	YES
Observations	8,319	8,319	8,319	8,319	8,319	8,319
# of industries	53	53	53	53	53	53
R-squared	0.632	0.658	0.646	0.663	0.652	0.652

Notes: Table 4 shows regression results from estimating equation (4) using industry-level job reallocation rates as dependent variable in columns (1)-(5). Productivity dispersion is defined as the log of the industry-level 90-10 percentile ratio of labor productivity. The trend variable is defined as a linear trend. Size (in terms of employment) distribution controls are lagged by one year and include the industry-level average firm size, skewness of the size distribution, and the percentiles 1, 5, 10, 25, 50, 75, 90, 95, and 99. Column (6) regresses productivity dispersion on a linear trend. Standard errors are clustered at the industry level. Significance: *10 percent, **5 percent, ***1 percent. All available industries and years. CompNet dataset.

5.2 A firm-level framework to study business dynamism

Business dynamism is ultimately tied to the individual decisions of firms. In the following, we will therefore present a simple firm-level framework that extends the work by Decker et al. (2020) to study the microeconomic mechanisms behind changing business dynamism. As we cannot conduct this type of analysis for Europe using micro-aggregated CompNet data, we plan to use firm-level data for the German manufacturing sector. . Our aim to show how changes in market power and production technologies affect firms' responsiveness to shocks and thus business dynamism.

Consider that firms produce physical output (Q_{it}) by combining labor (L_{it}), capital (K_{it}), and intermediates (M_{it}):

$$Q_{it} = Q_{it}(L_{it}, K_{it}, M_{it}) * TFP_{it}. \quad (5)$$

TFP_{it} denotes total factor productivity. Sales are given by $P_{it}Q_{it}$, with $TFP_{it} * P_{it}$ defining revenue productivity or $TFPR_{it}$, i.e. the composite from firms' technical efficiency and demand conditions. We do not restrict the production function to any specific form and only require it to be continuous and twice differentiable. Firm operating profits are given by:

$$P_{it}(Q_{it})Q_{it} - w_{it}(L_{it})L_{it} - z_{it}M_{it} - r_{it}\,K_{it}, \quad (6)$$

where w_{it}, z_{it}, and r_{it} denote unit costs for labor, intermediates, and capital. Note that output prices and wages are functions of quantities and labor inputs, respectively. This allows for the presence of firm market power on both the product and labor market.

From the first order condition for labor, we find:

$$w_{it}\left(1+\frac{1}{\varepsilon^{L}}\right)=\frac{P_{it}}{\mu_{it}}MPL_{it} \tag{7}$$

where ε^{L} is the inverse labor supply elasticity, μ_{it} firms' product markup, and MPL_{it} denotes the marginal product of labor. $\left(1+\frac{1}{\varepsilon^{L}}\right)=\gamma_{it}$ is a measure of firms' monopsony power. Assuming a Cobb-Douglas production function $Q_{it}={L_{it}}^{\theta_{it}^{L}}{K_{it}}^{\theta_{it}^{K}}{M_{it}}^{\theta_{it}^{M}}*TFP_{it}$. and reformulating (7) gives an expression for labor demand:

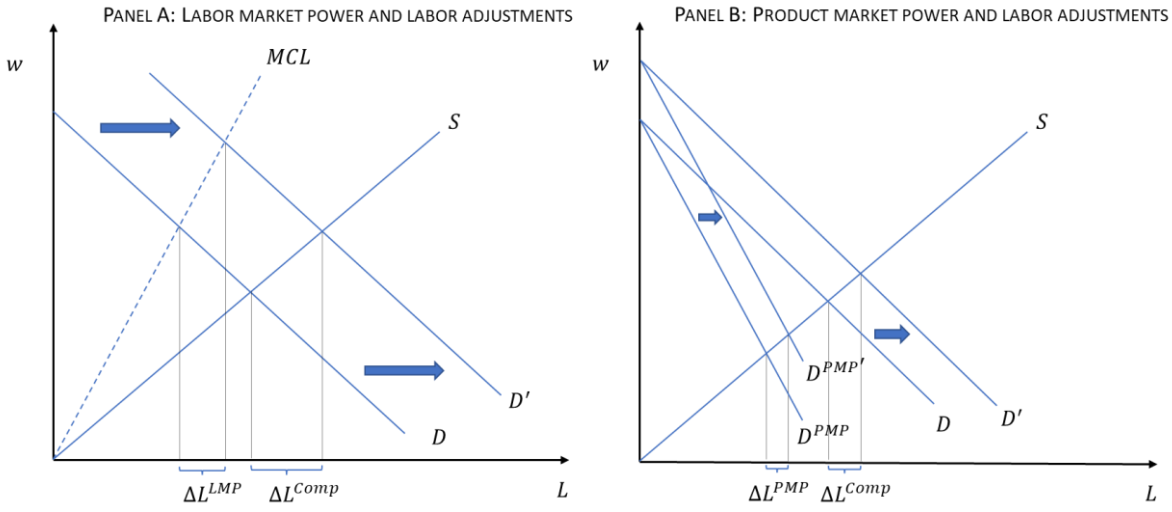
$$L=\frac{P_{it}Q_{it}}{\mu_{it}\gamma_{it}}\frac{\theta_{it}^{L}}{w_{it}}=\left[{K_{it}}^{\theta_{it}^{K}}{M_{it}}^{\theta_{it}^{M}}\frac{TFPR_{it}}{\mu_{it}\gamma_{it}}\frac{\theta_{it}^{L}}{w_{it}}\right]^{\frac{1}{1-\theta_{it}^{L}}}, \tag{8}$$

where θ_{it}^{L} is the output elasticity of labor, which reflects the technological importance of labor in production processes. Equation (8) shows that the pass-through from changes in revenue productivity is governed by several factors. First, a higher wage decreases the pass-through because at a higher wage firms can hire fewer workers for a given increase in sales (revenue productivity. Second, a higher technological importance of labor increases the pass-through. Intuitively, firms that do not employ any workers ($\theta_{it}^{L}=0$), will not increase their labor demand when facing a positive productivity shock. Third, both higher product and labor market power decrease the pass-through. Firm markup affects the pass-through by a reduction in firms' output which lowers factor demand for any given level of sales. The effect of firms' monopsony power operates through the marginal cost curve of labor being steeper than the labor supply curve.[13]

[13] Intuitively, firms with monopsony power pay wages bellow their marginal revenue product of labor. This leads to lower job reallocation between firms as they will not be as responsive to productivity shocks. On the downside, firms can retain workers in the face of a negative productivity shocks as there is a gap between what workers earn and what they produce. On the upside, firms would only be able to hire more workers by raising overall wages and giving up rents. Both factors lead to less job reallocation. As the market power of firms increases job reallocation across firms also decreases.

Figure 7 illustrates the comparative statics of product and labor market power on derived labor demand.[14]

FIGURE 7. FIRMS' MARKET POWER AND LABOR RESPONSES



Notes: Panel A shows how labor market power affects firms' labor adjustments. Panel B shows how product market power affects firms' labor adjustment

Panel A shows that when a firm has some monopsony power, it will equalize labor demand with their marginal costs of labor (MCL) instead of labor supply (S). As a result, we expect the change in firms' labor under monopsony (ΔL^{LMP}) to be lower than under competitive labor markets (ΔL^{Comp}) for a given labor demand shock (shift from D to D'). Panel B shows the adjustment process when a firm has product market power but no monopsony power. The labor demand curve will rotate inward when firms have labor market power, as the firm adjusts along its marginal revenue curve (rather than the demand curve). In the first-order condition it is marginal revenue product of labor $MRPL_{it} = \frac{P_{it}}{\mu_{it}} \frac{\partial Q_{it}}{\partial L_{it}}$ that must be equated to the wage. In general, this will cause a lower labor adjustment (ΔL^{PMP}).

[14] A similar argument has been made in De Loecker et al. (2021) for *product* market power. The effect of labor market power on job dynamism has, to our knowledge, not been discussed yet.

In sum, our simple framework predicts that a decline in labor responsiveness to revenue productivity shocks can be caused by i) a rise in firm product or labor market power, ii) by a decrease in the ratio of labor technological importance to firms to wages. In the aggregate, a reallocation of activity towards firms with high market power, high wages, and a low technological importance of labor can generate the decline in job reallocation rates documented in this paper.

5.3 Empirical analysis using firm-level data for the German manufacturing sector

We plan to transfer the framework in section 5.2 into firm-level regressions that extend the setting of Decker et al. (2020) by including terms for market power and the output elasticity of labor. From that we can measure the difference in "unconditional" responsiveness as estimated in Decker et al. (2020) and "conditional" responsiveness, i.e. conditional on market power and technology parameters. The difference in these responsiveness parameters will be informative on the role of market power and technology in explaining changing responsiveness.

6 Conclusion

We present novel evidence on business dynamism in Europe. We establish that, similarly to the US, in the last decades there has been a widespread decline in business dynamism in most European countries. Job reallocation rates and share of young firms in total firm counts decline in almost all the 19 countries we study. This is accompanied by a decline in employment shares within young firms and high-growth young firms. The decline in business dynamism occurs through all economic sectors and is mainly a within-sector phenomenon. When studying the mechanisms behind this decline in business dynamism, we find that firms labor adjustments

became less sensitive to productivity shocks. We rationalize these results with a simple theory that shows how market power and changing production technologies can drive for the decline in business dynamism. In future work, we will use micro-data to test for the importance of market power and technology in determining business dynamism.

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