Work Flexibility and Firm Growth: Evidence from LEED Data on the Emilia-Romagna Region

Work Flexibility and Firm Growth: Evidence from LEED Data on the Emilia-Romagna Region

Forthcoming in
INDUSTRIAL AND CORPORATE CHANGE

Alessandro Arrighetti[a], Luca Cattani[b], Fabio Landini[a,c], Andrea Lasagni[a]

[a] University of Parma

[b] University of Bologna

[c] Bocconi University, ICRIOS

Abstract

In the last decades, work flexibility emerged as a key requirement firms must meet to face volatile markets and highly differentiated product demand. This paper compares two alternative approaches to strengthen work flexibility: internal flexibility, i.e. practices that focus on the employees' ability to perform a variety of highly qualified tasks in a context of stable employment relationships; and external flexibility, i.e. practices that align employment and labour costs to demand fluctuations using a buffer of non-standard employees involved in routine tasks. We empirically verify whether both practices are able to boost sales growth using a linked employer-employee panel of manufacturing firms from the Emilia-Romagna region (Italy). While internal flexibility positively affects firm growth, external flexibility is at best not significant, and in some empirical specifications it appears to hamper firm growth. Such a negative effect, however, decreases when we limit the analysis to industries with high demand volatility and cost-based competition. The related managerial and policy implications are discussed.

Key words: internal flexibility; external flexibility; firm growth; industrial relations.

JEL Code: D22, L23, M51, M54, J41, J24

1. Introduction

Over the last half-century, managerial debate and practices stressed the importance of strategic and organizational flexibility as requirements to face environmental uncertainty. Quick and continuous adaptations to diversified and evolving consumer preferences, technological regimes and institutional settings are deemed necessary to acquire competitive advantages (McGrath, 2013). In the managerial jargon this view has been summarized by the ideal type of the 'flexible firm' (Volberda, 1998), which encompasses all kinds of organizational arrangements employers can adopt to achieve the required degree of flexibility.

According to Kalleberg (2001) firms can exploit two alternative approaches to deal with flexible labour utilization. On the one hand, there are practices that focus on the employees' ability to perform a variety of highly qualified tasks in a context of relatively stable employment relationships. On the other, there are approaches that stress the importance of reducing costs by creating a buffer of flexibility based on non-standard employees involved in relatively routine tasks. While the former has been generally referred to as *internal (or functional) flexibility*, the latter is best known as *external (or numerical) flexibility* (Atkinson 1984, 1985; Smith 1997; Hunter et al. 1993; Cappelli and Neumark, 2001).

During the last decades the literature has devoted a great deal of attention to the analysis of these two alternative flexible labour utilization strategies. Studies on internal flexibility have developed a rich theoretical framework to explain why human resource management practices that provide employees with skills, incentives and involvement in high quality productions may improve business performance. In a competitive environment characterized by shortening technological life cycles, expanding product varieties and hyper-competition, organizations need to constantly adjust their production processes/routines to meet ever changing requirements in terms of either time and/or quality. These conditions have led firms to reconsider the contribution that a qualified and motivated workforce can make to their business. The hiring of employees with a high level of education, who can more easily move between tasks and jobs in the organization, combined with increasing incentives to individual and collective investment in firm-specific skills and competences allow organizations to upgrade the quality of their productions while preserving the capacity to adapt to contextual changes. This, it is argued, should in turn make firms more competitive (Appelbaum et al., 2000; Way 2002; Huang and Cullen 2001; MacDuffie 1995; Groot and Van Den Brink 2000, Preenen et al., 2017).

Several companies, however, cope with complex business environments by relying on external rather than internal labour flexibility. Mounting evidence indeed shows that practices associated with external flexibility are rising in many European countries (Eurofound, 2010; Keune, 2013; Cappelli and

Keller, 2013). In Italy, for instance, the use of non-standard labour contracts substantially increased during the last several years (Arrighetti et al, 2019). The rationale behind such practices is that the availability of some fixed-term and easily replaceable workers allows companies to adjust the volume of production to changes in demand, without the need to increase the size of the fixed workforce (Roca-Puig et al., 2008). The benefits of such approaches include a greater capacity to adapt to unexpected changes of the competitive environment and lower fixed cost (Gramm and Schnell, 2001; Kalleberg et al., 2003). Especially when employed in productions that heavily rely on cost-based competition, external flexibility can be the source of competitive advantages and strengthened performance.

In this paper we contribute to this literature by providing empirical evidence on the effect of internal and external labour flexibility on a specific component of firm performance, i.e. sales growth. Previous works focused on similar issues. For instance, labour economic research shows a positive relationship between internal flexibility and firm innovation (Arvanitis, 2005; Zhou et al., 2011) as well as productivity (Preenen, 2017) and corporate profit (Michie and Sheehan-Quinn, 2001). Likewise, studies on external flexibility document the impact of the latter on different measures of firm performance such as returns on equity (Lepak et al., 2003), productivity growth (Boeri and Garibaldi 2007; Valverde et al., 2000; Bardazzi and Duranti 2016; Damiani et al., 2016), innovation (Kleinknecht et al., 2014) as well as workers' motivations (Battisti and Vallanti 2013). None of these papers, however, considers the effect of these two flexible labour utilization strategies jointly, using the same analytical framework. Moreover, there is no prior work that focuses on their effects on firm growth. The only exception is Kleinknecht et al. (2006), who use Dutch data to compare the impact of internal and external flexibility on sales growth. Their empirical analysis, however, is mainly cross-sectional and based on a relatively small sample of firms. Their classification of work management practices is based on two dimensions only, namely contractual relationship and functional mobility. Workforce education and quality of productions, which are integral parts of flexible labour utilization strategies, are not taken into account. Our work, which is based on a more robust empirical specification and a more comprehensive classification of work management practices, extend and strengthen their results.

We base our analysis on a linked employer-employee database (LEED) that combines two sources: a) worker- and firm-level information taken from the SILER-ARTER system, which collects all mandatory communications firms from the Emilia Romagna region (Italy) submitted to regional administrative offices in the cases of major employment events (e.g. hiring, firing, changes of contractual status) between January 2008 and December 2017; and b) accounting and financial information derived from the AIDA-BVD database, which contains disaggregated balance sheet and profit and loss statement

information for the universe of all Italian limited liability companies for the last 10 years, thus covering the period between 2008 and 2017. This gives us an open panel with detailed firm- and worker-level yearly information, including contractual basis and educational level. To limit issues related to labour market dualism and diffusion of informal employment we focus our analysis on firms from Emilia Romagna, an Italian region in which both features are restrained and homogeneously distributed compared to the national average (Di Caro and Nicotra, 2016; Istat, 2020).

We obtain the following results. First, internal flexibility has a positive effect on firm growth. Such an effect is robust to alternative specifications of the empirical model. Secondly, external flexibility is at best not significant, and in some empirical specifications it has a negative effect on sales growth. Interestingly, we find that the negative impact of external flexibility tends to disappear when restricting the analysis to firms operating in industries characterized by high volatility of market demand and cost-based competition. The related policy implications will be discussed in greater detail below.

The paper is organized as follows. Section 2 discusses the literature on the determinants of firm growth and argues how flexible labour utilization strategies could contribute to it. Section 3 gives background information on labour flexibility and production specialization in the Emilia Romagna region. Section 4 describes the data and the variables used in the empirical analysis. Section 5 shows some descriptive statistics on flexible labour utilization strategies. Section 6 discusses the empirical strategy. Sections 7 presents the main results and discusses some robustness checks. Finally, Section 8 concludes.

2. Flexible labour utilization strategies and firm growth

Since the seminal work by Gibrat (1931) empirical studies have provided a fairly consistent picture about the properties of firm growth (for a review see Dosi et al., 2020). The latter has been explained using a wide array of variables, including demographic ones such as age and size. Coad (2009), for instance, documents the existence of an inverse relationship between growth and firm age. Younger firms are driven to quickly exploit product and process innovations and to reach the minimum optimal size (Lee, 2010): their growth rate tends to be above average and the likelihood to perform like high-growth firms is higher than for older firms (Dobbs and Hamilton, 2007). Firm size was also shown to affect the growth process: in general, smaller firms grow faster than bigger ones (Barba Navaretti et al., 2014). Only after reaching a fairly high size threshold a relative independence between size and growth is observed, confirming Gibrat's Law (Lotti et al., 2003; Geroski and Gugler, 2004). More recent contributions have

considered other firm-level determinants as well. Grazzi and Moschella (2018), focus on export performance and find a positive relationship between the latter and growth (which however tends to decline with firm age). Other works consider more conventional measures of firm performance such as productivity and profitability, failing however to identify an unambiguous result (Foster et al., 1998; Bottazzi et al., 2002, 2006, 2010; Coad, 2009; Bartelsman and Doms, 2000). The influence of R&D and innovation on firm growth has also increased in relevance, with several studies finding a positive effect (Audretsch et al., 2014; Del Monte and Papagni, 2003; Oliveira and Fortunato, 2017). Pieri (2017) studies the effect of different organizational forms on growth behaviour and shows that high vertical integration is associated with less dispersed distribution of growth rates. Finally, the access to external financing was proved to exert an important constraint on firm growth, especially for small firms (Becchetti and Trovato, 2002; Oliveira and Fortunato, 2006, Musso and Schiavo, 2008).

Yet, the attention paid to work management practices, and in particular to the strategies of flexible labour utilization, as determinants of firm growth has been scant. The reasons can be of both theoretical and empirical nature. As for the former, most of the managerial and industrial relations literature tends to discuss the costs and benefits of the different work management practices mainly from an efficiency point of view, considering productivity and unit labour cost differentials as the main outcome variables. This approach led to the partial neglect of other economic gains that such practices can bring to organizations regardless of whether they increase production efficiency. Moreover, as for the empirical part, the analysis of work management practices requires detailed longitudinal firm-level data that are not readily available. This may have led authors to focus on other drivers of firm growth in their research.

From the theoretical point of view, the effects of labour flexibility on firm growth can be discussed within the standard frame of competitive advantages. As argued above, internal labour flexibility generally refers to measures that companies take to enhance the ability of their employees to perform a variety of tasks (Kalleberg, 2001). These measures usually include two main human resource practices: a) the hiring of employees with a high level of education and their involvement in continuous training (Delaney and Huselid 1996; Way 2002); and b) the use of standard long-term employment contracts as the main recruitment policy (Kalleberg and Moody, 1994; Ichniowski and Shaw, 1999). The former is believed to provide the firm with a pool of employees who are receptive to new ideas and changes. The latter is aimed at designing proper incentives for the workforce to invest in firm-specific skills and competences, strengthening individual commitment to the organization (Appelbaum et al., 2000). Joint together, these two practices strengthen the employability of human resources, encouraging mobility among jobs within a firm (Groot and Van Den Brink 2000).

Obviously, the employment of highly educated and widely protected employees is costly. For this reason, firms adopting a strategy of internal flexibility tend to compensate the rising labour costs by focusing on productions of higher quality (Bailey et al., 2001). This implies rising investment in technology and capital goods, while devoting a great deal of effort in organizing knowledge so as to make the production process smoother. The availability of skilled, motivated and functionally flexible workers helps in achieving this objective, making it easier to earn so-called information rents. The latter, as suggested by Appelbaum et al. (2000), occur whenever the increase in revenues associated with the use of internal labour flexibility is greater than the costs incurred while workers spend time processing information and managing production. For example, this can occur when the practices of internal flexibility allow a firm to produce more complex product mix, or enable the firm to avoid costly delays and provide reliable on-time delivery of products. If obtained, information rents can be the sources of competitive advantages that can feed market success and boost firm growth, independently of the achieved degree of production efficiency.

A specular line of reasoning can be used to discuss the contribution of external labour flexibility on firm growth. External flexibility consists of employers' attempts to obtain numerical flexibility by limiting the duration of employment through the use of short-term temporary workers who are hired for finite periods on an as-needed basis (Kalleberg, 2001). Sometimes such practice can be used to hire highly skilled professionals (e.g. independent consultants), but more often involve low skilled workers that perform relatively routine tasks within the organization. The main motivation for the use of external flexibility is indeed to favour the creation of a segment of easily replaceable workers that can be quickly employed and dismissed following the ups and downs of consumer demand (Benito and Hernando, 2008).

With reference to firm growth, the use of external flexibility has both costs and benefits. On the one hand, an extensive reliance on temporary and low skilled workers can negatively impact on firm growth whenever it contrasts with the need to accumulate firm-specific knowledge and competences (Appelbaum et al. 2000). On the other, this policy strengthens the firm's ability to adapt to volatile market environments saving on fixed labour costs and can thus be particularly effective in supporting firm growth when employed in manufacturing processes in which low costs are the main source of competitive advantages (Matusik and Hill 1998). Once again this results should hold independently of the static level of production efficiency, being instead related to a dynamic feature of firm behaviour such as adaptability.

As final notes on the theoretical discussion, let us highlight two important points. First, while the contrast between internal and external flexibility is common in the literature, there are several works investigating if and how firms can actually combine them in different ways. In this sense the most influential contribution is probably Atkinson's (1984, 1987) 'core-periphery' model, which postulates that firms seek to establish long-term employment relations with the most valuable part of their work-force ('core'), while at the same time externalizing other activities and/or person by means of transactional fixed-term contracts ('periphery'). Although popular among managers and government policy-makers, this model has however been subject of lively debates in the literature. Kalleberg (2001), in particular, concludes that there is not a direct systematic evidence supporting the assumptions as well as the actual implementation of the 'core-periphery' model. For this reason, we prefer to frame our study within the standard contrast between internal and external flexibility, leaving the analysis of the performance effect of their combination to future research.

The second point that we would like to highlight refers to the debate on the drivers of aggregate productivity growth, and in particular its decomposition separating the 'within component' (i.e. idiosyncratic changes in firm/plant productivity levels) and the 'between component' (i.e. changes due to reallocation of output shares across firms and/or due to entry into and exit from the market). We argue that a potential analogy with the object of our analysis is that while internal flexibility represents a 'within' driver of firm growth, external flexibility can be considered a factor that operates 'between' firms. In fact, firms relying on internal flexibility build competitive advantages based on resources that are already available within the organization, including the required managerial skills. On the contrary, the growth of externally flexible firms leverages on a competitive advantage that derive on one hand from the capability to contain average costs in response to market volatility and on the other from the reallocation of workers across production units. Clearly, whether one effect is predominant over the other is mainly an empirical question and also depends on the institutional context, such as the rules governing the labour market (Caroli et al., 2010). On this respect, prior empirical evidence concerning Italy is mixed. Some studies (e.g. Bottazzi et al., 2010) suggest that, as far as productivity growth is concerned, the within term generally offers a comparatively larger contribution than the between component. Other contributions (e.g. Bugamelli et al., 2018) emphasize the relevance of the between component instead, especially as drivers of productivity growth during the Great Recession. To check whether these results hold also for the relation between flexible labour utilization strategies and firm growth we need to inspect the data.

3. Institutional context and work flexibility

Our empirical analysis focuses on the manufacturing sector of one Italian region, Emilia-Romagna. Manufacturing is by far one of the most relevant sector of the Italian economy and a key driver of economic growth (e.g. Szirmai 2013; Andreoni and Chang 2016). Emilia-Romagna is one of the most prominent manufacturing regions in Italy. Almost 60% of regional GDP is related to the manufacturing sector[1] and the region ranks second in Italy and fifth in Europe for the number of people employed by this industry[2]. Manufacturing is also an economic sector in which firms adopting external vs. internal labour flexibility are likely to co-exist (Combs et al., 2006).

In terms of industrial structure, Emilia-Romagna is characterized by a highly decentralized productive regime. Like other regions in Italy, the proportion of labour force employed in small productive units is large: at the regional level, firms with less than 10 employees hire nearly one-fifth of the manufacturing workers, while such share rise up to nearly one-half for firm with less than 50 employees.[3] Moreover, small firms are frequently grouped in specific geographic areas according to their product, giving rise to monocultural industrial districts in which all firms present a low degree of vertical integration and the production process is carried on through the collaboration of many firms. Among the latter, only a proportion produces for final markets, while the others work as subcontractors, executing operations commissioned by the first group of firms. Production is thus widely decentralised following a pattern of flexible specialization (e.g. Piore and Sable, 1985). The split between 'final firms' and 'subcontractors' is not sufficient to characterize the production model. The system is in fact divided into two segments: the 'primary' sector made up of high-end market producers (final market firms with brand products and subcontractors with technological specialization, exclusiveness and relatively high market power) and a 'secondary' sector including low-end market producers (mainly subcontractors employing ordinary technological skills and low market power) (Brusco, 1982). In the 'primary' sector, firms specialized in high quality productions interact with strong (e.g. high unionization rate) but generally flexible unions (e.g. in the enforcement of contractual provisions and acceptance of overtime work). This combination guarantees that while unions exercise real control over working conditions, the employer enjoys a secure climate to plan the volume of investment and the differentiation of the products. The 'secondary' sector is instead populated by firms specialized in low quality/low cost productions that

[1] See the report Regional Innovation Monitor Plus 2016 (Industry 4.0 and smart systems). Available online at: https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/sites/default/files/report/2016_RIM%20Plus_Regional%20Innovation%20Report_Emilia%20Romagna_0.pdf (accessed on April 19 2019).
[2] Eurostat, data available online at: https://ec.europa.eu/eurostat/data/database (accessed on April 19 2019)
[3] Istat, data available online at: http://dati.istat.it/ (accessed on October 9 2019).

make more frequent use of non-standard labour contracts. These firms are able to hire and fire as the volume of orders changes, due to both the less stringent legislation against unfair dismissal for small firms and the low degree of unionization. As a result, in this sector changes in the level of output are mainly translated into variations in employment following the standard model of external flexibility (Brusco, 1982).

With respect to our work, focusing the analysis on a region with these characteristics has two main advantages. First, the predominance of decentralized production regimes based on small firms implies the existence of a dynamic economic environment in which episodes of firm growth are common. Secondly, the combination of a primary sector with unionized firms focused on high quality productions and a secondary sector with non-unionized firms selling low cost intermediate products increases the heterogeneity of labour utilization strategies. On this respect, although in recent years Italy went through a significant process of labour market deregulation that has made the use of non-standard contract easier (with the *Legge Treu* in 1997, the Legislative Decree 368 of 2001, and the Law 30 of 2003), there is evidence that the diversity of work management practices in Emilia-Romagna remains high (Arrighetti et al., 2019). Overall, these factors make the effect of different types of labour flexibility on firm growth easier to be detected.

4. Data

Our analysis is based on administrative LEED micro data collected by Italian local public administrations called 'Regions' (*i.e.* first-level constituent entities corresponding to the second NUTS administrative level) through a system called "*comunicazioni obbligatorie*", *i.e.* 'mandatory communications'. Regions are responsible for so-called 'active labour market policies' and thus required to create a digital platform through which private sector employers must communicate a given set of information concerning the firm, the employees and the contractual bases every time a given case of contract transformation occurs. The latter include cases of hiring, dismissal, resignation, extension of a fixed-term contract, conversion of a fixed-term contract into an open-ended one, main changes in contractual bases and characteristics, etc. In the case of Emilia-Romagna this electronic tool is called SILER-ARTER system, *i.e.* "*Sistema Informativo Lavoro – Emilia Romagna*". The resulting dataset thus potentially encompasses all employment relationships associated with events of contract transformation that took place from January 2008 to December 2017, in the private sector of the Emilia-Romagna region, excluding agriculture. Moreover, once an employment relationship enters the system via a mandatory communication, all the information concerning the individual worker is reconstructed going backward until the initial hiring. It

follows that employment relationships that began before 2008 and ended or were transformed after 2008 are also included in the dataset. For each employee the available information include gender, age, working experience, tenure, education and a classification of the employment relationship based on the contractual bases, which is indeed very important for the purpose of our research. In particular, we can distinguish between standard (*i.e.* open-ended) and non-standard employment, including externals, internals with fixed-term contracts, apprenticeships and the like. For all types of work, employment is measured in terms of average annual job positions (i.e. full-time equivalent), based on worker's presence in the reference week of each month. Information concerning the employer includes the sector of activity, the municipality where the firm is registered and the first year of activity.

A limitation of the SILER-ARTER database is that it does not include information about the economic and financial conditions of the firms. Therefore, we merge such database with the Aida-BVD archive, retrieving such information concerning only manufacturing firms with positive values of turnover and valid entries for all of the main explanatory variables described below.[4] After this merge and cleaning procedure, the resulting dataset consists of a ten-years panel (i.e. 2008-2017) made up of nearly 40,000 observations relative to around 4,000 firms (for details on the temporal distribution of the sample see Table A.1 in the Appendix).

To check the representativeness of the obtained sample we compare it with census data retrieved from Istat's *Archivio Statistico delle Imprese Attive* (ASIA). In particular, we match the distribution of firms across different industries considering 2011 as reference year. Overall, the firms included in our sample represent roughly one-tenth of the manufacturing firms active in the Emilia-Romagna region. The sample representativeness in terms of industry of activity is preserved (see Tables A.2 in the Appendix).

Among the different measure of firm growth, we focus our analysis on changes in the volume of sales as they are directly related to the success (or failure) on the product market. In particular, firm growth rate is computed as log-difference of total sales in two consecutive years after removing from firm-level sales their annual average:

$$G_{i,t} = \left(S_{i,t} - S_{i,t-1}\right) - \left(\overline{S_t} - \overline{S_{t-1}}\right) \qquad (1)$$

[4] The AIDA-BVD archive contains financial and economic information concerning the universe of all Italian limited liability companies and only for the 10 most recent years, thus excluding unlimited liability companies, family and individually owned companies. In addition, even if limited liability companies have to deposit their balance sheet on an annual basis, attrition and missing values are unavoidable as in any firm-level dataset. For an in-depth discussion and presentation of the AIDA-BVD archive see Grazzi et al. (2018), as far as Italian companies are concerned.

where $G_{i,t}$ is the annual sales growth of firm i at time t, $S_{i,t}$ and $S_{i,t-1}$ are the logs of total sales of firm i at time t and $t-1$, respectively; and $\overline{S_t}$ and $\overline{S_{t-1}}$ are the (three-digit) industry averages of the log of total sales at time t and $t-1$, respectively. This normalization allows us to account for common industry trends such as inflation and demand fluctuations. As a result, it allows us to interpret firm size dynamics in terms of market shares. For similar approaches see Bianchini et al. (2017, 2018).

We relate sales growth to different flexible labour utilization strategies. Unfortunately, we do not directly observe human resources strategies developed in each firm. For this reason, we must rely on proxy variables to capture the firm's propensity to adopt specific work management practices. In line with the above discussion we focus on three variables: i) the share of employees with high skills (i.e. holding a graduate degree or higher), ii) the share of employees with a standard labour contract (i.e. long-term tenured) and iii) the ratio between value added and total sales. The first two variables reflect the firm's use of employees with a relatively high (low) level of education in a context of relatively stable (unstable) employment relationships. The latter variable captures instead the degree of vertical integration. Then, we classify as firms adopting internal flexibility those that in a given year present higher-than-industry-median share of skilled employees, higher-than-industry-median share of tenured employees and higher-than-industry-median ratio of value added over sales. These are firms that, compared to the others in the same sector, make relatively large use of employees with high level of education, protect them with long-term labour contract and are more vertically integrated. The degree of vertical integration can be driven by different industry-specific and firm-specific factors. Among the latter, the quality of productions plays a particularly relevant role. In presence of incomplete contracts and asymmetric information, in fact, the propensity to rely on in-house production increases when transactions are complex, when they involve specific investments, and when the quality of assets used in production is high and difficult to verify (Lafontaine and Slade, 2007). The fact that a firm presents a higher degree of vertical integration than the median of its sector can thus be interpreted as a signal of a stronger focus on productions of relatively higher quality. Combined with the use of more qualified and tenured employees, this focus on quality suggests that the firm is indeed more likely to rely on work management practices based on internal flexibility[5].

[5] We are aware of the fact that the ratio of value added over sales captures only indirectly and to a limited extent the quality of production mainly because of sectoral differences. To tackle this issue, we classify a firm as highly vertically integrated based on the relevant sectoral median value of this ratio, thus limiting our analysis to intra-sectoral differences. In addition, as a further robustness check we also run the empirical analysis not including this proxy for quality (i.e. vertical

Conversely, we classify as firms adopting external flexibility those that in a given year present lower-than-industry-median share of skilled employees, lower-than-industry-median share of tenured employees and lower-than-industry-median ratio of value added over sales. Compared to the most direct competitors, these firms tend to hire less qualified and thus cheaper employees, maintain high numerical flexibility through short-term contracts and engage in productions of relatively low quality. Overall, they should thus be more oriented towards the achievement of cost-based advantages using work management practices that exploit external flexibility.[6]

5. Descriptive statistics

This section presents some descriptive statistics concerning our variables of interest. As expected, the adoption of relatively stringent criteria to identify unambiguously firms adopting a specific work management practice inevitably leads to extract two highly polarized and hence numerically limited subsets of firms. Figure 1 shows the shares of firms that we classified as relying on internal and external flexibility between 2008 and 2017. Our proxy variables include nearly one-fifth of all firms and this proportion is relatively stable over time. Interestingly, we notice that while the share of firms that use external flexibility has gradually reduced, going from slightly more than 14% in 2010 to 12% in 2017, the proportion of firms relying on internal flexibility has remained stable around 8% throughout the whole period. This trend can be explained by a composite set of factors, including the economic crisis. In these years, in fact, the Italian economy was hit by an important economic downturn that put significant pressure on active firms. As shown by Bartoloni et al. (2020) the chances of survival during this period were significantly larger for firms involved in production of higher quality and hiring workers with higher education. Such firms were indeed equipped with the necessary skills to deal with the rising complexity of the business environment and thus enjoyed a survival premium. This effect can partially account for the relative decrease in the number of externally flexible firms.

[Figure 1]

integration), using only the other two constituents of our flexibility variables, namely the share of high-skilled and the share of tenured employees and the results hold.

[6] For all the variables used in the definition of flexible labour utilization strategies we compute the industry median considering the three-digits ISTAT-ATECO classification. As a robustness check we classified firms considering the 40th or the 60th percentile rather than the median, main results do not change.

The fact that firms adopting internal flexibility tend to be characterized by more complex and robust organizational structures compared to firms relying on external flexibility is confirmed also by Figure 2, which shows the distribution of labour utilization strategies across different size classes. For firms with less than 10 employees, external flexibility is almost twice as common as internal flexibility (16% vs. 9%). When the number of employees rises between 10 and 50, the two labour utilization strategies have similar shares. Then, among organizations with more than 50 employees the proportion of firms using external flexibility significantly reduces, while the share of internally flexible firms increases. In the class that includes firms with more than 250 employees one-fifth of firms adopts internal flexibility and external flexibility is nearly absent. Therefore, in line with previous works (e.g. see Appelbaum et al., 2000), we find the existence of a positive (negative) relationship between the adoption of internal (external) labour flexibility and firm size.

[Figure 2]

Another relevant characteristic that is often associated with different work management practices is firm age. In fact, the use of non-standard forms of employment is often motivated by the need to search for the right competences on the labour market and can thus be larger in firms that go through early stages of their life cycle (de Matos and Parent, 2016; Portugal and Varejão, 2010). On the contrary, the use of labour utilization strategies based on internal flexibility requires adequate managerial skills that can only be learned over time (Arrighetti et al., 2019). The adoption of such strategy should therefore become more common as firms get older. Our data seem to confirm this interpretation. Figure 3 reports the distribution of internally and externally flexible firms across different age classes. Among firms that are less than 10 years old external flexibility is by far the most frequent strategy. Beyond that age, however, the share of firms relying on internal flexibility increase sensibly, while the share of firms using external flexibility shrinks. This result provides support for the idea that learning indeed play an important role in shaping work management practices at the firm level.

[Figure 3]

The economic sector is another factor that may affect the adoption of labour utilization strategies. On this respect, Figure 4 shows the fraction of internally and externally flexible firms across industries,

using Pavitt's (1984) taxonomy as reference for the latter. In supplier dominated sectors (i.e. Pavitt 1), which include the most traditional and price sensitive productions, the fraction of firms relying on external flexibility is nearly three times as large as the one of firms using internal flexibility. The result is just the opposite in the most technologically advanced science-based sectors (i.e. Pavitt 4), where the large majority of firms adopts internal flexibility. For scale-intensive (i.e. Pavitt 2) and specialized suppliers (i.e. Pavitt 3) the distribution is more balanced with external flexibility that slightly prevail in the former and internal flexibility in the latter. Overall this distribution provides two interesting insights. First of all, some degree of heterogeneity in work management practices tend to exist in all industries, independently of the underlying production regimes. Secondly, internal flexibility tends to be more common in technologically advanced industries, where competition is driven primarily by innovation and knowledge accumulation. On the contrary, external flexibility seems to be prevalent in sectors where competition is mostly based on costs.

[Figure 4]

To conclude our descriptive analysis, we report in Table 1 some summary statistics for the main covariates, distinguishing between internally flexible, externally flexible and other firms (for a full description of the variables as well as the correlation matrix among them see respectively Tables A.3 and A.4 in the Appendix). The "Test" column shows the results of an F-test comparing the mean difference among the different types of firms, i.e. columns 2, 3 and 4. Internal and external flexibility are associated with remarkable differences at the firm level. For externally flexible firms the use of non-standard contracts is five times greater than internally flexible ones. At the same time, while the former exhibits a share of graduate employees that is more than three times the sample average, the former makes no use of graduate employees at all. These differences translate into a significant difference also in terms of valued added over sales, which is by definition larger in internally flexible firms. When we move to other firm-level characteristics we find that, in line with the evidence discussed above, firms that rely on internal flexibility are larger and older than both externally flexible and other firms. The employee-level information reveals that for internally flexible firms, higher firm's age is also associated with higher mean age and experience of the employees, which actually reinforces the above intuition on the relevant role of learning for the adoption of internal flexibility. Not surprisingly, internally flexible firms exhibit larger value added and labour productivity compared to the others . Quite interestingly, instead, we observe that while internal flexibility is associated with higher degree of outsourcing compared to

external flexibility as well as other firms, the difference in terms of profits (measured by returns on investments, ROI) is only weakly significant. This result confirms that although labour utilization strategies can be very different in terms of the skills and contracts that are employed, the final outcome for the firm ownership can be relatively similar.

[Table 1]

As far as our dependent variable (sales growth) is concerned, it is noticeable how firms adopting internal flexibility strategies expanded their market shares between 2008 and 2019 compared to other types of firms. As Table 2 shows, total sales of firms adopting this strategy increased more than 3 million € in ten years, coming to represent 11.01% of the Emilia-Romagna market in 2017, whereas firms adopting external flexibility increased by just over 760,000 € and, consequently, their relative market share is only 6.16%. Figure 5 shows such divergent pattern, started roughly in 2011 and persisted until the end of the period of interest.

[Table 2]

[Figure 5]

6. Econometric analysis

Our econometric analysis aims at identifying the effect of work management practices based on internal vs. external flexibility on firm growth. We start with a baseline specification where we collapse observations across two subperiods, i.e. 2008-2011 and 2012-2017, and test how the average sales growth in the second period relates to the average use of internal flexibility and external flexibility in the first period. Such specification provides a medium-run assessment of the relationship between our focus variables and it is safer in terms of noise in growth rates. In particular, the estimated model takes the following form:

$$G_{i,t} = \alpha G_{i,t-1} + \beta_1 INTFLEX_{it-1} + \beta_2 EXTFLEX_{it-1} + \gamma \times \mathbf{Z_{i,t-1}} + \epsilon_{i,t}, \qquad (2)$$

where the dependent variable $G_{i,t}$ is the above-mentioned measure of relative growth (see Eq. 1) and is computed as mean value between 2012 and 2017, whereas all the independent variables are computed as

average values between 2008 and 2011. In particular, the main regressors $INTFLEX_{it-1}$ and $EXTFLEX_{it-1}$ represent our proxy measures for internal and external flexibility, $\mathbf{Z_{i,t-1}}$ is a set of firm-specific controls and $\epsilon_{i,t}$ is a regular time-varying error, while α, β_1, β_2 and γ are the parameters to be estimated. Vector of controls $\mathbf{Z_{i,t-1}}$ includes variables that could affect either sales growth or the propensity to adopt internal vs. external flexibility. In particular, the latter can be divided in two groups. The first one includes lagged firm-level attributes that enter a typical Gibrat-type growth regression such as: a proxy for firm size in terms of the number of employees in full-time equivalent (in logs); firm age computed by year of foundation (in logs); firm profit measured as return on investment; labour productivity measured as value added over total number of employees; and a proxy of the firm's propensity to rely on outsourcing calculated as the ratio between the cost for external services and total costs (in logs). The second group of control variables included workers' characteristics that can affect the firms' propensity to hire high-skill workers and/or firms' median tenure expressed in years. In fact, firms with high proportions of experienced and ageing workers may be forced to hire young new entrants in the external labour markets in order to replace retiring incumbent cohorts. Thus, we have to control for workers' median age and median working experience to discriminate between firms that are actually investing in human capital by consistently hiring high-skill workers and firms that are simply replacing retiring incumbents with younger outsiders, usually benefiting of higher educational/schooling levels. In this case, both variables can be computed at the firm level using information available in the SILER-ARTER database. Finally, we include among controls industry and municipality dummies.

A potential issue in the above specification is the endogeneity of work management practices, which could arise in because of either simultaneity or omitted variable bias (or both). The fact that the proxies for work flexibility are included with a time lag should partially, at least, address the former. To deal with the latter we combine two approaches. First we assume that endogeneity is due to time-invariant omitted variables. In these cases, consistent estimates can be obtained through the introduction of fixed-effects. Thus, we build a panel that exploits the full longitudinal nature of the data and we estimate a standard dynamic regression model:

$$G_{i,t} = \alpha G_{i,t-1} + \beta_1 INTFLEX_{it-1} + \beta_2 EXTFLEX_{it-1} + \gamma \times \mathbf{Z_{i,t-1}} + u_i + \epsilon_{i,t}, \qquad (3)$$

where we include the firm fixed-effect u_i. All the other variables are as in Eq. 1 but they are computed on a year-to-year basis. Moreover, we include among controls a set of time dummies. This specification

allows us to identify the coefficients of $INTFLEX$ and $EXTFLEX$ by exploiting within-firm variation in work management practices.

To deal with endogeneity due to time-varying omitted variables, we resort to panel-GMM estimation. In particular, we apply the GMM-DIFF estimator (Arellano and Bond, 1991), which mitigates the endogeneity of $INTFLEX$ and $EXTFLEX$ by taking lags of the covariates as instruments after the differencing of the main regression equation. In particular, different lags of $INTFLEX$, $EXTFLEX$, and other regressors are selected by applying the standard Arellano-Bond tests for serial correlation and the robust Hansen test for overidentifying restrictions.[7] For a similar approach see Bianchini et al. (2019).

7. Results

Table 3 shows the results of our baseline specification, *i.e.* collapsed ordinary least squares (OLS) with two sub-periods (2008-2011 and 2012-2017). Column (1) reports the estimated marginal effects when no additional control for work management practices is included beside our proxies for internal and external flexibility. In columns (2) to (4) we check whether the estimated effects are driven by any specific component of work management practices by adding the variables that we used to construct our proxy measures among control variables.

[Table 3]

In all the estimated models, the use of internal flexibility has a positive and statistically significant effect on subsequent expansions in the market. In particular, it increases relative sales growth by 1.6-2.4%. On the contrary, external flexibility has no significant effect. These results confirm the theoretical arguments concerning the role of internal flexibility as driver of firm-level competitive advantages, but they reject a similar role attributed to external flexibility. With respect to the latter it seems therefore that the costs in terms of firm growth, i.e. inability to accumulate firm-specific knowledge and competences, compensate the related benefits, i.e. adaptability to volatile market environments.

For the other predictors of firm growth, we find a significant effect only for two variables, i.e. the lagged growth rate and labour productivity, both with a negative sign. With respect to the former, the role of autoregressive terms in growth equations is widely debated in the literature. According to Dosi et al. (2020) persistent heterogeneity across firms in organizational forms, technological capabilities, and

[7] Following Roodman (2009) we report in GMM results the instrument count.

strategies should plausibly lead to persistence also in growth patterns. Using a dataset that spans 50 years for US manufacturing firms, they indeed find evidence of an autoregressive structure of firm-specific growth patterns. Other results that are fairly consistent with this view are discussed in Canarella et al. (2018) and in Fotopoulos and Giotopoulos (2010). In our case, however, the lagged growth rate is associated with negative and (weakly) significant coefficient in all specifications. We have two possible explanations for this. First, the period that we consider (i.e. 2008-2017) includes the Great Recession, which may explain part of the negative autocorrelation effect. In fact, the heterogeneity of the crisis' impact may be consistent with rather erratic patterns in sales growth. Alternatively, persistence in growth rates can be driven by persistence in innovation activities, innovative and quality goods which are in turn associated with different work management strategies. Applying a similar approach in a model that test for the effect of innovation persistence on employment dynamics, Bianchini and Pellegrino (2019) find a negative and statistically significant coefficient associated with the autoregressive term. For comprehensive discussion of the evidence on erratic growth patterns see Geroski (2002).

For what concerns labour productivity, its negative relationship with sales growth can be somewhat counterintuitive.[8] However, previous evidence suggests that measures of production efficiency derived from firms' balance sheets are relatively poor predictors of firm growth. By combining Italian and French data, for instance, Bottazzi et al. (2010) find that the relationship of corporate growth with productivity is weak, if existent at all. Similar results are obtained by the literature that provides an indirect account of the relation between relative productivity levels and firm growth through the decomposition of productivity changes. The latter measures the total sum of the changes in market shares weighted by the firms' initial productivity levels. Taking for granted that the latter is a good measure of the productivity-growth link, all evidence seems to suggest that when existent such link is at best weak, and sometime even perverse. Disney et al. (2003), for instance, running their productivity decomposition exercise on UK data find a negative between effect, i.e. the reallocation of market shares tends to go in favour of less productive firms.

Finally, we find significant effects also for variables related to workers' characteristics. In particular, we find that both worker median age and median working experience have a negative impact on firm growth. Our interpretation is that these two variables play a role similar to firm age, which is often found to be negatively associated with firm's growth. With particular reference to work experience we notice

[8] As a robustness check we carried out the same exercise using total factor productivity as opposed to labour productivity to control for production efficiency. Results do not change.

that the squared term exhibits a positive and statistically significant sign, suggesting that the underlying relations is not linear.

As argued above a potential limitation of the collapsed OLS estimation is that it fails to take adequately into account issues related to unobserved omitted variables. For this reason we run a dynamic panel model with firm fixed effects, whose results are reported in the first four columns of Table 4. We estimated all these models using also random effect estimators and run the Hausman specification test (Hausman, 1978) to compare the two alternatives. The results suggest that the fixed effect model is indeed most appropriate in estimating the growth equation.[9]

[Table 4]

With reference to internal flexibility the result of the collapsed OLS is confirmed: the coefficient is positive and significant in all the estimated models. Instead, external flexibility appears to hamper firm's growth (negative sign), although this effect is statistically significant only in three estimated models out of four. It is important to notice that in this dynamic setting such coefficients capture the effect that a switch towards the related work management practice taking place in time $t - 1$ has on sales growth in time t, once controlled for firm-specific growth trends. Thus, we find that a switch towards internal flexibility increases sales growth by 2.3-4.2%. On the contrary, a switch towards external flexibility reduces sales growth by 1.3-2.1%.

For the control variables, estimated coefficients partially confirm the earlier evidence. In particular, the coefficients associated with the lagged growth rate and labour productivity are both negative and significant. Moreover, in this specification we find additional results for other regressors that are in line with the previous literature. Firm age and size (measured in terms of total labour force) have negative effects on firm growth, whereas profit (measured with the ROI) has a positive impact. Finally, the results for variables that exploit worker-level information are also confirmed. The coefficients of worker median age and median working experience are both negative and significant. The relationship between work experience and sales growth, however, is non-linear as the squared term associated with the former exhibits a positive and statistically significant sign.

As discussed above the fixed effect estimator provides consistent estimates only under the assumption that endogeneity is due to time-invariant omitted variables. As a robustness check, in the last

[9] The results of the random effect estimators are available upon request.

column of Table 4, we relax this assumption and resort to panel-GMM estimation applying the Arellano-Bond estimator. Standard tests for serial correlation and the robust Hansen test for overidentifying restrictions are reported at the bottom of the table. The p-value of the Hansen-J statistic indicates that the test for overidentifying restrictions is satisfactory. Furthermore, we reject the presence of second-order autocorrelation validating the use of suitably lagged endogenous variables as instruments.

With reference to our variable of interests the previous results are confirmed. The use of internal flexibility impacts positively on sales growth. On the contrary, an extensive reliance on external flexibility has a detrimental effect. In this case the magnitude of the two coefficients is +9.8% for internal flexibility and -6% for external flexibility. For the other covariates, only the coefficient associated with productivity and profit remain significant and with the same sign as before.

One potential explanation for the opposite impact of distinct labour flexibility strategies on firm growth is related to the expanding demand for differentiated and customised products, mainly in the intermediate and capital goods markets, which represents an increasing portion of manufacturing output, especially in Emilia Romagna. In such a context cost-based competition plays a relevant, but progressively a much weaker role. Consequently, the market opportunities to exploit the benefits deriving from savings on fixed labour costs, correlated to the external flexibility model, shrink and the likelihood to growth in sales decrease. The opposite occurs for firms that rely on internal flexibility and thus compete primarily on the basis of quality.

To verify the validity of this potential explanation we run a robustness check aimed at isolating firms belonging to sectors that are exposed to particularly high demand volatility and/or characterized by cost-based competition. In particular, we proceed as follows. First of all, we compute for every 2-digits-ATECO industry a seasonality index as the average of percent differences between unadjusted and seasonal adjusted monthly indexes of industrial production. A high value of such index is thus a symptom of high degree of sector specific demand fluctuations. Then, we select the 25% of industries with the highest seasonality index and call them high seasonality (HS), labelling low seasonality (LS) all the others. Similarly, we proceed to distinguish between High-Tech and Low-Tech sectors using Pavitt's (1984) classification as a references, i.e. Pavitt 3 and 4 for the former and Pavitt 1 and 2 for the latter. Finally, we re-estimate the above models with fixed-effect estimators on the subsamples of firms belonging to HS vs. LS sectors, as well as to HS Low-Tech (HSL) vs. LS Low-Tech sectors (LSL). The results are reported in Table 5.

[Table 5]

For most of the variables included in the analysis the estimated effects do not change. The coefficient of internal flexibility is positive and statistically significant in all sectors. For external flexibility, the negative effect that we observed in previous estimations tends instead to disappear in all cases with high demand volatility. In fact, we fail to reject the null hypothesis that the coefficient associated with external flexibility is different from zero in both column (1) and column (3) of Table 3. This result provides support for our interpretation of the negative impact of external flexibility on sales expansion that was outlined above. Future research will take care of identifying the conditions under which such impact can eventually become positive.

8. Conclusion

Flexibility, i.e. the capacity to manage demand uncertainty and the variety of products supplied to the market, is often considered a central feature of contemporary firms. Different methods have been experimented to increase flexibility at firm level. This paper compares two alternative approaches: internal flexibility, i.e. practices that focus on the employees' ability to perform a variety of highly qualified tasks in a context of stable employment relationships; and external flexibility, i.e. practices that align employment and labour costs to firm demand fluctuations by creating a buffer of flexibility based on non-standard employees involved in routine tasks. We empirically verify the impact of both practices on sales growth. We test this hypothesis using a LEED panel of manufacturing firms from the Emilia-Romagna region (Italy).

In sum, our results show that, while internal flexibility positively affects firm growth, external flexibility appears to hamper it. Such a negative effect, however, decreases when we limit the analysis to industries characterized by high volatility of demand and cost-based competition.

These results have interesting policy implications, especially in relation to the debate on labour market reforms. In particular, the empirical evidence gained in this work suggests that the emphasis usually put on labour market liberalization as a tool to increase competitiveness and foster business growth appears misplaced. In contexts of market uncertainty and increasing demand differentiation, sales growth is correlated with managerial practices that strengthen employee engagement, favour human capital accumulation and create incentives for sustained increase in the quality of productions. These objectives can be pursued only if the employment relationship takes a long-time horizon, so as to favour

firm-specific investments in activities that enhance firm's capabilities, such as training and skill acquisition.

With specific reference to managers, our results suggest that if external flexibility appears an advantageous alternative in terms of cost reduction and ability to adapt to the economic cycle, it does not result to be the right approach for growth-oriented firms. On the contrary, the latter should focus on practices that support internal flexibility and the upgrading of product quality. Although costly in the short term, such practices provide better chances of creating sustained competitive advantages, thus favouring firm growth.

References

Andreoni, A. and Chang, H.J. (2016) Industrial policy and the future of manufacturing. Economia e Politica Industriale 43(4): 491-502.

Appelbaum, E., Bailey, T.A., Berg, P.B., Kalleberg. AL.L. (2000) Manufacturing advantage: Why high-performance work systems pay off. New York: Cornell University Press.

Arellano, M. and Bond, S. (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies, 58(2), 277-297.

Arrighetti, A., Bartoloni, E., Landini, F., Pollio, C. (2019) Exuberant proclivity towards non-standard employment: evidence from linked employer-employee data. Economics Department Working Papers 2019-EP02, University of Parma.

Arvanitis, S. (2005) Modes of labor flexibility at firm level: Are there any implications for performance and innovation? Evidence for the Swiss economy. Industrial and Corporate Change 14(6): 993–1016.

Atkinson, J. (1984) Manpower strategies for flexible organizations. Personnel Management, 16(8): 28–31.

Atkinson, J. (1985) Flexibility: planning for an uncertain future. Manpower Policy and Practice 1(1): 26–29.

Atkinson, J. (1987) Flexibility or fragmentation? The United Kingdom labor market in the eighties. Labor and Society 12(l): 87–105.

Audretsch, D. B., Coad, A. and Segarra, A. (2014) 'Firm growth and innovation,' Small business economics, 43(4), 743-749.

Bailey, T., Berg, P. and Sandy, C. (2001) The effect of high-performance work practices on employee earnings in the steel, apparel, and medical electronics and imaging industries. Industrial & Labor Relations Review, 54(2A), 525-543.

Bardazzi, R. and Duranti, D. (2016) Atypical work: a threat to labour productivity growth? Some evidence from Italy. International Review of Applied Economics 30(5): 620–643.

Bartelsman, E. J., and Doms, M. (2000) 'Understanding productivity: Lessons from longitudinal microdata.' Journal of Economic literature, 38(3), 569-594.

Bartoloni, E., Arrighetti, A., Landini, F. (2020) Firm survival during economic downturns: is selecton based on cleansing or skill accumulation?. Small Business Economics, forthcoming.

Battisti, M., Vallanti, G. 2013. Flexible wage contracts, temporary jobs, and firm performance: Evidence from Italian firms. Industrial Relations: A Journal of Economy and Society, 52(3): 737–764.

Becchetti, L. and Trovato, G. (2002) 'The determinants of growth for small and medium sized firms. The role of the availability of external finance,' Small Business Economics, 19(4), 291-306.

Benito, A. and Hernando, I. (2008) Labour demand, flexible contracts and financial factors: firm-level evidence from Spain. Oxford Bulletin of Economics and Statistics, 70(3), 283-301.

Bianchini, S., Bottazzi, G., Tamagni, F. (2017). What does (not) characterize persistent corporate high-growth?. Small Business Economics, 48(3), 633-656.

Bianchini, S., Pellegrino, G. and Tamagni, F. (2018) Innovation complementarities and firm growth. Industrial and Corporate Change, 27(4), 657-676.

Boeri, T. and Garibaldi, P. (2007) Two tier reforms of employment protection: a honeymoon effect? Economic Journal 117(521): F357–85.

Bottazzi, G., Cefis, E. and Dosi, G. (2002) 'Corporate growth and industrial structure: some evidence from the Italian manufacturing industry,' Industrial and Corporate Change, 11(4), 705-723.

Bottazzi, G., Dosi, G., Jacoby, N., Secchi, A. and Tamagni F. (2010) 'Corporate performances and market selection: some comparative evidence,' Industrial and Corporate Change, 19(6), 1953-1996.

Bottazzi, G., Secchi, A., and Tamagni, F. (2006) 'Financial fragility and growth dynamics of Italian business firms.' LEM Working Paper Series (No. 2006/07).

Brusco, S. (1982) The Emilian model: productive decentralisation and social integration. Cambridge journal of economics, 6(2), 167-184.

Bugamelli, M., Lotti, F., Amici, M., Ciapanna, E., Colonna, F., D'Amuri, F., Giacomelli, S., Linarello, A., Manaresi, F., Palumbo, G., Scoccianti, F., Sette, E. (2018). Productivity growth in Italy: a tale of a slow-motion change. Quaderni di Economia e Finanza – Banca d'Italia, 422.

Canarella, G., and Miller, S. M. (2018). The determinants of growth in the US information and communication technology (ICT) industry: A firm-level analysis. Economic Modelling, Vol. 70, pp. 259-271.

Cappelli, P. and Keller, J.H. (2013) Classifying work in the new economy. Academy of Management Review 38(4): 575-596.

Cappelli, P., and Neumark, D. (2001) External job churning and internal job flexibility. NBER Working Paper No. 8111.

Caroli, E., Gautié, J., Lloyd, C., Lamanthe, A., and James, S. (2010). Delivering flexibility: Contrasting patterns in the French and the UK food processing industry. British Journal of Industrial Relations, 48(2), 284-309.

Coad, A. (2009) The growth of firms: a survey of theories and empirical evidence. Edward Elgar Publishing: Cheltenham, UK.

Combs, J., Liu, Y., Hall, A., and Ketchen, D. (2006) How much do high-performance work practices matter? A meta-analysis of their effects on organizational performance. Personnel Psychology, 59(3), 501-528.

Damiani, M., Pompei, F. and Ricci, A. (2016) Temporary employment protection and productivity growth in EU economies. International Labour Review 155(4): 587-622.

de Matos, A. D., and Parent, D. (2016) Which firms create fixed-term employment? Evidence from Portugal. Labour Economics, 41, 348-362.

Del Monte, A., and Papagni, E. (2003) "R&D and the growth of firms: empirical analysis of a panel of Italian firms," Research policy, 32(6), 1003-1014.

Delaney, J.T., and Huselid, M.A. (1996) "The Impact of Human Resource Management Practices on Perceptions of Organizational Performance," Academy of Management Journal, 39, 949–969.

Di Caro, P., Nicotra, G. (2016) Short, Long and Spatial Dynamics of Informal Employment, Regional Studies, Vol. 50 Issue 11, pp. 1804-1818.

Disney, R., Haskel, J., and Heden, Y. (2003) Entry, exit and establishment survival in UK manufacturing. Journal of Industrial Economics, 51(1), 91-112.

Dobbs, M. and Hamilton, R. T. (2007) 'Small business growth: recent evidence and new directions,' International journal of entrepreneurial behavior & research, 13(5), 296-322.

Dosi, G., Grazzi, M., Moschella, D., Pisano, G., and Tamagni, F. (2020). Long-term firm growth: an empirical analysis of US manufacturers 1959–2015. Industrial and Corporate Change, Vol. 29 Issue 2, pp. 309-332.

Eurofound (2010) Very a-typical Work: Exploratory Analysis of Fourth European Working Conditions Survey. Dublin: European Foundation for the Improvement of Living and Working Conditions, p. 34.

Foster, L., Haltiwanger, J. and Krizan C. (1998) 'Aggregate productivity growth: lessons from microeconomic evidence,' NBER Working Paper No. 6803.

Fotopoulos, G., and Giotopoulos, I. (2010). Gibrat's law and persistence of growth in Greek manufacturing. Small Business Economics, Vol. 35 Issue 2, pp. 191-202.

Geroski, P.A., 2002. The growth of firms in theory and in practice. Competence, Governance, and Entrepreneurship – Advances in Economic Strategy Research. Oxford and New York: Oxford University Press.

Geroski, P. A., and Gugler, K. (2004) 'Corporate growth convergence in Europe,' Oxford Economic Papers, 56(4), 597-620.

Gibrat, R. (1931) Les inègalitès èconomiques, Librairie du Recuil Sirey, Paris.

Gramm, C.L. and Schnell, J.F. (2001) "The Use of Flexible Staffing Arrangements in Core Production Jobs," Industrial & Labor Relations Review, 54, 2, 245–258.

Grazzi, M., Piccardo, C., Vergari, C. (2018). Building a firm level dataset for the analysis of industrial dynamics and demography. Journal of Economic and Social Measurement, 43(3-4), 169-197.

Grazzi, M. and Moschella, D. (2018) 'Small, young, and exporters: New evidence on the determinants of firm growth,' Journal of Evolutionary Economics, 28(1), 125-152.

Groot, W. and Van Den Brink, H.M. (2000) "Education, Training and Employability", Applied Economics, 32, 573–581.

Hausman, J. A. (1978) Specification tests in econometrics. Econometrica, 1251-1271.

Huang, H.J. and Cullen, J.B. (2001) "Labour Flexibility and Related HRM Practices: A Study of Large Taiwanese Manufacturers," Canadian Journal of Administrative Sciences, 18, 1, 33–39.

Hunter, L., McGregor, A., MacInnes, J., and Sproull. A. (1993), The ''flexible firm'': strategy and segmentation. British Journal of Industrial Relations, 31(3): 383–407.

Ichniowski, C., and Shaw, K. (1999) The effects of human resource management systems on economic performance: An international comparison of US and Japanese plants. Management Science, 45(5), 704-721.

Istat (2020), Conti economici territoriali - Anni 2016-2018, Roma.

Kalleberg, A. L., Reynolds, J., and Marsden, P. V. (2003) Externalizing employment: flexible staffing arrangements in US organizations. Social Science Research, 32(4), 525-552.

Kalleberg, A. L. (2001) Organizing flexibility: the flexible firm in a new century. British Journal of Industrial Relations 39(4): 479-504.

Kalleberg, A. L. and Moody, J. W. (1994) `Human resource management and organizational performance'. American Behavioral Scientist, 37: 948-62.

Keune, M. (2013) Trade union responses to precarious work in seven European countries. International Journal of Labour Research 5(1): 59.

Kleinknecht, A., van Schaik, F.N. and Zhou, H. (2014) Is flexible labour good for innovation? Evidence from firm-level data. Cambridge journal of economics 38(5): 1207-1219.

Kleinknecht, A., Oostendorp, R., Menno, P. and Naastepad. C. W. M. (2006) Flexible labour, firm performance and the Dutch job creation miracle. International Review of Applied Economics 20(2): 171-187.

Lafontaine, F., Slade, M. (2007) Vertical integration and firm boundaries: The evidence. Journal of Economic literature, 45(3), 629-685.

Lee, C.Y. (2010) 'A theory of firm growth: learning capability, knowledge threshold, and patterns of growth,' Research Policy, 39(2): 278-289.

Lepak, D. P., Takeuchi, R. and Snell, S.A. (2003) Employment flexibility and firm performance: examining the interaction effects of employment mode, environmental dynamism, and technological intensity. Journal of Management 29(5): 681-703.

Lotti, F., Santarelli, E. and Vivarelli, M. (2003) 'Does Gibrat's Law hold among young, small firms?' Journal of Evolutionary Economics, 13(3), 213-235.

MacDuffie, J.P. (1995) "Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry," Industrial & Labor Relations Review, 48, 197–221.

Matusik, S. F. and Hill, C. W. (1998) The utilization of contingent work, knowledge creation, and competitive advantage. Academy of management review, 23(4), 680-697.

McGrath, R. G. (2013) The end of competitive advantage: how to keep your strategy moving as fast as your business. Boston, MA: Harvard Business Review Press.

Michie, J. and Sheehan-Quinn, M. (2001) Labour market flexibility, human resource management and corporate performance. British Journal of Management, 12(4), 287-306.

Musso, P. and Schiavo, S. (2008) 'The impact of financial constraints on firm survival and growth,' Journal of Evolutionary Economics, 18(2), 135-149.

Navaretti, G. B., Castellani, D. and Pieri, F. (2014) 'Age and firm growth: evidence from three European countries,' Small Business Economics, 43(4), 823-837.

Oliveira, B. and Fortunato, A. (2006) 'Firm growth and liquidity constraints: a dynamic analysis,' Small Business Economics, 27(2-3), 139-156.

Oliveira, B. and Fortunato, A. (2017) 'Firm growth and R&D: Evidence from the Portuguese manufacturing industry,' Journal of Evolutionary Economics, 27(3), 613-627.

Pavitt, K. (1984) Sectoral patterns of technical change: towards a taxonomy and a theory. Research policy, 13(6), 343-373.

Pieri, F. (2017) 'Vertical organization of production and firm growth,' Industrial and Corporate Change, 27(1), 83-106.

Piore, M. J. and Sabel, C.C. (1985) The second industrial divide: possibilities for prosperity. New York: Basic Books.

Portugal, P. and Varejão, J. (2010) The hidden side of temporary employment: Fixed-term contracts as a screening device. Banco de Portugal, Economics and Research Department.

Preenen, P. T., Vergeer, R., Kraan, K. and Dhondt, S. (2017) Labour productivity and innovation performance: The importance of internal labour flexibility practices. Economic and Industrial Democracy, 38(2), 271-293.

Roca-Puig, V., Beltrán-Martín, I., Bou-Llusar, J. C. and Escrig-Tena, A. B. (2008) External and internal labour flexibility in Spain: a substitute or complementary effect on firm performance?. International Journal of Human Resource Management, 19(6), 1131-1151.

Roodman, D. (2009) A note on the theme of too many instruments. Oxford Bulletin of Economics and statistics, 71(1), 135-158.

Rovigatti, G. and Mollisi, V. (2018) Theory and practice of total-factor productivity estimation: The control function approach using Stata. The Stata Journal, 18(3), 618-662.

Smith, V. (1997) New forms of work organization. Annual Review of Sociology 23(1): 315–39.

Szirmai, A., Naudé, W. and Alcorta, L. (2013) Pathways to industrialization in the twenty-first century: new challenges and emerging paradigms. Oxford: Oxford University Press.

Valverde, M., Tregaskis, O. and Brewster, C. (2000) Labor flexibility and firm performance. International advances in economic research 6(4): 649-661.

Volberda, H. W. (1998) Building the flexible firm. Oxford: Oxford University Press

Way, S.A. (2002) "High Performance Work Systems and Intermediate Indicators of Firm Performance Within the US Small Business Sector," Journal of Management, 28, 765–785.

Zhou, H., Dekker, H. and Kleinknecht, A. (2011) Flexible labor and innovation performance: evidence from longitudinal firm-level data. Industrial and Corporate Change, 20(3): 941-968.

Figures and Tables

Figure 1 - Flexible labour utilization strategies over time

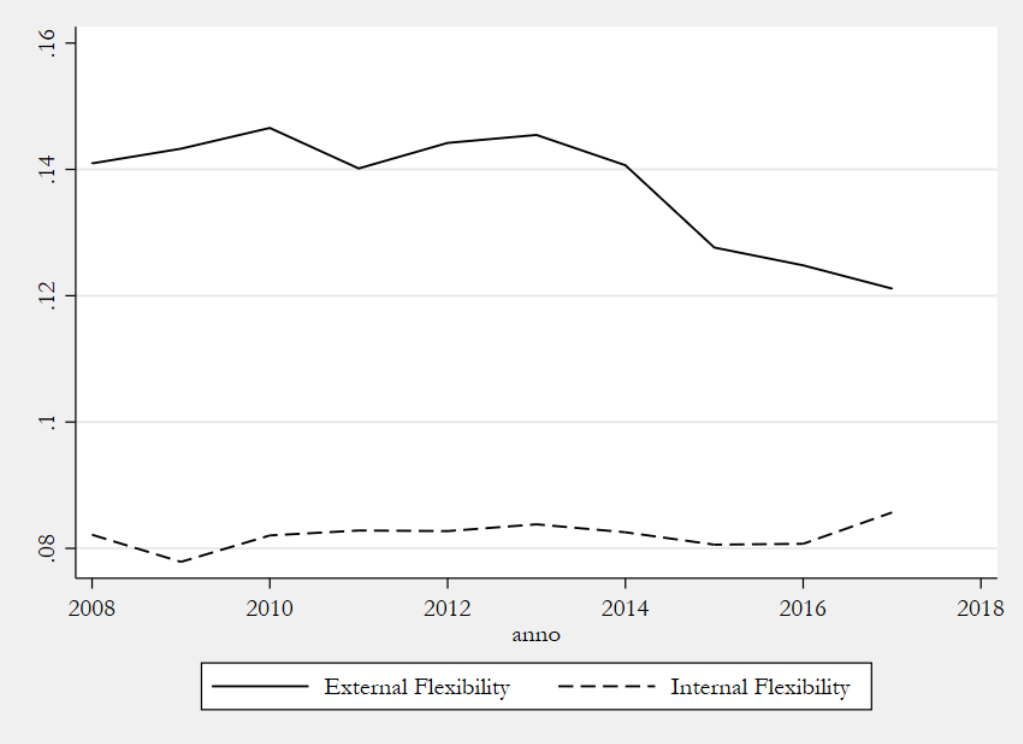
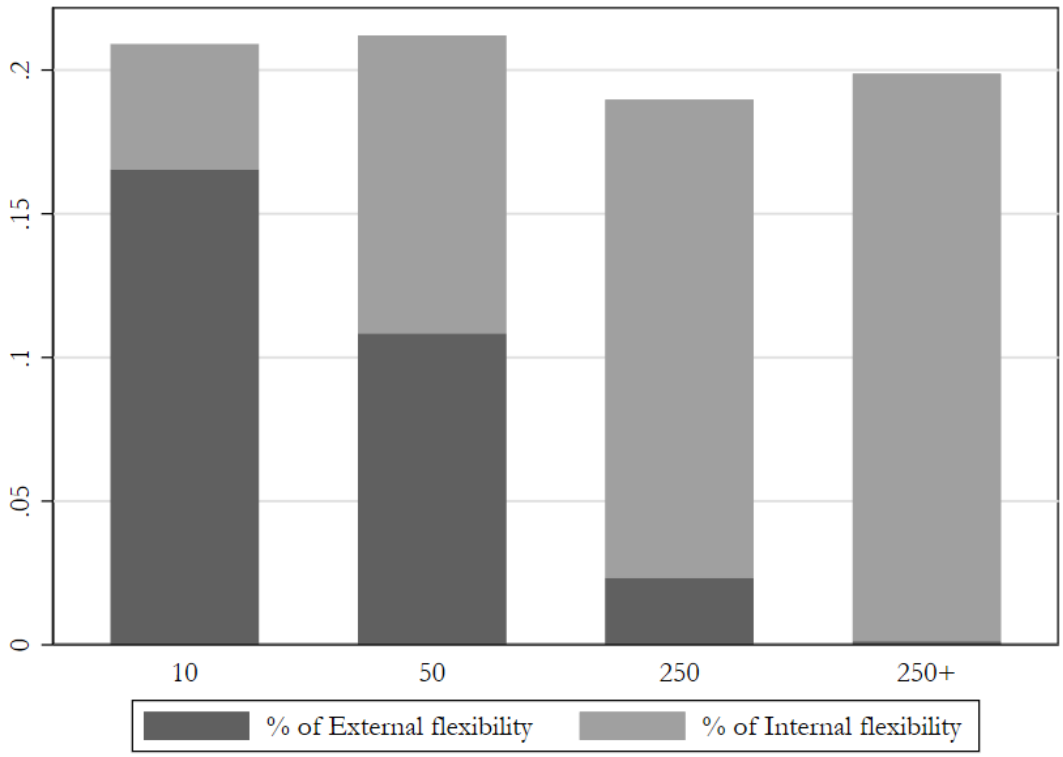
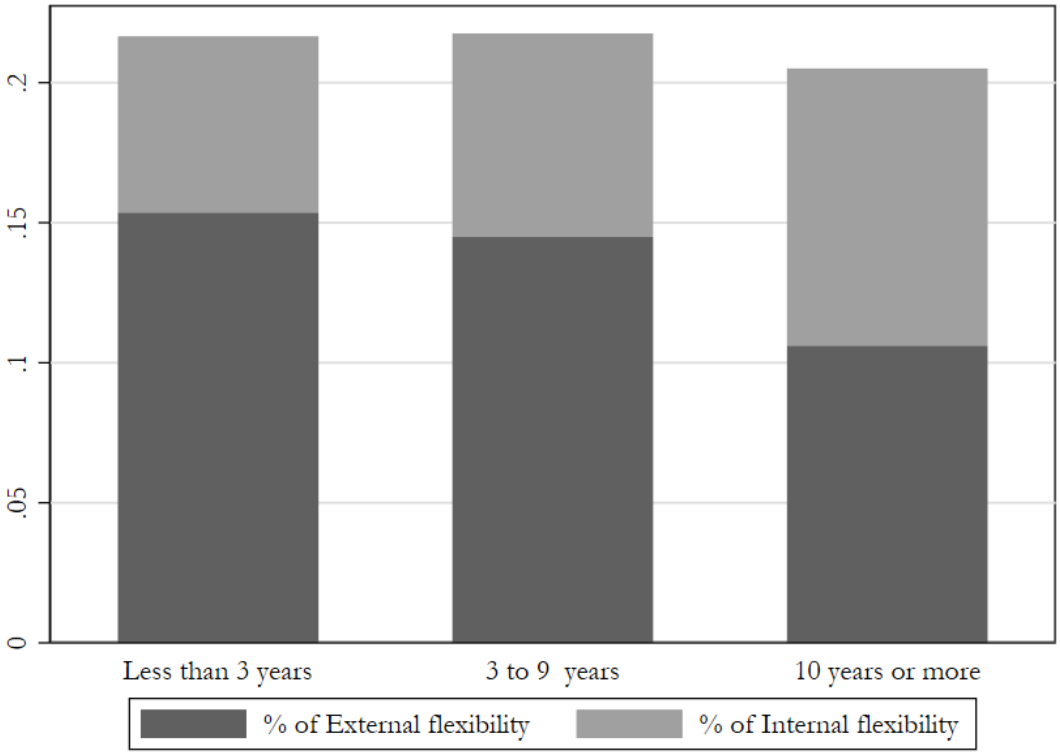


Figure 2 – Flexible labour utilization strategies: comparison across size classes



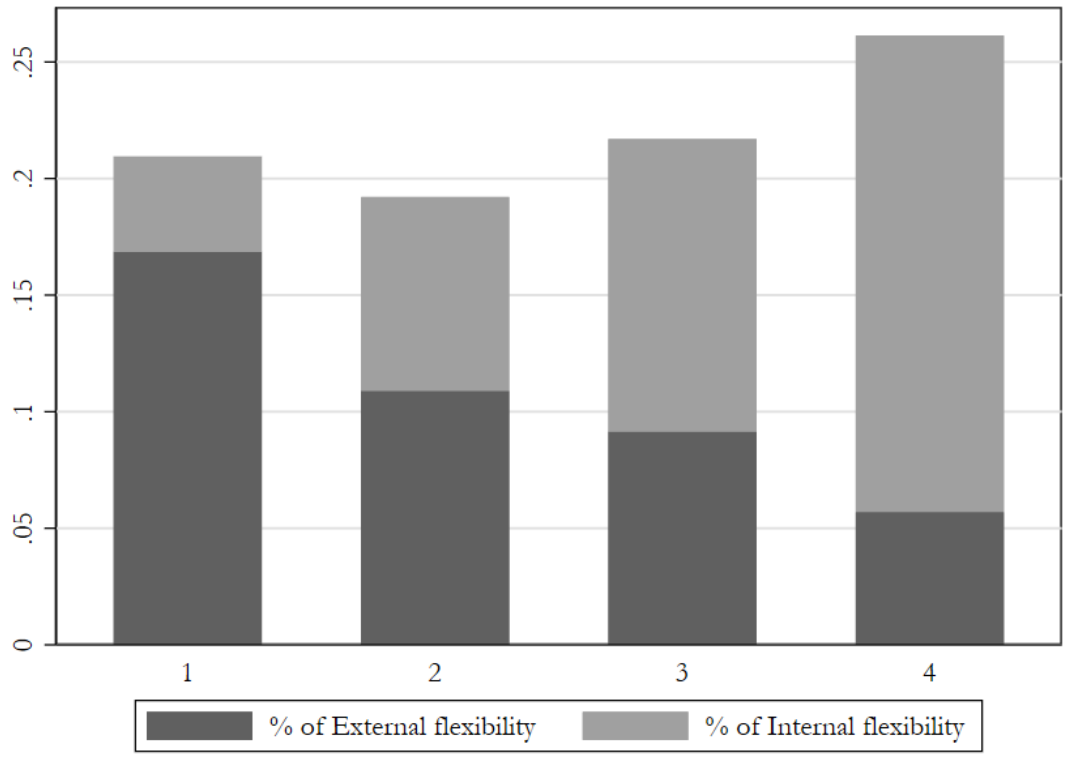
Note: share of firms adopting internal flexibility and external flexibility across different size classes (i.e. less than 10 employees, between 10 and 50, between 50 and 150, above 250). The adoption of internal (external) flexibility is more (less) common in firms of larger size.

Figure 3 – Flexible labour utilization strategies: comparison across age classes



*Note***:** share of firms adopting internal flexibility and external flexibility across different size classes (i.e. less than 3 years, between 3 and 10, above 10). The adoption of internal (external) flexibility is more (less) common in older firms.

Figure 4 – Flexible labour utilization strategies: comparison across Pavitt industries



*Note***:** share of firms adopting internal flexibility and external flexibility across different pavitt secors (i.e. 1 supplier dominated, 2 scale-intensive, 3 specialized suppliers, 4 science based). The adoption of internal (external) flexibility is more (less) common among industries classified as science based and specialized supplierscompared to scale-intensive and supplier dominated industries .

Figure 5 – Market shares evolution over time by flexibility types

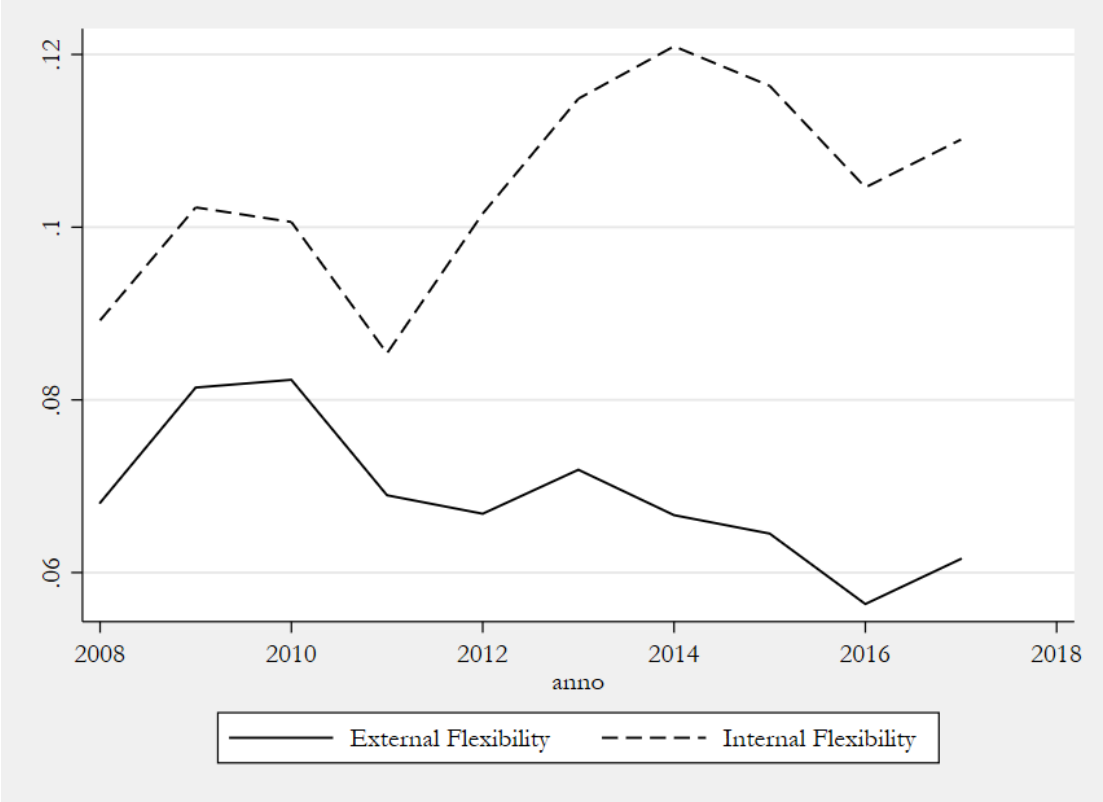


Table 1 – Descriptive statistics: different labour utilization strategies

	(1) All		(2) Internal flex		(3) External flex		(4) Others		F-Test
Variable	**Mean**	**S.d.**	**Mean**	**S.d.**	**Mean**	**S.d.**	**Mean**	**S.d.**	
Value added (ln)	6.85	1.44	7.66	1.37	6.31	1.23	6.86	1.44	***
Labour productivity	78.63	118.35	88.90	65.16	70.81	85.55	78.92	127.22	***
Total employment (FTE)	33.93	68.53	57.10	95.65	16.30	24.08	34.58	69.56	***
Firm age	21.10	14.82	24.84	15.59	18.13	14.16	21.22	14.75	***
ROI	0.10	1.59	0.12	0.23	0.06	0.11	0.10	1.80	*
Outsourcing	0.25	0.12	0.25	0.10	0.27	0.14	0.25	0.12	***
Worker median age	39.11	6.10	40.29	5.53	38.29	6.18	39.12	6.12	***
Median working experience	5.24	3.72	6.27	3.36	3.92	3.06	5.36	3.80	***
% Non-standard contract	0.13	0.15	0.05	0.04	0.25	0.17	0.12	0.14	***
% Graduates	0.04	0.09	0.12	0.13	0.00	0.01	0.04	0.08	***
Value added over sales	0.31	0.15	0.39	0.12	0.22	0.08	0.32	0.15	***

Note: significance levels: * 10%, ** 5%, *** 1%.

Table 2 – Total turnover by flexibility types (millions of Euro)

Year	Internal Flexibility	Others	External Flexibility	Total sales
2008	4.7	44.8	3.6	53.1
2009	4.6	36.8	3.7	45.1
2010	5.1	41.7	4.2	51
2011	4.9	48.5	3.9	57.3
2012	5.8	47.8	3.8	57.4
2013	7.1	50	4.4	61.5
2014	7.7	51.5	4.2	63.4
2015	7.3	51.7	4.1	63.1
2016	6.8	54.6	3.7	65.1
2017	7.8	59	4.4	71.2

Table 3 – Flexible labour utilization strategies and firm growth: collapsed OLS across sub-periods

Dependent variable is G_t	**(1) Collapsed OLS**	**(2) Collapsed OLS**	**(3) Collapsed OLS**	**(4) Collapsed OLS**
G_{t-1}	-0.0234*	-0.0230*	-0.0233*	-0.0228*
	(0.0136)	(0.0137)	(0.0136)	(0.0137)
Internal flexibility $_{t-1}$	0.0209***	0.0235**	0.0198**	0.0162**
	(0.0076)	(0.0092)	(0.0080)	(0.0071)
External flexibility $_{t-1}$	0.0043	0.0022	0.0055	0.0092
	(0.0073)	(0.0074)	(0.0084)	(0.0084)
Labour Productivity $_{t-1}$	-0.0107**	-0.0103**	-0.0108**	-0.0101**
	(0.0046)	(0.0047)	(0.0046)	(0.0046)
Total employment (ln) $_{t-1}$	-0.0018	-0.0009	-0.0016	-0.0016
	(0.0020)	(0.0021)	(0.0020)	(0.0019)
Firm age (ln) $_{t-1}$	-0.0009	-0.0008	-0.0009	-0.0008
	(0.0027)	(0.0027)	(0.0027)	(0.0027)
ROI $_{t-1}$	0.0215	0.0198	0.0221	0.0132
	(0.0230)	(0.0226)	(0.0232)	(0.0220)
Outsourcing (ln) $_{t-1}$	0.0018	0.0020	0.0019	0.0018
	(0.0052)	(0.0052)	(0.0052)	(0.0052)
Worker median age $_{t-1}$	-0.0013***	-0.0013***	-0.0013***	-0.0013***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Median working experience $_{t-1}$	-0.0099***	-0.0101***	-0.0100***	-0.0099***
	(0.0014)	(0.0015)	(0.0014)	(0.0013)
Median working experience^2 $_{t-1}$	0.0005***	0.0005***	0.0005***	0.0005***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
% Graduates > Median $_{t-1}$ (d)		-0.0054		
		(0.0066)		
% Non-standard > Median $_{t-1}$ (d)			0.0022	
			(0.0053)	
Val.Add. / Sales (ln) > Median $_{t-1}$ (d)				0.0096*
				(0.0050)
Constant	0.0303	0.0286	0.0286	0.0226
	(0.0360)	(0.0362)	(0.0351)	(0.0366)
Industry dummies	Yes	Yes	Yes	Yes
Municipality dummies	Yes	Yes	Yes	Yes
N	4213	4213	4213	4213
R^2	0.129	0.129	0.129	0.130

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4 – Flexible labour utilization strategies and firm growth: dynamic panel and Arellano-Bond

Dependent variable is G_t	**(1) FE**	**(2) FE**	**(3) FE**	**(4) FE**	**(5) AB**
G_{t-1}	-0.1565***	-0.1562***	-0.1563***	-0.1534***	-0.0002
	(0.0111)	(0.0111)	(0.0111)	(0.0111)	(0.0343)
Internal flexibility $_{t-1}$	0.0368***	0.0415***	0.0340***	0.0226**	0.0980***
	(0.0090)	(0.0094)	(0.0090)	(0.0089)	(0.0286)
External flexibility $_{t-1}$	-0.0164***	-0.0207***	-0.0131**	-0.0032	-0.0597***
	(0.0060)	(0.0065)	(0.0063)	(0.0061)	(0.0219)
Labour Productivity $_{t-1}$	-0.2345***	-0.2349***	-0.2339***	-0.2438***	-0.8030***
	(0.0185)	(0.0185)	(0.0185)	(0.0190)	(0.269)
Total employment (ln) $_{t-1}$	-0.2392***	-0.2372***	-0.2378***	-0.2447***	0.4680
	(0.0169)	(0.0170)	(0.0170)	(0.0172)	(0.513)
Firm age (ln) $_{t-1}$	-0.0512***	-0.0512***	-0.0513***	-0.0493***	-0.4660
	(0.0110)	(0.0110)	(0.0110)	(0.0111)	(0.387)
ROI $_{t-1}$	0.4073***	0.4070***	0.4077***	0.3984***	0.7990**
	(0.0698)	(0.0700)	(0.0697)	(0.0726)	(0.398)
Outsourcing (ln) $_{t-1}$	-0.0212	-0.0209	-0.0209	-0.0184	0.4060
	(0.0145)	(0.0145)	(0.0145)	(0.0146)	(0.641)
Worker median age $_{t-1}$	-0.0034***	-0.0035***	-0.0034***	-0.0034***	-0.0713
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0858)
Median working experience $_{t-1}$	-0.0144***	-0.0146***	-0.0147***	-0.0143***	0.0344
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0545)
Median working experience^2 $_{t-1}$	0.0006***	0.0006***	0.0006***	0.0005***	-0.0075
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0146)
% Graduates > Median $_{t-1}$ (d)		-0.0150*			
		(0.0081)			
% Non-standard > Median $_{t-1}$ (d)			0.0074		
			(0.0046)		
Val.Add. / Sales (ln) > Median $_{t-1}$ (d)				0.0419***	
				(0.0081)	
Constant	1.7295***	1.7323***	1.7198***	1.7592***	
	(0.1015)	(0.1017)	(0.1023)	(0.1034)	
Time dummies	Yes	Yes	Yes	Yes	Yes
N	34634	34634	34634	34634	29278
R^2	0.141	0.141	0.141	0.143	
No. of instruments					31
AR1 (p-value)					0.000

AR2 (p-value)					0.271
Hansen-J (p-value)					0.143
Hausman	$Chi^2(18)$ = 3731.86***	$Chi^2(19)$ = 3743.26***	$Chi^2(19)$ = 3739.77***	$Chi^2(19)$ = 3838.73***	

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. We also report p-values of the Arellano-Bond test for first- and second-order serial correlation, AR(1) and AR(2), together with the p-value for the robust Hansen test for overidentifying restrictions for instruments validity.

Table 5 – Flexible labour utilization strategies, firm growth and demand seasonality

Dependent variable is G_t	**(1)** **FE - HS**	**(2)** **FE - LS**	**(3)** **FE - HSL**	**(4)** **FE - LSL**
G_{t-1}	-0.1289***	-0.1603***	-0.1678***	-0.1339***
	(0.0322)	(0.0113)	(0.0364)	(0.0146)
Internal flexibility $_{t-1}$	0.0524**	0.0338***	0.0548**	0.0351**
	(0.0209)	(0.0100)	(0.0216)	(0.0153)
External flexibility $_{t-1}$	0.0016	-0.0209***	-0.0037	-0.0177**
	(0.0149)	(0.0065)	(0.0161)	(0.0081)
Labour Productivity $_{t-1}$	-0.1609***	-0.2552***	-0.1336**	-0.2530***
	(0.0527)	(0.0204)	(0.0595)	(0.0335)
Total employment (ln) $_{t-1}$	-0.2034***	-0.2502***	-0.2355***	-0.2308***
	(0.0516)	(0.0178)	(0.0519)	(0.0266)
Firm age (ln) $_{t-1}$	-0.0623**	-0.0473***	-0.0762***	-0.0409***
	(0.0262)	(0.0120)	(0.0285)	(0.0128)
ROI $_{t-1}$	0.4255	0.4068***	0.4135	0.5541***
	(0.2634)	(0.0709)	(0.2933)	(0.1592)
Outsourcing (ln) $_{t-1}$	-0.0475	-0.0182	-0.0583	-0.0207
	(0.0574)	(0.0140)	(0.0598)	(0.0187)
Worker median age $_{t-1}$	-0.0069**	-0.0025***	-0.0070**	-0.0013
	(0.0029)	(0.0009)	(0.0031)	(0.0011)
Median working experience $_{t-1}$	-0.0147***	-0.0144***	-0.0150***	-0.0121***
	(0.0043)	(0.0015)	(0.0045)	(0.0019)
Median working experience^2 $_{t-1}$	0.0002	0.0007***	0.0001	0.0005***
	(0.0003)	(0.0001)	(0.0003)	(0.0001)
Constant	1.3741***	1.8275***	1.3771***	1.7016***
	(0.2632)	(0.1114)	(0.2970)	(0.1709)
			-0.1678***	-0.1339***
Time dummies	Yes	Yes	Yes	Yes
N	5841	28793	5196	16530
R^2	0.081	0.160	0.095	0.149

Robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A.1 – Temporal distribution of the sample

Year	Freq.	Percent	Cum.
2009	3,685	9.34	9.34
2010	3,914	9.92	19.26
2011	4,082	10.35	29.61
2012	4,228	10.72	40.32
2013	4,389	11.12	51.45
2014	4,562	11.56	63.01
2015	4,726	11.98	74.99
2016	4,905	12.43	87.42
2017	4,964	12.58	100.00
Total	39,455	100.00	

Table A.2 – Distribution of firms across industries, 2011

Ateco 2 digit code	***SILER* & *AIDA* cleaned sample**		***ASIA* Census Sample**	
	N.	**%**	**N.**	**%**
10 - Manufacture of food products	386	9.46	4,896	12.57
11 - Manufacture of beverages	34	0.83	152	0.39
12 - Manufacture of tobacco products	0	0.00	0	0.00
13 - Manufacture of textiles	47	1.15	1,102	2.83
14 - Manufacture of wearing apparel	146	3.58	3,692	9.48
15 - Manufacture of leather and related products	63	1.54	687	1.76
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	70	1.71	1,967	5.05
17 - Manufacture of paper and paper products	65	1.59	336	0.86
18 - Printing and reproduction of recorded media	117	2.87	1,337	3.43
19 - Manufacture of coke and refined petroleum products	4	0.1	9	0.02
20 - Manufacture of chemicals and chemical products	128	3.14	450	1.15
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	16	0.39	27	0.07
22 - Manufacture of rubber and plastic products	220	5.39	1,029	2.64
23 - Manufacture of other non-metallic mineral products	183	4.48	1,556	3.99
24 - Manufacture of basic metals	71	1.74	330	0.85
25 - Manufacture of fabricated metal products, except machinery and equipment	981	24.03	6,997	17.96
26 - Manufacture of computer, electronic and optical products	121	2.96	703	1.8
27 - Manufacture of electrical equipment	176	4.31	1,046	2.68
28 - Manufacture of machinery and equipment	855	20.95	4,590	11.78
29 - Manufacture of motor vehicles, trailers and semi-trailers	79	1.94	310	0.8
30 - Manufacture of other transport equipment	27	0.66	256	0.66
31 - Manufacture of furniture	84	2.06	1,201	3.08
32 - Other manufacturing	95	2.33	2,134	5.48
33 - Repair and installation of machinery and equipment	114	2.79	4,157	10.67
Total	4,082	100	38,964	100

Table A.3 – Variables description

ID	Variable	
1	G (Sales Growth)	Firm's sales growth rate (%) normalised by yearly industry mean.
2	Internal flexibility (d)	Dummy variable equal to 1 when firm has: i) share of graduate employees larger than the yearly industry median; ii) share of non-standard employment lower than the yearly industry median; iii) valued added over sales ratio larger than the yearly industry median. 0 otherwise.
3	External flexibility (d)	Dummy variable equal to 1 when firm has: i) share of graduate employees lower than the yearly industry median; ii) share of non-standard employment higher than the yearly industry median; iii) valued added over sales ratio lower than the yearly industry median. 0 otherwise.
4	% Graduates	Number of graduate employees over total number of employees.
5	% Non-standard	Number of employees with non-standard labour contracts over total number of employees
6	Value added over sales	Ration between value-added and total sales
7	Labour productivity (ln)	Natural logarithm of firm's labour productivity, calculated as Value-added/employment ratio.
8	Total employment	Nautral logarithm of firm's total labour force expressed in terms of FTE units of labour.
9	Firm age	Natural logarithm of the number of years since firm's establishment.
10	ROI	Return On Investments (natural logarithm) normalised by yearly industry mean.
11	Outsourcing (share on total production costs)	Natural logarithm of the share of expenditures for services on the total production costs.
12	Median age	Median age of firm's employees as difference from the median age of the industry on a yearly basis.
13	Median working experience	Median number of working experience of firm's employees as difference from the median of the industry on a yearly basis.

Table A.4 – Variable correlation matrix

ID	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	G (Sales Growth)	1												
2	Internal flexibility (d)	-0.0248*	1											
3	External flexibility (d)	0.0543*	-0.1191*	1										
4	% Graduates > Median t – 1 (d)	0.0082	0.3709*	-0.3212*	1									
5	% Non-standard > Median t – 1 (d)	0.0880*	-0.2957*	0.4028*	0.0984*	1								
6	Val.Add. / Sales (ln) > Median t – 1 (d)	-0.0255*	0.3025*	-0.3940*	-0.0507*	-0.0222*	1							
7	Labour productivity (ln)	0.1033*	0.0862*	-0.0629*	0.1816*	0.0360*	0.0539*	1						
8	Total employment (F.T. equivalent on yearly basis, ln)	0.0076	0.1576*	-0.1475*	0.4759*	0.1323*	0.0249*	0.1763*	1					
9	Firm age (ln)	-0.1830*	0.0683*	-0.0816*	0.1140*	-0.0583*	0.0231*	0.1752*	0.2528*	1				
10	ROI	-0.0959*	0.0042	-0.0096*	-0.0043	-0.0015	0.0269*	0.0374*	-0.0042	0.0041	1			
11	Outsourcing (share on total production costs)	-0.0183*	0.0160*	0.0178*	-0.0310*	-0.0018	0.0136*	-0.0886*	-0.1044*	-0.0396*	0.0116*	1		
12	Median age	-0.0533*	0.0597*	-0.0465*	-0.0319*	-0.1371*	0.0267*	0.0111*	0.0361*	0.1302*	-0.0011	-0.0122*	1	
13	Median working experience	-0.1362*	0.0841*	-0.1399*	-0.0690*	-0.3165*	0.0606*	0.0469*	0.0450*	0.4347*	0.0081	-0.0219*	0.3429*	1

Note: significance levels: * 5%.