



UNIVERSITÀ DI PARMA

ARCHIVIO DELLA RICERCA

University of Parma Research Repository

Exuberant Proclivity Toward Non-Standard Employment: Evidence from Linked Employer-Employee Data

This is the peer reviewed version of the following article:

Original

Exuberant Proclivity Toward Non-Standard Employment: Evidence from Linked Employer-Employee Data / Arrighetti, Alessandro; Landini, Fabio; Pollio, Chiara; Bartoloni, Eleonora. - In: INDUSTRIAL & LABOR RELATIONS REVIEW. - ISSN 0019-7939. - 75:4(2022), pp. 1024-1053. [10.1177/00197939211009515]

Availability:

This version is available at: 11381/2890758 since: 2024-12-23T15:50:16Z

Publisher:

Cornell University

Published

DOI:10.1177/00197939211009515

Terms of use:

Anyone can freely access the full text of works made available as "Open Access". Works made available

Publisher copyright

note finali coverpage

(Article begins on next page)

12 May 2025

Exuberant Proclivity Towards Non-Standard Employment: Evidence from Linked Employer-Employee Data¹

Alessandro Arrighetti^a, Eleonora Bartoloni^{b,a}, Fabio Landini^{a,c}, Chiara Pollio^{d,e}

^a University of Parma

^b ISTAT, Regional Office for Lombardy in Milan

^c Bocconi University, ICRIOS

^d University of Ferrara

^e EmiliaLab – Network of Departments of Economics of the Emilia-Romagna Region

Abstract

In most industrialized countries temporary and non-standard forms of employment have become a pervasive feature of the labor market. However, at the firm level, their diffusion is less uniform than expected: while some firms exhibit high propensity to use non-standard labor, others make no use of it. The most conventional explanations (market uncertainty, production regimes, competitive pressure) fail to account for such heterogeneity. In this article the authors develop an alternative explanation that links non-standard employment to the firm-specific availability of managerial resources: whenever the latter are relatively scarce, firms make larger use of non-standard labor to reduce coordination and operating costs. Using a linked employer-employee panel of manufacturing firms from the Emilia-Romagna region (Italy), the authors provide empirical support for this hypothesis. The result is robust to different estimation strategies and controlling for alternative drivers of non-standard employment. This novel finding suggests that the use of non-standard labor is motivated by the firm's needs to compensate for specific managerial weaknesses.

Key words: non-standard employment, managerial resources, span of control, firm heterogeneity,

JEL Code: D22, L23, M51, M52, J41, J23.

¹ **Acknowledgment:** This work is the result of collaboration developed within two projects: a) “Competence for manufacturing in Emilia-Romagna”, which is a two-years project funded by the Regione Emilia Romagna in collaboration with EmiliaLab; and b) “Business demography during the great recession: patterns of resilience and productivity dispersion”, which is part of a three-year strategic research plan promoted by the National Institute of Statistics (ISTAT). The empirical part of this research was carried out at the ISTAT Regional Office for Lombardy in Milano. We would like to acknowledge the support of Roberto Monducci, Director for Economic Statistics and Rosalia Coniglio, Director of the Regional Office for Lombardy. The views expressed in this paper are those of the authors and do not necessarily reflect the views of ISTAT. We thank Sandro Montresor, Davide Castellani, Antonello Zanfei as well as participants to the workshop on “Technology, Work and Internationalization” held at the University of Urbino for the useful comments. All remaining errors are ours.

Exuberant Proclivity Towards Non-Standard Employment: Evidence from Linked Employer-Employee Data

Abstract

In most industrialized countries temporary and non-standard forms of employment have become a pervasive feature of the labor market. However, at the firm level, their diffusion is less uniform than expected: while some firms exhibit high propensity to use non-standard labor, others make no use of it. The most conventional explanations (market uncertainty, production regimes, competitive pressure) fail to account for such heterogeneity. In this article the authors develop an alternative explanation that links non-standard employment to the firm-specific availability of managerial resources: whenever the latter are relatively scarce, firms make larger use of non-standard labor to reduce coordination and operating costs. Using a linked employer-employee panel of manufacturing firms from the Emilia-Romagna region (Italy), the authors provide empirical support for this hypothesis. The result is robust to different estimation strategies and controlling for alternative drivers of non-standard employment. This novel finding suggests that the use of non-standard labor is motivated by the firm's needs to compensate for specific managerial weaknesses.

Key words: non-standard employment, managerial resources, span of control, firm heterogeneity,

JEL Code: D22, L23, M51, M52, J41, J23.

During the last decades, several countries have enacted labor market reforms designated to increase firm's external flexibility, i.e. the freedom employers enjoy to expand or contract the workforce as they wish and to employ workers on a temporary and part-time basis (Treu, 1992). Such reforms made it easier for both manufacturing and service firms to hire workers through non-standard forms of employment (Kalleberg 2011; Hipp, Bernhardt, and Allmendinger 2015; Millward, Bryson, and Forth 2000; Peck and Theodore 2006; Cappelli and Keller 2013; ILO 2015). The latter differ markedly from ordinary labor contracts, which provide an indefinite duration of the employment relationship, full-time schedules and a precise correspondence between employer and hierarchical authority, i.e. between work and employment (Quinlan 1998; Allan 2000; Kalleberg 2000; Keller and Seifert 2005; Cappelli and Keller 2013): in non-standard employment at least one of such requirements is missing. The International Labour Organization (ILO) (2018) identifies four main types of non-standard employment: (1) temporary contracts; (2) part-time and on-call work; (3) temporary agency work and other forms of employment involving multiple parties; and (4) disguised employment relationships and dependent self-employment (e.g. freelancers and independent contractors). Among the latter, temporary contracts and temporary agency work, which are the main focus of our analysis, are among the most frequent types (in Italy they account for about 50% of all non-standard forms, see ISTAT, 2017).

Although the rate of non-standard employment varies depending on the industry and the country (Hipp et al. 2015; Eichhorst, Feil and Marx 2010; ILO 2018), its diffusion is pervasive. Millward et al. (2000), for instance, show that in Britain the share of workers hired on the basis of temporary as well as part-time and self-employment contracts has been on the rise since the 1980s. Keune (2013), Cappelli and Keller (2013) and Allmendinger, Hipp, and Stuth (2013) confirm the existence of a growing, although differentiated, trend in the use of fixed-term contracts in most advanced countries. Some recent works suggest that the firm's propensity to rely on non-standard labor may increase in presence of severe downturns, following the need to adjust the use of inputs to demand shocks (Boeri, Garibaldi, and Moen 2013; Bartelsman, Lopez-Garcia, and Presidente 2019; Bachmann et al. 2015; ILO 2015; Luo, Mann, and Holden 2010). With specific reference to the Great Recession, for instance, this increase has been particularly high in Italy, where the share of employees with fixed-term contract has grown by 50 percent in the overall working-age population (from 8 percent in 2009 to 12 percent in 2017) and by 57 percent among the youngest, i.e. between 15 and 24 years-old (from 35 percent in 2009 to 55 percent in 2017). This pattern has been less pronounced (and sometime even

opposite) in countries where the use of these contracts was relatively common, such as Germany and France (see Figure A1 and A2 in the Appendix).

The growing relevance of non-standard employment has attracted the attention of scholars and policy makers. The research has focused on two main issues. First of all, its impact on work relations and job conditions, which turns out to be sizable. In particular, non-standard employment is shown to increase job instability, persuade workers that they are replaceable (Kalleberg 2011), introduce wage penalties (especially for temporary agency workers, see ILO 2015 and 2018) and shift part of the entrepreneurial risk to employees (Kleinknecht et al. 2006). Moreover, as highlighted by OECD (2015), being on a temporary contract significantly reduces the likelihood of receiving employer-sponsored training. Secondly, a large number of contributions investigate the impact of non-standard employment on different components of firm performance such as returns on equity (Lepak, Takeuchi, and Snell 2003), productivity growth (Boeri and Garibaldi 2007; Ichino and Riphahn 2005; Valverde, Tregaskis, and Brewster 2000; Bardazzi and Duranti 2016; Lucidi and Kleinknecht 2010; Damiani, Pompei, and Ricci 2016), innovation and R&D (Kleinknecht, van Schaik, and Zhou 2014) as well as workers' motivations (Blanchard and Landier 2002; Battisti and Vallanti 2013) and the propensity to accumulate firm-specific skills (Lepak and Snell 2002). Overall, the evidence produced by these works is mixed, fueling doubts about the role of non-standard employment as drivers of long-term firm efficiency.

In this paper we depart from this literature by studying the drivers of firm's recourse to non-standard employment. In particular, rather than focusing on its effect on some outcome variable, e.g. work conditions and/or firm performance, we ask what drives the firm's propensity to rely on this type of labor in the first place. This question is relevant for three reasons. First, because it helps explaining where the need for external flexibility originates from, whether outside (e.g., rising uncertainty of market dynamics) or inside (e.g., managerial resources) the boundary of the firm (or both). Secondly, because it improves our understanding of how firms may eventually respond to policy interventions aimed at tailoring the use of non-standard labor. Finally, because it may provide an explanation for the diversity of firm's proclivity towards non-standard employment within and between industries. To the best of our knowledge, this article is the first that focuses explicitly on this issue.

To address this question we first compare different theoretical arguments that can explain the use of non-standard labor. Then, we check the validity of these arguments by making use of a linked employer-employee database that combines two sources: a) firm- and worker-level information taken from the Italian Statistical Office (ISTAT)'s registry of active firms (*ASIA*)

for the years 2012-2016; and b) accounting and financial information derived from ISTAT's *Limited Companies Balance Sheets Panel*, which gathers the balance sheets of all Italian limited companies from 2001 to 2014. To limit issues related to labor market dualism and diffusion of informal employment we focus our analysis on Emilia Romagna, an Italian region in which both features are limited and homogeneously distributed compared to the national average (Di Caro and Nicotra 2016). With our work we make two main contributions to the literature. First, we outline a theoretical framework that can be used to study the drivers of non-standard employment at the firm level. Second, we provide empirical evidence in support (or against) some of these drivers.

Common theoretical explanations and preliminary evidence

While the diffusion of non-standard employment is a widely debated topic, especially due to the related social, economic and organizational implications (Nienhueser 2005), its drivers are only partially known (Cappelli and Keller 2013). In fact, information concerning the characteristics of the firms that make use of non-standard labor and the actual reasons that lead them to adopt these contractual forms are relatively limited. Nevertheless, the available explanations converge around three *structural/contextual* factors¹: a) market uncertainty and volatility, b) knowledge-intensive production regime and c) increasing market openness and competitive pressure.

Market uncertainty and volatility

Flexibility (i.e., the firm's ability to manage demand uncertainty)² represents one of the distinguishing features of the post-Fordist production regime, which has come to dominate most industries in advanced countries (Duguay, Landry, and Pasin 1997). In such a regime, unpredictable product demand and uncertainty in consumer preferences are considered the main factors that force firms to achieve some degree of flexibility in production (Atkinson 1987; Gerwin 1993; Chang 2012). While in the past such flexibility was partly satisfied by holding stocks rather than by adjusting working time and production volumes, at the present this solution is not viable. The adoption of business models based on production to order and

¹ Other explanations stress the role and strength of unions (Devicienti, Naticchioni, and Ricci 2018) and the use of temporary contracts as screening device for the new hiring (Portugal and Varejao 2009).

² This definition is taken from Stigler (1939). More recent approaches in the management literature equate the notion of flexibility with the one of organizational agility, namely as the capacity of an organization to efficiently and effectively redeploy/redirect its resources to value creating and value protecting activities as internal and external circumstances warrant. For a thoughtful discussion of this literature see Teece, Peteraf, and Leih (2016).

the growing number of product varieties associated with mass customization limit the possibility to keep parts in stock as a buffer between market and production (Bosch 2004). An alternative is to adapt to unforeseen market signals by changing the internal composition of productive resources, including labor (Volberda 1996). In this sense, the design of labor market institutions and regulations is certainly influential, but, as argued by Saint-Paul (1996), the dichotomy between primary (stable) and secondary (unstable) employment can endogenously arise within a firm as a response to demand fluctuations. Since searching, recruiting, monitoring and replacing workers with high skills is particularly costly (Biegert and Kühhirt 2018), firms are pushed to split their workforce into a higher-paid, primary workforce and a secondary, or peripheral, workforce, whose adjustment costs are substantially lower (Doeringer and Piore 1985; Aleksynska and Berg 2015). In this view uncertainty leads employers to react by creating a buffer of flexibility based on precarious, fixed-term or external employees (Kalleberg 2011; ILO 2015). Following this argument, it is therefore the high market uncertainty of most modern industries that leads firms to increase their use of non-standard employment.³

Knowledge-intensive production regime

A parallel argument can be developed by looking at the knowledge content of production activities. According to Piore and Sabel (1984), Tolliday and Zeitlin (1986) and Streeck (1987), in fact, together with market uncertainty, another central feature of the change towards post-Fordist production regimes lies in the emergence of knowledge-intensive modes of production. The evolution of the technological supply towards the adoption of fungible plants and machinery fosters the restructuring of firms (especially in manufacturing), making the constant accumulation of internal knowledge exceedingly important (Danneels 2002; Vrontis et al. 2017). In a business environment characterized by globalization and rapid technological change (Vrontis and Thrassou 2013), activities such as the acquisition of new competencies and the collection and processing of information currently absorb most part of the economic and managerial resources in nearly every sector (Verdu-Jover, Llorens-Montes, and Garcia-Morales 2005). At different organizational layers, firms need workers who are able to adapt to

³ According to Aleksynska and Berg (2015) empirical evidence both in economics and in management literature shows that temporary workers can indeed be used to help firms attain numerical flexibility (Bentolila and Dolado 1994; Abraham and Taylor 1996; Bentolila and Saint-Paul 1994), allowing them to survive in the adverse macroeconomic conditions (Holmlund and Storrie 2002), and deal with seasonal demand or with fluctuations in labor supply (Ko 2003). In addition, organizations in industries with highly volatile demand are more likely to recur to temporary labor (Cappelli and Keller 2013); but also organizations of smaller size, which are less likely to have employees available to meet temporary adjustment needs (Davis-Blake and Uzzi 1993).

the demands of new technologies as they emerge, because this is the only way to maximize the advantage from technology and innovation (Brewster, Mayne, and Tregaskis 1997). In other words, the whole organization has to become functionally, and not only externally, flexible. This goal can be achieved by means of intensive internal training, enlarging worker participation in decision-making and increasing incentives to individual and collective investment in firm-specific skills and competences. Clearly, such firm-specific commitment requires a time perspective which is at odds with short-term and flexible forms of employment (Mayer and Nickerson 2005). It follows, that in presence of highly sophisticated and firm-specific knowledge, the propensity to rely on non-standard employment will tend to be low (both to save on training costs and to improve firm's internal know-how). As a result, increasing *knowledge-intensive production regime* will tend to reduce the use of non-standard labor at plant/firm level.

Competitive pressure

A third commonly used argument links the increasing use of non-standard employment to competition. Over the last decades, in fact, in most advanced countries the changes in market uncertainty and production technology coupled with extended trade and market liberalization (ILO 2018). As a consequence, in most industries both the market size of individual products and the number of market players expanded, amplifying the cost/price competitive pressures among incumbent firms (Feenstra and Weinstein 2017). As showed by Chen, Imbs, and Scott (2009) and Lee and Pak (2018), trade liberalization brought about a significant compression of prices and markups. The latter has become particularly challenging to manage due to the existence of a hypercompetitive landscape (D'Aveni 1994, 1999), where firms are not able to resort to stable barriers to entry or to leverage durable product differentiation to face heterogeneous global rivals (Harvey and Novicevic 2001). Faced with this competitive environment, firms rely on non-standard labor as useful tools to strengthen their bargaining power in wage negotiations, favoring a partial recovery of profitability through labor cost savings. Landini, Arrighetti and Bartoloni (2020), for instance, show that the larger availability of non-standard employment contracts is indeed associated with a reduction in average wages. Consequently, the use of such contracts can be interpreted as deriving from firms' attempts to search for additional sources of profit in contexts characterized by strong and growing competitive pressures.

All the arguments sketched out above share a common aspect, namely they place the main driver of non-standard employment outside the boundary of the firm. Whether it is the degree of market uncertainty, the characteristics of production technology or the strength of competitive pressure, the choice to rely on some forms of external flexibility depends on factors that a) are external to the firm and b) affect in a similar way all firms operating in the same competitive environment (e.g. the industry). Consequently, one may expect the use of non-standard labor to be higher (lower) in industries where demand is more (less) volatile, the production technology is less (more) knowledge intensive and the competitive pressure is stronger (weaker). Still, irrespective of the argument that one picks, the main empirical prediction would be that firm's recourse to non-standard employment tends to be relatively uniform within sectors (and possibly heterogeneous across them).

The evidence that emerges from the data, however, tells a different story. The left panel of Figure 1 shows the quantile distribution of the share of fixed-term and agency contracts for the firms included in our dataset. The latter is built using administrative data for the whole population of manufacturing limited companies operating within the Emilia-Romagna region in Italy (for more details, see Section 4). The right panel reports the quantile distribution of the same variable after normalization by the industry mean. In particular, the ISTAT's ATECO 2-digits classification has been used for the industry.⁴ On average, the workers hired with non-standard contracts account for only 7% of total employees. A more detailed analysis, however, reveals high heterogeneity in the population of firms. The median of this ratio, in fact, is barely above 3% and nearly 35% of the firms do not employ such contracts at all. Meanwhile, the top decile of firms relies extensively on external flexibility, with non-standard contracts representing 20% to nearly 100% of the total employees among these firms (on average 33%). Such evidence is even more compelling if one considers that the observed heterogeneity remains high even within industries. The shape of the distribution after normalizing by industry mean (right panel) remains virtually unchanged, with the top decile of firms relying on non-standard employment from 3 to 15 times more than their industry average.⁵

[Figure 1]

⁴ ATECO is the Italian classification of economic activities; it corresponds to the EU Rev. 2 NACE Classification.

⁵ Survey data on a large and representative sample of Italian non-agricultural firms confirms that the shape of the distribution remains unchanged also when considering firms outside of the Emilia-Romagna region (see Figure A.3 in the Appendix).

The relatively low average diffusion of non-standard employment and, above all, the high within-industry asymmetry of its use cast doubt on the explanatory power of contextual-structural variables alone, such as market uncertainty, production regimes and competitive pressure. To explain such asymmetry, we need to focus on firm-specific factors that may lead firms operating within the same competitive environment to differentiate their recourse to non-standard labor. The next section deals precisely with this issue.

An alternative explanation: managerial resources and internal segmentation

An important factor that in our view explains part of the observed firm-level heterogeneity in the use of non-standard labor is managerial resources.⁶ In fact, among the changes brought about by the advent of post-Fordism there is not only the rising market uncertainty and complexity, but also the relevance of management as driver of firm behavior. The reason is twofold. First, because in presence of uncertainty firm success depends on the ability of managers to constantly review and update their decisions. The way such process unfolds can be very different, as managers do not react in mechanistic ways to external *stimuli*. Rather, as shown by recent management research, they are subject to a variety of constraints (e.g., resource endowments, demand conditions, governance), incentives (e.g., performance compensation, stakeholder activism) and psychological biases (e.g., overconfidence, hyperbolic discounting) (Banker et al. 2018). It follows that, depending on the managerial resources available within the organization, firm's decisions, including on the use of non-standard labor, can be highly differentiated, even for firms within the same competitive environment (Ketokivi 2006; Sanchez 1995; Kalleberg 2001; Lepak and Snell 1999, 2002).

Secondly, the diffusion of post-Fordist production regimes has brought with it a significant reorganization of production activities, increasing the number of people involved in non-routine tasks (Acemoglu and Autor 2011). The latter are usually abstract cognitive tasks involving analytical and/or interpersonal skills (Autor, Levy, and Murnane, 2003; Fonseca,

⁶ This view is shared also by scholars that consider non-standard employment as the modern version of labor contracts that were common in the initial phase of capitalism (Eichhorst, Feil, and Marx 2010). According to this view, the use of non-standard labor signals a lack of propensity towards innovation as well as managerial backwardness and de-skilling of the wage-earners (Michie and Sheehan 2003; Zhou et al. 2011; Fernández-Kranz and Rodríguez-Planas 2011; Addabbo and Solinas 2012; Kleinknecht, van Schaik, and Zhou 2014). In this sense, and referring to temporary staffing industry, Peck and Theodore (2007) argue that non-standard employment is “a mean to manage and dissipate the effects of product market/personnel fluctuations, to tap skills required on a discontinuous basis, as well as to (re)establish a form of at-will employment relationship among some segments of the labour supply” (p.176).

Lima and Pereira 2018). Typical activities include data analysis, creative thinking, directing or maintaining interpersonal relationships; all activities related to problem-solving, managing or carrying out complex communications (Fonseca, de Faira, and Lima 2019). Such tasks are difficult to evaluate and compensate, requiring *ad-hoc* activities related to direction and monitoring that go beyond the simple definition of wage schemes. Moreover, in presence of rapid changes of the competitive environment, these tasks require a constant renewal of the related competences, which is often costly to accomplish. Altogether, this makes the coordination activity usually attributed to managers more challenging, increasing the importance of highly qualified managers. In this respect, several recent works indeed show that the quality of management accounts for large part of performance differentials among both manufacturing and service firms (Bloom et al. 2013; Bender et al. 2018).

Based on these considerations, we argue that managerial resources affect the recourse to non-standard employment. As suggested above, environmental uncertainty and technological volatility rise the costs of hierarchical coordination, generating strong pressures on management (Patel 2011). In line with contributions in the organizational economics and industrial relation literature⁷, we argue that the reaction of managers can be twofold: a) to strengthen internal flexibility, *i.e.* enhancing the ability of standard employees to perform a variety of tasks and participate in decision-making; b) to rely on external flexibility, *i.e.* exploiting non-standard labor so as to reduce costs by limiting workers' involvement in the organization (Kalleberg 2001). Both options have advantages and disadvantages. Internal flexibility uses mainly standard forms of employment and thus entails relatively high operating costs (e.g., hiring and firing costs). Moreover, it requires an intensive and costly activity of coordination by highly qualified managers to ensure a smooth allocation of workers across the different tasks. At the same time, the combination of job variety and participation in decision-making makes this option particularly convenient when the tasks involved are non-routine, because it is more effective in fostering learning and information sharing. On the contrary, external flexibility is relatively expensive when it is used for tasks other than routine ones, since it discourages competence accumulation. However, it enjoys lower operating costs and less intensive use of managerial resources as the allocation of employees into tasks occur

⁷ According to Kalleberg (2001) the literature emphasize two distinct strategies of flexible labor organization: enhancing employees' ability to perform a variety of jobs and participate in decision-making, and reducing costs by limiting workers' involvement in the organization. These two strategies have been referred to variously as: functional vs. numerical flexibility (Atkinson 1984; Smith 1997; Hunter et al. 1993), internal vs. external flexibility (Cappelli and Neumark 2001), clan vs. market (Ouchi 1980), dynamic vs. static flexibility (Colclough and Tolbert 1992; Deyo 1997), and organization-focused vs. job-focused employment relations (Tsui et al. 1995).

primarily via the market (*i.e.*, it exploits a mechanism of “external delegation” of coordination activities, see Bock et al. 2012). It follows, that the firm’s rate of non-standard employment will depend both on the characteristics of the tasks and on the availability of managerial resources. For any given level of managerial resources, the probability to use non-standard contracts is lower (higher) the less (more) routinized the tasks. On the other hand, for any given distribution of tasks, such probability is lower (higher) for firms with higher (lower) level of managerial resources.

To illustrate our argument, we discuss a simple example. Consider an industry populated by a fixed number of firms. Each firm i needs to produce a given output at minimum costs. For reasons not explicitly modeled and related to previous investments and learning paths, firms differ in their endowment of managerial resources. In particular, we characterize such endowment by the ratio $\sigma_i = s_i/c_i$ where $s_i(> 0)$ is the number of employees involved in subordinate roles (*i.e.* either manual or cognitive tasks) and $c_i(> 0)$ is the number of employees with coordination responsibilities (*i.e.* managers) employed by firm i . In other words, σ_i represents the so-called span of control, *i.e.*, the number of subordinates per manager⁸. Whenever σ_i is low, the coordination and monitoring burden placed on each manager is small because the manager has to supervise a relatively small number of subordinates. In these cases managerial resources can be considered relatively abundant, *i.e.*, it is a case of slack managerial resources (see Penrose, 1959). On the contrary, whenever σ_i is high, the coordination and monitoring burden placed on each manager is large and managerial resources are relatively scarce.

Each firm must decide how to organize its production activities, which consist of a continuum of tasks of unit size. Let us assume such tasks can be ordered from the most to the least routinized and call $t \in [0,1]$ the resulting ordered segment of tasks. For the sake of simplicity and without loss of generality, we assume such tasks to be the same for all firms. Given σ_i and t , firm i decides whether to manage each task via internal or external flexibility comparing the relative cost of the two options, *i.e.*, respectively $IF(t, \sigma_i)$ and $EF(t)$, with i) $IF_t > 0$, ii) $EF_t > 0$, iii) $IF_{tt} > 0$, iv) $EF_{tt} > 0$, v) $EF_{tt} > IF_{tt}$, vi) $IF_{\sigma_i} > 0$, and vii) $IF_{t\sigma_i} > 0$. These conditions capture that a) the cost of both managerial solutions is higher for less routinized tasks, b) the cost of external flexibility rises in t at a faster rate than the one of internal flexibility and c) the cost of internal flexibility increases (reduces) in firms with scarce

⁸ For a similar definition see Caliendo, Monte, and Rossi-Hansberg (2015). More general discussion about the span of control construct and its evolution can be found in Bell (1967), Blau and Schoenherr (1971), Ouchi and Dowling (1974), Garicano (2000), Bandiera et al. (2014), Rajan and Wulf (2006).

(slack) managerial resources. For all t such that $EF(t) < IF(t, \sigma_i)$ firm i will rely on external flexibility; the remaining tasks will instead be managed via internal flexibility, *i.e.*, an internal labor segmentation will occur. Obviously, conditions vi) and vii) imply that the cutoff value of t which makes firm i to switch from external to internal flexibility will be higher, the higher σ_i .

Figure 2 summarizes our argument. The horizontal axis reports the ordered segment of task t , while the vertical axis represents managerial costs. We compare two firms with high (σ_h) and low (σ_l) span of control. Both firms face the same curve of costs of external flexibility $EF(t)$, as it does not depend on managerial resources. However, σ_l -firm enjoys a comparative advantage in the use of internal flexibility compared to σ_h -firm, because she can devote more resources to internal coordination. The two firms will rely on external flexibility up to task t_i^* such that $EF(t_i^*) = IF(t_i^*, \sigma_i)$, with $1 - t_i^*$ being the tasks managed via internal flexibility. As it is easy to see $t_l^* < t_h^*$, *i.e.* the cutoff point in which firms segment the internal labor force, is higher (lower) for the firm with higher (lower) span of control, *i.e.* scarcer (more abundant) managerial resources. In other words, the scarcer the managerial resources, the smaller the set of tasks that the firm will manage via internal flexibility and thus the higher the probability to extensively rely on external flexibility, *i.e.* non-standard employment.

[Figure 2]

Overall, our argument is consistent with the so-called core-periphery hypothesis as proposed by Kalleber (2001) and Atkinson (1984, 1987), *i.e.*, the idea that firms ‘seek to establish long-term employment relations with part of their work-forces (the ‘core’, regular, permanent workers who are highly trained, skilled and committed to the organization, attributes that are thought to be needed for functional flexibility) at the same time as they externalize other activities and/or persons by means of transactional contracts’ (Kalleber 2001: 484). Our contribution is to suggest that the relative size of the core and the periphery is not predetermined, but depends on the available managerial resources. When the latter are sufficiently abundant (scarce) the core (periphery) can be as large as the whole organization.

An important assumption in our argument is that managerial resources are heterogeneous across firms. Several works provide empirical evidence in support of it (Bloom and Van Reenen 2010; Arrighetti, Landini, and Lasagni 2014). What lead these heterogeneous patterns of accumulation to unfold, however, is less clear. We suggest that two types of drivers exist. Some of them are of endogenous nature and depend on firm-specific strategies and learning

paths (Landini et al. 2020). Others, however, are the result of external conditionings, which affect the view about how firms ought to be managed. On this respect, Bagguley (1991) argues that the decision to combine scant accumulation of managerial resources and high use of non-standard labor can be motivated by different corporate rhetoric and cultures. In this view, the adoption of external flexibility as a managerial reference model was not simply a consequence of changes in monitoring and resource management practices brought about by the diffusion of post-Fordism. It was also the rejection of some objectives that were typical of Fordism, such as medium-term planning, the adaptation of resources and investments to medium-long term goals, the acquisition of stable competitive advantages (Volberda 1998; McGrath 2013). These objectives were replaced by short-term targets such as agility, exploitation of transitory strategic opportunities and ad-hocracy (Volberda 1996; Hyman 2016). This allowed the managerial culture that presents external flexibility as a pragmatic managerial response to a given set of circumstances (Brewster et al. 1997) and identifies the flexible company as a universal organizational paradigm (Atkinson 1985; Dreyer and Grønhaug 2004) to prevail. Such view was further strengthened by growing relevance of managerial ‘shortesism’, *i.e.*, the idea that management skills are to be assessed not by comparing different levels of profit among firms, but by considering the short-term performances and steadiness of profits of the same firm over time (Laverty 1996; Hirshleifer and Thakor 1992; Dunk 1993). Obviously, the way these corporate cultures affect firm decisions is not general and depend on several idiosyncratic factors. For instance, it may be contingent on managerial preferences and ideology. In general, however, we may expect that the more differentiated these idiosyncratic factors are, the more heterogeneous the resulting managerial responses will be.

Institutional context

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 (Kaldor 1967; more recently Szirmai 2013; Andreoni and Chang 2016, only to cite a few). Emilia Romagna is one of the most prominent manufacturing region in Italy. It is calculated that about 60% of regional GDP is related to the manufacturing sector⁹ and the region ranks second in Italy and fifth in Europe for the number of people

⁹ See the report by Technopolis Group: Regional Innovation Monitor Plus 2016 Regional Innovation Report Emilia-Romagna (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_Emiliana%20Romagna_0.pdf (last accessed on 19th of April 2019).

employed by this industry¹⁰. Moreover, the analysis of this region presents two additional advantages. First of all, Emilia Romagna has one of the lowest unemployment rate among all the Italian regions. In 2012 it was about 7%, compared to other regions such as Campania (19.2%) and Sicilia (18.4%), the country average being around 10%¹¹. This implies that the high risk of unemployment is not a relevant factor leading workers to accept non-standard labor contracts in our case. Secondly, according to Di Caro and Nicotra (2016) Emilia Romagna is characterized by a relatively small diffusion of informal employment, which is on the contrary a common problem in other Italian regions. We can thus assume that for most firms in our data, informal employment does not represent a viable alternative to non-standard employment. All these factors strengthen the external validity of our results.

The international comparative literature stresses the importance of institutional and regulative factors to explain the incidence of non-standard employment (Allmendinger et al., 2013). In particular, regulations on firing permanent workers and hiring non-standard workers are the ones receiving the greatest attention. In theory, high levels of dismissal protection for regular workers and low entrance barriers for non-standard workers should be associated with a large proportion of the workforce being hired on a non-standard basis (Hipp et al., 2015). On both these dimensions Italy presents some specific characteristics. Dismissal protection is regulated by the so-called Workers' Statute (*Statuto dei lavoratori*, Law 200/1970). According to the latter, dismissal is possible for justified "subjective" and "objective" reasons, with Courts having the ultimate word on the need for reinstatement in appealed cases. If the latter are judged unlawful, the mechanisms for reinstatement apply on a size-contingent basis and are relatively stricter for firms with more than 15 employees. These features led some authors to classify Italy as having a relatively protected labor market (Bertola, Boeri, and Cazes, 2000). However, the large prevalence of micro and small firms implies that reinstatement restrictions apply to a relatively small fraction of firms, which partly explains the relatively high rate of employee turnover (Pacelli and Leombruni 2003). With respect to hiring non-standard workers, Italy followed a pattern similar to other European countries and since the mid-1990s went through a significant process of labor market deregulation, which made the recourse to non-standard employment easier (with the *Legge Treu* in 1997, the Legislative Decree 368 of 2001, and the Law 30 of 2003). These interventions introduced various forms of atypical contracts without

¹⁰ Eurostat, data available online at: <https://ec.europa.eu/eurostat/data/database> (Last accessed on the 19th of April 2019)

¹¹ ISTAT, data available online at: http://dati.istat.it/Index.aspx?DataSetCode=DCCV_TAXDISOCCU1 (last time accessed on the 11th of June 2019).

changing the legislation on permanent (open-ended) positions. The combination of moderate dismissal protection and easy access to atypical contracts contributed to spread non-standard employment within the country.¹²

Among the different types of full-time non-standard employment, the most popular is fixed-term contract which accounts for nearly 60% of all atypical positions in manufacturing¹³. According to the Italian legislation, fixed-term contracts can last no more than 12 – in extraordinary circumstances 24 – months¹⁴. Workers that are hired with these contracts are formal employees of the company and they are subject to the same line of hierarchical authority as workers with permanent contracts. This feature makes the two types of contracts easily comparable in our framework: the only difference is the short duration of fixed-term contracts, which makes them a suitable tool to achieve external flexibility.

Other types of non-standard forms of employment available to Italian firms include agency contracts and collaboration contracts. The former rest on the involvement of three subjects: the firm demanding labor, the worker and an intermediary agency that formally employs the worker – permanently or for a fixed term – and stipulates a supply contract with the firm¹⁵. Collaboration contracts are instead agreement in which the workers are to be formally considered self-employed and should be used primarily for consultancy reasons. Altogether these two types of contracts are not very common in Italy covering around 4.5% of the total workforce (Devicienti et al., 2018). Differently from fixed-term contracts, workers under agency and collaboration contracts are not formal employees of the company. Therefore, at least officially, they are not subject to the firm's hierarchical authority. Moreover, available data do not allow to distinguish those collaboration or agency workers who actually replace standard employees from those involved in genuine consultancy or that have short-term labor relations with the firms. For the purposes of our analysis, these aspects make a direct comparison with standard permanent contracts rather difficult. For this reason, at a first level

¹² A major labor legislation reform in Italy known as 'Jobs Act', which has decreased the dismissal protection related to standard contracts, has been implemented between the end of 2014 and 2015. However, this is not covered in our paper since the data of our empirical investigation cover a previous time span (2012-2014).

¹³ According to ISTAT, the total number of manufacturing NSFE in 2012 were 348.675, out of which 205.866 (59%) were fixed-term contracts. Authors' calculation based on ISTAT data: http://dati.istat.it/Index.aspx?DataSetCode=DICA_ASIAUE1P# (last time accessed on the 11th of June 2019).

¹⁴ The most recent Italian laws regulating fixed term contracts are the so-called *Jobs Act* (*Decreto Legislativo 15 giugno 2015, n. 81 - Disciplina organica dei contratti di lavoro e revisione della normativa in tema di mansioni, a norma dell'articolo 1, comma 7, della legge 10 dicembre 2014, n. 183*) and the so-called *Decreto Dignità* (*Decreto Legge 12 luglio 2018, n. 87 - Disposizioni urgenti per la dignità dei lavoratori e delle imprese*)

¹⁵ The temporary agency contracts were first introduced in the Italian legislation by the so called *Pacchetto Treu* in 1997 (*Legge 24 giugno 1997, n. 196 - Norme in materia di promozione dell'occupazione*) and modified to the current form by the so called *Legge Biagi* (*Legge 14 febbraio 2003, n. 30 - Delega al Governo in materia di occupazione e mercato del lavoro*) and by the *Decreto Dignità*.

of approximation we prefer to leave agency and collaboration contracts out of the analysis and focus primarily on fixed-term contracts.¹⁶

Data

To conduct the empirical analysis, we combined original data from three sources. We started from the entire population of manufacturing firms operating in Emilia Romagna according to *Asia-Imprese*, the ISTAT's registry of active firms. Such registry was established in 1996 and reports yearly information about structural characteristics of all Italian firms, including the legal form, total employees and geographic localization. It also provides a unique firm identifier that can be linked to *ASIA-Occupazione*, another ISTAT's registry. The latter is a linked employer-employee database with detailed information of each worker employed in any firms recorded in *ASIA-Imprese* since 2012. The available information includes gender, age, place of birth of the worker and, which is more relevant for the purpose of our study, a classification of the employment relationship. In particular, the type of employment is divided into internal, distinguishing between open-ended and fixed-term contracts, and external when the worker participates in the production process through forms of work remunerated with collaboration or temporary agency contracts. In all the cases, employment is measured in terms of average annual job positions (i.e. full-time equivalent), calculated on the basis of the worker's presence in the reference week of each month. To obtain information about the economic and financial conditions of the firms, we merge the previous two databases with the ISTAT's *Limited Company Balance Sheets Panel*, which gathers the balance sheets as well as information about import and export for all Italian limited companies from 2001 to 2014. The results is an unbalanced panel of nearly 9.000 manufacturing firms per year operating in Emilia Romagna between 2012 and 2014¹⁷. For each firm we observe a set of demographic and structural characteristics, economic and financial conditions, workforce composition as well as details about the geographic localization.

The main dependent variable of our empirical analysis is the ratio between the number of employees with fixed-term contract and the total number of employees. In both cases, employment is measured in full-time equivalent. According to the Italian legislation, temporary contracts distinguish in two main categories: those that contain training clause (*"contratti a*

¹⁶ Sometime agency workers happen to carry out tasks that are under the informal authority of top and mid-level managers. For these reason in a robustness check we consider them alongside fixed-term workers as proxies for non-standard employment. Main results do not change.

¹⁷ In particular, the dataset includes 9.388 firms in 2012, 8.542 firms in 2013 and 8.518 firms in 2014.

causa mista”, “*contratti di formazione lavoro*”, “*contratti di inserimento lavorativo*”), and those that do not (“*contratti a tempo determinato*”) (Devicienti et al., 2018). While the former are used also for screening purposes before a regular position is offered, the latter is typically exploited as a source of external flexibility. In our analysis we consider only fixed-term contracts without training clause.

Among the explanatory variables, our focus is on the structure of the workforce organization within the firm, proxied by the span of control. To measure the latter, we first distinguish between roles that usually belong to high organizational layers and are endowed with strategic planning and coordination responsibilities such as executives, top and mid-level managers, and roles that belong to the bottom of the hierarchy and are engaged with more operative tasks such as manual industrial workers and office workers. Then, we measure the span of control as the logarithm of the ratio between the number of employees in the latter roles (i.e. manual industrial workers and office workers), as the numerator, and the number of employees in the former roles (i.e. executives, top and mid-level managers), as the denominator. A high span of control means that executives, top and mid-level managers have to coordinate a relatively large number of subordinate workers – either manual or cognitive. Consequently, the constraints on their coordination activities are likely be binding. Conversely, a low span of control means that each executive, top and mid-level managers is responsible for a restricted number of subordinates, implying that the burden associated with coordination activities is relatively small.

Obviously, we cannot exclude that other factors affect the firm’s propensity to use non-standard labor alongside the span of control. For this reason, we include a set of covariates using information retrieved from the firm’s balance sheets and other structural characteristics. In particular, we focus on factors that are commonly associated with the need to rely on external flexibility (see above).¹⁸

To control for market uncertainty, we use three variables. The first one is the volatility of sales, which is computed for each firm i and year t as the ratio between the average standard deviation of sales over the ten years previous to t and the average sales over the same period.

¹⁸ One aspect that can certainly affect the firm’s propensity to rely on non-standard employment is task composition. The latter is partly firm-specific and it may depend on the nature of productions as well as on competitive strategy. For instance, some firms may be engaged in productions characterized by a relatively large share of non-routines tasks, whose accomplishment relies on the tacit knowledge of shop-floor workers. Other firms, may adopt different strategies and organize production around a relatively large share of routine tasks, which require codified knowledge. Depending on the characteristics of task composition, non-standard employment can be more or less convenient. Since we rely on administrative data we do not have the information to control for the features of firm-specific task content. However, it is fair to assume that the latter is a relatively persistent characteristics of firm organization, which can be controlled for in our empirical analysis.

It is a firm-specific proxy of demand variability (for a similar approach see Devicienti et al. 2018). The second variable is the yearly sales growth, which can be considered another firm-specific measure capturing short-term changes in product market. Finally, we include in our analysis a seasonality index which is computed starting from the ISTAT monthly series of industrial production indexes (2-digit ATECO) to account for sector-specific market fluctuations (see Table A1 for more details).

Part of the literature links external flexibility to specific characteristics of the production technology, such as the adoption of knowledge-intensive production regimes. The latter involve both hiring highly qualified workers and deploying advanced manufacturing equipment. To account for these two factors, we use two variables. The first is labor productivity, which we measure as the ratio between value added and total employees, in logs. The second one is the physical asset trend, which we measure as the ratio between the value of tangible asset at time t and the mean value of the same variable over the previous ten years, in logs.

Finally, to account for the competitive environment we combine information on international activities and profitability. In particular, we consider a) whether the firm is exposed to international competition through exports with a dummy variable taking value 1 if the firm i is an exporter in year t and 0 otherwise and b) the firm's profit variation using yearly growth rate of the return on sales (ROS).

Descriptive statistics

This section presents some descriptive statistics on our variables of interest. Figure 3 shows the frequency distribution and kernel density function of non-standard temporary employment considering all firms and years in our dataset. The shape of the distribution confirms the existence of very large asymmetries, with a long right tail of firms that rely on such form of employment on a substantial scale. Such asymmetries are confirmed also when comparing the average of temporary employment across different quartiles of the distribution. For instance, we observe that firms belonging to the fourth quartile of the distribution employ a share of temporary employees eight times larger than the firms belonging to the other three quartiles (about 16% against 2%) and employ more than 70% of all temporary workers. Overall, these figures suggest that the firm use of non-standard employment based on fixed-term contracts is highly concentrated, with a clear demarcation between 'exuberant' and 'conventional' users. Explaining such demarcation is precisely the aim of our empirical analysis.

[Figure 3]

Among the potential explanatory variables, our focus is on the span of control. A key precondition for the latter to be able to explain (at least part of) the firm-level asymmetric use of non-standard temporary employment is that its distribution is sufficiently heterogeneous. To verify whether this is actually the case, we report in Figure 4 the frequency distribution and kernel density function of the span of control (as before all firms and years are included in the analysis). In line with the use of temporary contracts, the span of control exhibits high heterogeneity. While a quite large number of firms – about 46 percent – have a span of control value between 2 and 3 (in logs), an additional 30 percent has smaller value, while there exist a relatively long right tail covering the remaining fifth of the sample. According to our argument, firms with smaller values of the span of control, therefore with a lower subordinates-to-management ratio, should use less non-standard workforce, while the firms on the right tails should make a larger use.

[Figure 4]

One possible explanation for the skewed distributions of both non-standard temporary employment and span of control is that they reflect some industry-contingent factors that simultaneously affect the two variables. For instance, the existence a relatively routinized and modular task composition in some specific industries, may lead the firms operating in the latter to use more temporary employees and have a larger span of control (due to the lower needs for coordination) compared to firms operating in other industries. To check whether this is indeed the case we report in Figure 5 the distribution of average temporary employment and span of control across sectors, using the ISTAT's ATECO 2-digits classification for industries. Temporary employees are present in all sectors, although they are more common in industries related to food and beverage transformation (codes 10 and 11), textile (13, 14 and 15) and, to a lesser extent, in plastic (22), non-metallic minerals (23) as well as other manufacturing (32). The span of control presents some variation across the different sectors and it is highest in leather (15), computer and electronics (26) and furniture (31). Overall, a clear pattern of industry differentiation that involve both non-standard temporary employment and span of

control does not emerge, which suggests that their skewed distribution is not likely be driven by industry-specific factors.

[Figure 5]

Additional descriptive evidence that helps qualifying the relationship between non-standard temporary employment and span of control comes from Figure 6, which shows the variation in the mean values of the two variables across different size classes (i.e. number of employees). On average, firms with less than 11 employees make lower use of temporary work and have a smaller span of control than the others. For larger firms, the mean value of the span of control grows almost linearly with firm size between 11 and 100 employees and then it stabilizes around a value of 35-40. The share of temporary employment increases between 11 and 100 employees and then it slightly reduces. Altogether, these results suggest that the scarcity of managerial resources and, we argue, the consequent use of non-standard labor is an issue that affects primarily firms beyond a certain size threshold (in our data more than 10 employees), i.e. firms that exhibit sufficiently high degree of organizational complexity.

[Figure 6]

To complete the descriptive analysis, we report in Table 1 some summary statistics for the main covariates. To enrich the analysis we distinguish between large and small users of non-standard temporary employment, *i.e.* firms belonging to the fourth quartile vs. first-second-third quartiles of the share of fixed-term labor contract distribution respectively (for a full description of all variables as well as the correlation matrix among them see respectively Tables A.1 and A.2 in the Appendix). The “Test” column shows the results of an F-test comparing the mean difference between columns 2 and 3. On average, firms that use more temporary work have a larger span of control (*i.e.*, scarcer managerial resources) than small users, which is in line with our main theoretical hypothesis. Additionally, large temporary employment users are characterized by higher volatility of sales and larger yearly sales growth, with mean differences in the latter being particularly relevant. While these two results provide support for market uncertainty being a driver of non-standard employment, the fact that the mean difference of the seasonality index is slightly larger in firms with less temporary employees suggests that, if

anything, this effect tend to be weak. Quite interestingly, we find that large and small users of temporary work do differ in the characteristics of their production regime, but in ways that seemingly contrast with literature. In fact, both labor productivity (a proxy of skilled workforce) and physical asset trend (a proxy of investments) are on average larger in firms that make larger use of temporary contracts. In our view this result can be interpreted as the consequence of the internal division of labor, through which large users of non-standard labor identify a core of highly qualified (and productive) permanent employees who are provided with advanced manufacturing equipment. In this sense, the direction of the observed mean difference is coherent with our theoretical hypothesis. Finally, for what concerns the variables associated with the characteristics of the competitive environment we notice that while being an exporter is less common in large users of temporary work, the latter present a higher profit growth. Also in this case, the results contrast with the arguments put forward by literature that links the use of non-standard labor with rising competitive pressures.

[Table 1]

Econometric analysis

Our econometric analysis aims at identifying the drivers of non-standard employment, placing particular attention on the role of the span of control. We do so by estimating a linear fixed effects panel model:

$$Y_{i,t} = \beta_0 + \beta_1 SPAN_{i,t} + \gamma X_{i,t} + u_{i,t}$$

Where $Y_{i,t}$ is the temporary employment ratio in firm i in year t , $SPAN_{i,t}$ is the log of the span of control (our main variable of interest), $X_{i,t}$ is a vector of controls, β_0, β_1 and γ are the parameters to be estimated, and $u_{i,t}$ is the error term. In addition to the covariates of non-standard employment discussed above, in all the estimated models we include the following set of control variables: firm's size (logarithm of the number of employees), firm's age (in years), a dummy for the participation into a group, sector dummies (2-digit ATECO)¹⁹ and year dummies.

A potential issue in our empirical analysis is the endogeneity of the span of control, which could arise for two reasons. The first is omitted variables, *i.e.*, the span of control affects the

¹⁹ In other specifications, available upon request, we substitute the ATECO-2-digit dummies with the OECD technology level dummies. The results are robust to the change.

use of non-standard labor through some unobservable variable (*e.g.*, managers' ideology) that we do not/cannot include in the model. The second is simultaneity, *i.e.*, the internal composition of the workforce, here included the rate of non-standard labor, affects the managerial resources of the firm, giving rise to reverse causality. In case we are in presence of time-invariant omitted variables, we avoid potential endogeneity sources via fixed-effects. To deal with other sources of endogeneity, we rely on instrumental variable (IV) models²⁰. We have greater confidence in the validity of our results when they are robust to the two alternative methods.

The main benefit of an IV approach is that it can potentially deal with both time-invariant and time-variant omitted variable biases as well as simultaneity. The major challenge, however, is to find suitable instruments for the span of control. Ideally, we would like to instrument $SPAN_{i,t}$ with an external variable that is correlated with the span of control but not with the error term (*i.e.*, it affect the use of non-standard labor only through $SPAN_{i,t}$). This is not a simple task and require the imposition of some exclusion restrictions. In order to build the instrument, we refer to the recent literature exploring the drivers of firm hierarchies using a knowledge-based perspective. In particular, Garicano (2000) develops a formal model in which the composition and structure of firm hierarchy depends on the trade-off between communication and knowledge acquisition costs. By creating a hierarchy, the former costs rise, while the latter reduces. It follows that factors affecting the value of such costs affect the structure of the hierarchy. Following this theoretical framework, Bloom et al. (2014) have assessed that information technologies (*e.g.* enterprise resource planning software) and communication technologies (*e.g.* Intranet) have different and opposite effects on firm's hierarchy. With specific reference to communication technologies, these authors argue that they can act as a centralizing force, lowering the costs of transferring knowledge within the organization and ultimately enabling firms to deepen their internal hierarchies (*i.e.* to increase the number of layers). Along these lines, we have worked on the hypothesis that the local availability of advanced communication technologies such as broadband connection based on the optic fibre infrastructure can be used as an exogenous source of variation to instrument the span of control. More specifically, we claim that firms located in municipalities where such infrastructure is available experience a reduction in communication costs, which rises the benefit of relying on the internal hierarchy to organize expertise. This should translate into a

²⁰ We are aware that both approaches have benefits and costs. This is the reason why we do not depend solely on either the FE or the IV, but rather conduct the empirical analyses using both of them.

negative effect on the span of control. At the same time, the local availability of optic fibre should not directly impact on the firm-level use of non-standard employment.

To build the instrument we use data on the percentage of coverage the optic fibre infrastructure in the municipality where the firm is located. The data are collected from Infratel Italia, an in-house company of the Italian Ministry of Economic Development.²¹ A limitation of such database is that it reports the stock of the infrastructures updated to the first trimester of 2015, while our firm-level data refer to the time span 2012-2014. However, several considerations can be made in order to ensure that such data can still be used in our IV strategy. First, the largest part of the programs for extending optic fibre communication technologies in Italy took place from 2015 onwards. In fact, the same data that we use to build the instrument were collected by the government as a basis for a publicly-funded program to implement the service which so far had been build up only by private actors. Second, the data were collected in the first trimester of 2015. We can then assume that the coverage of such infrastructure in each municipality underwent small changes between 2014 – the last year of our firm-level database – and the first three months of 2015 – when the survey took place. At most, one can surely assume that the municipalities that were not covered by the service in 2015 had not been covered in previous years, while few changes might have happened in what resulted covered to some percentage in 2015. However, in order to further reduce the bias related to possible over-estimation of coverage, we take two precautions. First, we only run the IV model for 2014, as over-estimation of the coverage might arise the largest the delay in measurement occurs. Second, we run the IV considering both a continuous measure of broadband coverage as well as a dummy variable as instrument, where the latter take the value of 0 if the municipality is not covered – which by definition was 0 even before 2015 – and 1 if the town is covered. In this way we diminish the bias coming from possible change in the percentage of coverage between the end of 2014 and the first months of 2015.²²

²¹ Data available online at: <https://www.infratelitalia.it/archivio-documenti/documenti/esito-consultazione-pubblica-banda-ultralarga> (Last accessed on the 2nd of September 2020)

²² One potential limitation of our IV strategy is that optic fiber coverage can affect the use of non-standard labor not only through the span of control, but also through its impact on labor supply and demand. In particular, Dettling (2016) shows that residential broadband Internet access can increase women's participation in the US labor market via a larger use of telework and saving time in home production. Although the teleworking option had a relatively limited diffusion in Italy at the time of our analysis, we cannot exclude this possibility and thus some care must be taken in interpreting the IV results.

Results

Preliminary analysis

Before moving to the main empirical exercise, we explore the correlation between the use of non-standard temporary employment and span of control using pooled OLS regressions with time and industry fixed effects. This is to verify how much of the variance of the former can be explained by the span of control as opposed to other explanatory variables usually considered by the previous literature. Following the above discussion, we organize alternative explanatory variables in three groups: those that are proxies of market uncertainty, the ones that capture the characteristics of the production regime; and those related to the features of the competitive environment. In all the estimated models we regress the ratio of temporary employment against our focus variables plus a set of year dummies and industry dummies.

Table 2 reports the results. The span of control alone (column 1) explains nearly 7 percent of the variation of non-standard temporary employment. Such value is slightly smaller for the other groups of variables, ranging between 4 percent for competition-related variables and 6 percent for the proxies of environmental uncertainty. It is also interesting to notice that while for the span of control the sign of the coefficient is consistent with the theory, for some of the other explanatory variables this is not the case. In particular, both being an exporter and business seasonality are negatively associated with the use of temporary employment. Overall, these results suggest that the span of control has an explanatory power that is comparable to (if not larger than) other factors usually considered by the previous literature.²³

[Table 2]

Baseline specification

Table 3 shows the results of our baseline specification, *i.e.* fixed effect panel model. In column (1), we estimate a parsimonious model in which we control only for firm and year fixed effects. In column (2), we add controls for firm-level characteristics such as size, age and being part of a group. In column (3), we control also for alternative drivers of non-standard employment. Finally, in column (4) we conduct a robustness checks taking into account a broader definition of non-standard labor. In particular, we estimate the same model as in column (3) considering however the share of fixed-term and agency contracts as our dependent variable.

²³ These results are confirmed also when we run OLS pooled regression with clustered standard errors. The clustered standard error-version of these preliminary regressions are available upon request.

In all the models, the span of control has a positive and statistically significant effect. Being the average value of non-standard employment 5.7 percent of total employment, this means that starting from the mean span of control of 16, an increase by one unit of the span of control is associated with an increase between 2.9 and 3.3 percent in the share of non-standard temporary employment. Such increase is nearly four times the increase one would get by a comparable unit increase in firm size (0.77 percent). When we consider fixed-term and agency contract jointly the result does not change. This evidence is consistent with our hypothesis according to which a larger span of control increases the managers' coordination and monitoring costs, thus making the recourse to non-standard labor more likely.

[Table 3]

For what concerns the other covariates, we find mixed evidence. First, referring to market uncertainty and volatility, there is a positive and significant effect of both seasonality and sales growth. The latter effects hold also when we adopt a broader categorization of non-standard employment, i.e. column 4. These results are consistent with the theoretical arguments that link the use of non-standard labor to the need of being flexible to deal with a constantly changing business environment. However, this argument is not consistent with the result for sales volatility, whose coefficient turns out to be negative and significant.

Moving to the variables related to knowledge-intensive production regimes, *i.e.* labor productivity and physical asset trend, we obtain results that partially contrast with the prevailing arguments in the literature. In particular, no significant effect is observed for physical asset trend, while labor productivity is significant only when we consider fixed-term and agency contracts jointly, and with a positive sign. As argued above, while these results contradict the idea that the most productive and technologically advanced firms make little use of non-standard labor, the positive sign of productivity might be consistent with the core-periphery hypothesis (Kalleber, 2001; Atkinson 1984, 1987). According to the latter, firms with high technological endowments undergo a process of sustained polarization of the internal labor. Alongside highly qualified, trained and stable workers in charge of core non-routine operations, the firm rely on atypical workers to deal with peripheral routine tasks. In the sense, our estimates capture the high productivity of core workers.

Thirdly, also competitive pressures, as proxied by export and profit growth, do not seem to be a strong predictor of non-standard labor. In particular, profit growth has no statistically significant effect on the share of temporary employment. Similarly, being involved in

international markets via export has a weakly significant effect on the use of fixed-term contracts, but with a negative sign (whereas the competition argument would predict a positive association). Both results hold also when we include in the analysis agency contracts.

Finally, with respect to firm-level baseline characteristics, we find evidence that the non-standard labor is positively associated with firm's size and negatively associated with firm's age, while no effect is found for being part of a group.

IV specification

Given that the exogeneity of the span of control in our baseline specifications is a questionable assumption, we move to the IV estimation strategy. Table 4 shows the results when municipality-level broadband coverage, our instrument, is measured both as a continuous variable and dummy variables. For comparative purposes, we also report the OLS results in Column (1) for the single year we are taking into consideration. Columns (1) and (3) show the first stages: as theorized by previous studies, we find that the availability of broadband connection reduces the span of control. This is coherent with the theory, suggesting that advanced communication technologies reduce intra-firm communication costs and make it more convenient to rely on deeper organizational hierarchies (i.e. in our framework to reduce the span of control). The first stages of both models show a good explanatory power related to the instrumented variable. Columns (2) and (4) show the second-stage results. First, when instrumented, the span of control is confirmed to affect positively the use of non-standard labor. In particular, starting from the sample mean, an increase of one unit in the span of control generates an increase between 2.6 and 3.6 percent of the share of temporary employment. The results connected with such instrumented variable are still strongly significant, although standard errors are, as expected, inflated if compared with OLS and with fixed effects.²⁴

[Table 4]

With respect to the other covariates, when run only on 2014, the IV regression yield partially different results than the fixed effect, which however again do not confirm usual theoretical explanation for the use of non-standard contracts. With respect to market

²⁴ To control for the potential influence of our instrument on firm's location choice, we run the same IV model after removing all firms that were borne later than 2009, i.e. the year in which the Italian broadband program was started. The main results hold.

uncertainty, the results again yield some positive relation, this time between volatility, on one hand, and growth of sales, on the other. However, this relation is not confirmed when looking at the seasonality index. Secondly, we find an additional - and stronger than in the fixed effect model - confirmation of the theory of firm polarization when looking at those variables representing knowledge-intensive production (labor productivity and asset trend): indeed, both variables have a positive effect on the share of temporary employment. Finally, for the variables capturing the competitive pressure, while exporting firms are confirmed to use less fixed-term contracts than non-exporting firms, we find a positive relation between profit growth and the dependent variable, suggesting again that the explanations based on the role of competitive pressure are not strongly confirmed.

Conclusion

Most parts of the literature explain the use of non-standard labor on the basis of external flexibility requirements that are imposed on firms by increasingly uncertain global markets. Although seldom subjected to direct empirical scrutiny, three are the factors considered to be the main sources of the need for external flexibility: a) wider and unpredictable demand fluctuations in product markets, which require the creation of secondary wide workforce buffer; b) the adoption of knowledge-intensive production regimes, which create incentives for firms to invest in training and the accumulation of firm-specific skills by highly qualified workers while shifting the burden of flexibility on the least qualified components of employment; c) the increase of competitive pressure in international markets, which brings about a significant compression of mark-ups, strengthening the role of non-standard employment as means to reduce costs by transforming labor into a variable expenditure, closely related to demand and business cycles, rather than a fixed and long-term investment.

The above mentioned *structural/contextual* factors should in principle affect all manufacturing firms. It follows that a relatively uniform within-industry distribution of non-standard employment should be expected. The evidence gathered in this work, however, contradicts this conclusion. The use of non-standard labor is markedly heterogeneous, with some firms that do not make use of it and others that do so extensively. In fact, in our data more than two thirds of all atypical contracts are underwritten by only a quarter of the firms. Such marked concentration led us into questioning the firm-level drivers of intensive non-standard employment.

Specifically, in this article we study firm-specific factors that may push firms operating within the same competitive environment to differentiate their use of non-standard labor. In

particular, we emphasize the role of managerial resources (which we proxy with the span of control): whenever such resources are relatively scarce (*i.e.*, the span of control is high), we argue that firms are more willing to make large use of non-standard labor to reduce coordination and operating costs. We verify this hypothesis using a linked employer-employee panel of manufacturing firms from the Emilia Romagna region (Italy). To be consistent with our theoretical framework we focus our analysis on non-standard employment based on fixed-term contracts. In a robustness check we extend the definition to include also agency contracts.

Summing up the econometric results, we obtain a fairly confirmative picture. The span of control has a positive and significant impact on the use of non-standard labor. This result holds controlling for alternative drivers of atypical work and combining both IV and fixed effects models. This finding provides strong support for the idea that managerial competences explain large part of the observed firm-level heterogeneity in non-standard employment.

With reference to the *structural/contextual* explanations, we obtain much less supportive evidence. Market uncertainty and volatility seem to affect the extra-use of non-standard employment, but this result is not robust to either alternative measures of volatility or different model specifications. For the variables related to knowledge-intensive production regimes, we obtain results that contrast with the arguments prevailing in the literature. In particular, they have a positive and significant effect on the use of non-standard labor. Finally, also competitive pressure does not seem to be a consistent predictor of non-standard employment.

It is worth acknowledging some limitations of our study. First, we base our analysis mainly on temporary employment and to some extent agency contracts, which, although predominant (especially the former), are only two of the different types of non-standard forms of employment available in the market. Further research based on a more variegated classification of non-standard employment could check the validity of our results also for other types of non-standard contract. Second, in our measure of the span of control we infer individual positions within the firm's hierarchy on the basis of the professional classification as defined by the Italian law and available in administrative registries. Although this is the best that can be done with our data, future research may test the robustness of the findings using more detailed definition of the firm's hierarchy. Finally, our analysis is based on data that refers only to Emilia Romagna. Even though we are confident that the main results extend to other regions as well, future research will have to investigate their actual degree of generalizability.

Overall, our findings contribute to the previous literature by suggesting that, contrary to the prevailing arguments focusing solely on contextual/structural factors, non-standard employment has strong managerial roots: it allows firms to compensate for firm-specific

managerial weaknesses. We believe that this has important implications for policy design and implementation. First, managerial roots in the use of non-standard labor should be taken into account especially while designing policy interventions such as labor market reforms. In fact, to assume that the demand for enhanced labor flexibility is entirely driven by factors that are outside the boundary of the firms, may bias the perception of policy makers regarding the right amount of non-standard labor required by the markets. On the contrary, firms may ask for more flexibility in the labor market, *i.e.* external flexibility, so as to avoid the need to increase managerial capabilities, which would allow them to rely on internal flexibility. Such misperception suggests that policy makers may have to reconsider the appropriate diffusion of non-standard employment. Moreover, considering the social costs that precarious jobs entail, we argue that policy measures should be aimed at encouraging the use of internal flexibility (e.g. supporting workforce training programs, team organization, working time flexibility arrangements) and should devote more resources to strengthening the manager's ability to comply with complexity - for example by promoting the diffusion of good managerial practices and more generally managerial resources via local spillovers.

References

- Abraham, Katharine G., and Susan K. Taylor. 1996. Firms' use of outside contractors: Theory and evidence. *Journal of Labor Economics* 14(3): 394–424.
- Acemoglu, Daron, and David H. Autor. 2011. Skills, tasks and technologies: Implications for employment and earnings. In Orley Ashenfelter and David Card (Eds.), *Handbook of Labor Economics*, Vol. 4, pp. 1043–1171. Amsterdam: Elsevier-North Holland.
- Addabbo, Tindara, and Giovanni Solinas (Eds.). 2011. *Non-standard employment and quality of work: the case of Italy*. Heidelberg: Physica.
- Aleksynska, Mariya, and Janine Berg. 2015. Understanding firms' demands for temporary labour in developing countries. Regulating for Decent Work 2015 Conference. Geneva: International Labour Organization.
- Allan, Cameron. 2000. The hidden organizational costs of using non-standard employment. *Personnel Review* 29(2): 188–206.
- Allmendinger, Jutta, Lena Hipp, and Stefan Stuth. 2013. Atypical employment in Europe 1996–2011. WZB Discussion Paper No. P 2013-003. Berlin: Berlin Social Science Center.
- Andreoni, Antonio, and Ha-Joon Chang. 2016. Industrial policy and the future of manufacturing. *Economia e Politica Industriale* 43(4): 491–502.
- Ansoff, Igor H., and Robert G. Brandenburg. 1971. A language for organizational design: parts I and II. *Management Science* 17(12): 350–393.
- Arrighetti, Alessandro, Fabio Landini, and Andrea Lasagni. 2014. Intangible assets and firm heterogeneity: evidence from Italy. *Research Policy* 43(1): 202–213.
- Atkinson, John. 1984. Manpower strategies for flexible organizations. *Personnel Management* 16(8): 28–31.
- Atkinson, John. 1985. Flexibility: planning for an uncertain future. *Manpower Policy and Practice* 1(1): 26–29.
- Atkinson, John. 1987. Flexibility or fragmentation? The United Kingdom labor market in the eighties. *Labor and Society* 12(1): 87–105.
- Autor, David H., Frank Levy, and Richard J. Murnane. 2003. The skill content of recent technological change: an empirical exploration. *Quarterly journal of economics* 118(4): 1279–1333.
- Bachmann, Ronald, Peggy Bechara, Anica Kramer, and Sylvi Rzepka. 2015. Labour market dynamics and worker heterogeneity during the Great Recession—Evidence from Europe. *IZA Journal of European Labor Studies* 4(1): 19.
- Bagguley, Paul. 1991. Post-fordism and enterprise culture: flexibility, autonomy and changes in economic organization. In Russel Keat and Nicholas Abercrombie (Eds.), *Enterprise Culture*. London: Routledge.
- Banker, Rajiv D., Dimitri Byzalov, Shunlan Fang, and Yi Liang. 2018. Cost management research. *Journal of Management Accounting Research* 30(3): 187–209.
- Bandiera, Oriana, Andrea Prat, Raffaella Sadun, and Julie Wulf. (2014). Span of control and span of attention. Strategy Unit Working Paper No. 12-053. Harvard Business School.

- Bardazzi, Rossella, and Silvia Duranti. 2016. Atypical work: a threat to labour productivity growth? Some evidence from Italy. *International Review of Applied Economics* 30(5): 620–643.
- Bartelsman, Eric, Paloma Lopez-Garcia, and Giorgio Presidente. 2019. Labour Reallocation in Recession and Recovery: Evidence for Europe. *National Institute Economic Review* 247(1): R32-R39.
- Battisti, Michele, Giovanna Vallanti. 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.
- Bell, Gerald D. 1967. Determinants of the span of control. *American Journal of Sociology* 73(1): 100-109.
- Bender, Stefan, Nicholas Bloom, David Card, John Van Reenen, and Stefanie Wolter. 2018. Management practices, workforce selection, and productivity. *Journal of Labor Economics* 36(S1): S371-S409.
- Benner, Chris. 2008. *Work in the new economy: Flexible labor markets in Silicon Valley*. Oxford: Blackwell Publishers.
- Bentolila, Samuel, and Juan J. Dolado. 1994. Labour flexibility and wages: Lessons from Spain. *Economic Policy* 18: 55–99.
- Bentolila, Samuel, and Gilles Saint-Paul. 1994. A model of labor demand with linear adjustment costs. *Labour Economics* 1(3–4): 303–26.
- Bergh, Donald D., and Michael W. Lawless. 1998. Portfolio restructuring and limits to hierarchical governance: The effects of environmental uncertainty and diversification strategy. *Organization Science* 9(1): 87-102.
- Bertola, Giuseppe, Tito Boeri, and Sandrine Cazes. 2000. Employment protection in industrialized countries: the case for new indicators. *International Labour Review* 139(1), 57-72.
- Biegert, Thomas, and Michael Kühhirt. 2018. Taking lemons for a trial run: does type of job exit affect the risk of entering fixed-term employment in Germany?. *European Sociological Review* 34(2): 184-197.
- Blanchard, Olivier, and Augustine Landier. 2002. The perverse effect of partial labour market reform: fixed-term contracts in France. *Economic Journal* 112 (480): F214–F244.
- Blanchard, Olivier J., and Justine Wolfers. 2000. The role of shocks and institutions in the rise of European unemployment: the aggregate evidence. *Economic Journal* 110(462): C1–33.
- Blau, Peter M., and Richard A. Schoenherr. 1971. *The structure of organizations*. New York: Basic Books.
- Bloom, Nicholas, and John Van Reenen. 2010. Why do management practices differ across firms and countries? *Journal of Economic Perspectives* 24(1): 203-24.
- Bloom, Nicholas, Benn Eifert, Aprajit Mahajan, David McKenzie, and John Roberts. 2013. Does management matter? Evidence from India. *Quarterly Journal of Economics* 128(1): 1-51.
- Bloom, Nicholas, Louis Garicano, Raffaella Sadun, and John Van Reenen. 2014. The distinct effects of information technology and communication technology on firm organization. *Management Science* 60(12): 2859-2885.

- Bock, Adam J., Tore Opsahl, Gerard George, and David M. Gann. 2012. The effects of culture and structure on strategic flexibility during business model innovation. *Journal of Management studies* 49(2): 279-305.
- Boeri, Tito, and Pietro Garibaldi. 2007. Two tier reforms of employment protection: a honeymoon effect? *Economic Journal* 117(521): F357–85.
- Boeri, Tito, Pietro Garibaldi, and Espen R. Moen. 2013. Financial shocks and labor: facts and theories. *IMF Economic Review* 61(4): 631-663.
- Bosch, Gerard. 2004. Towards a new standard employment relationship in Western Europe. *British journal of industrial relations* 42(4): 617-636.
- Brewster, Chris, Lesley Mayne, and Olga Tregaskis. 1997. Flexible working in Europe. *Journal of World Business* 32(2): 133-151.
- Bushman, Robert, Qi Chen, Ellen Engel, and Abbie Smith. 2004. Financial accounting information, organizational complexity and corporate governance systems. *Journal of Accounting and Economics* 37(2): 167-201.
- Cappelli, Peter, and Joseph (JR) H. Keller. 2013. Classifying work in the new economy. *Academy of Management Review* 38(4): 575-596.
- Cappelli, Peter, and Neumark, David 2001. External job churning and internal job flexibility. NBER Working Paper No. 8111. Cambridge, MA: National Bureau of Economic Research.
- Caliendo, Lorenzo, Ferdinando Monte, and Esteban Rossi-Hansberg. 2015. The anatomy of French production hierarchies. *Journal of Political Economy* 123(4), 809-852.
- Caudron, Shari. 2002. Another God that's failed, *Across the Board* 39(3): 1–3.
- Chang, An-Yuan. 2012, Prioritising the types of manufacturing flexibility in an uncertain environment. *International Journal of Production Research* 50(8): 2133-2149.
- Chen, Natalie, Jean Imbs, and Andrew Scott. 2009. The dynamics of trade and competition. *Journal of International Economics* 77(1): 50-62.
- Colclough, Glenna and Tolbert, Charles M. 1992. Work in the fast lane: flexibility, divisions of labor, and inequality in high-tech industries. Albany: SUNY.
- Comin, Diego, and Thomas Philippon. 2005. The rise in firm-level volatility: causes and consequences. *NBER Macroeconomics Annual* 20: 167-201.
- Damiani, Mirella, Fabrizio Pompei, and Andrea Ricci. 2016. Temporary employment protection and productivity growth in EU economies. *International Labour Review* 155(4): 587-622.
- Danneels, Erwin 2002. The dynamics of product innovation and firm competences. *Strategic Management Journal* 23(12): 1095–1121.
- Davis-Blake, Alison, and Brian Uzzi. 1993. Determinants of employment externalization: A study of temporary workers and independent contractors. *Administrative science quarterly* 38(2): 195-223.
- D'Aveni, Richard A. 1994. *Hypercompetition: managing the dynamics of strategic maneuvering*. New York: Free Press.
- D'Aveni, Richard A. 1999. Strategic supremacy through disruption and dominance. *Sloan Management Review* 40(3): 127-36.

- Devicienti, Francesco, Paolo Naticchioni, and Andrea Ricci. 2018. Temporary employment, demand volatility, and unions: firm-level evidence. *ILR Review* 71(1): 174-207.
- Deyo, Frederic C. 1997. Labor and post-Fordist industrial restructuring in East and Southeast Asia. *Work and Occupations*, 24(1): 97–118.
- Dettling, Lisa J. 2017. Broadband in the labor market: the impact of residential high-speed internet on married women's labor force participation. *ILR Review*, 70(2): 451-482.
- Di Caro, Paolo, and Giuseppe Nicotra. 2016. Short, long and spatial dynamics of informal employment. *Regional Studies* 50(11): 1804-1818.
- Doeringer, Peter B., Michael J. Piore. 1985. *Internal Labor Markets and Manpower Analysis*. London: M. E.Sharpe, Inc.
- Dreyer, Bent, and Kjell Grønhaug. 2004. Uncertainty, flexibility, and sustained competitive advantage. *Journal of business research* 57(5): 484-494.
- Duguay, Claude R., Sylvain Landry, and Federico Pasin. 1997. From mass production to flexible/agile production. *International Journal of Operations & Production Management* 17(12): 1183-1195.
- Dunk, Alan S. 1993. The effect of budget emphasis and information asymmetry on the relation between budgetary participation and slack. *Accounting Review* 68(2): 400-410.
- Eichhorst, Werner, Michael T. Feil, and Paul Marx. 2010. Crisis, what crisis? Patterns of adaptation in European labor markets. *Applied Economics Quarterly* 56(61): 29–64.
- Feenstra, Robert C., and David E. Weinstein. 2017. Globalization, markups, and US welfare. *Journal of Political Economy* 125(4), 1040-1074.
- Fernández-Kranz, Danile, and Núria Rodríguez-Planas, N. 2011. The part-time pay penalty in a segmented labor market. *Labour Economics* 18(5): 591-606.
- Fonseca, Tiago, Pedro de Faria, and Francisco Lima. 2019. Human capital and innovation: the importance of the optimal organizational task structure. *Research Policy* 48(3): 616-627.
- Fonseca, Tiago, Francisco Lima, and Sonia C. Pereira. 2018. Job polarization, technological change and routinization: evidence for Portugal. *Labour Economics* 51(April): 317-339.
- Garicano, Louis. 2000. Hierarchies and the organization of knowledge in production. *Journal of Political Economy* 108(5): 874-904.
- Gerwin, Donald. 1993. Manufacturing flexibility: a strategic perspective. *Management Science* 39(4): 395–410.
- Gittell, Jody H. 2000. Paradox of coordination and control. *California Management Review* 42(3): 101-117.
- Harvey, Michael, and Milorad M. Novicevic. 2001. The impact of hypercompetitive “timescapes” on the development of a global mindset. *Management Decision* 39(6): 448-460.
- Hipp, Lena, Janine Bernhardt, and Jutta Allmendinger. 2015. Institutions and the prevalence of nonstandard employment. *Socio-Economic Review* 13(2): 351-377.
- Hirshleifer, David, and Anjan V. Thakor. 1992. Managerial conservatism, project choice and debt, *Review of Financial Studies* 5(3): 437–470.
- Holmlund, Bertil, and Donald Storrie. 2002. Temporary work in turbulent times: the Swedish experience. *Economic journal* 112(480): F245-F269.

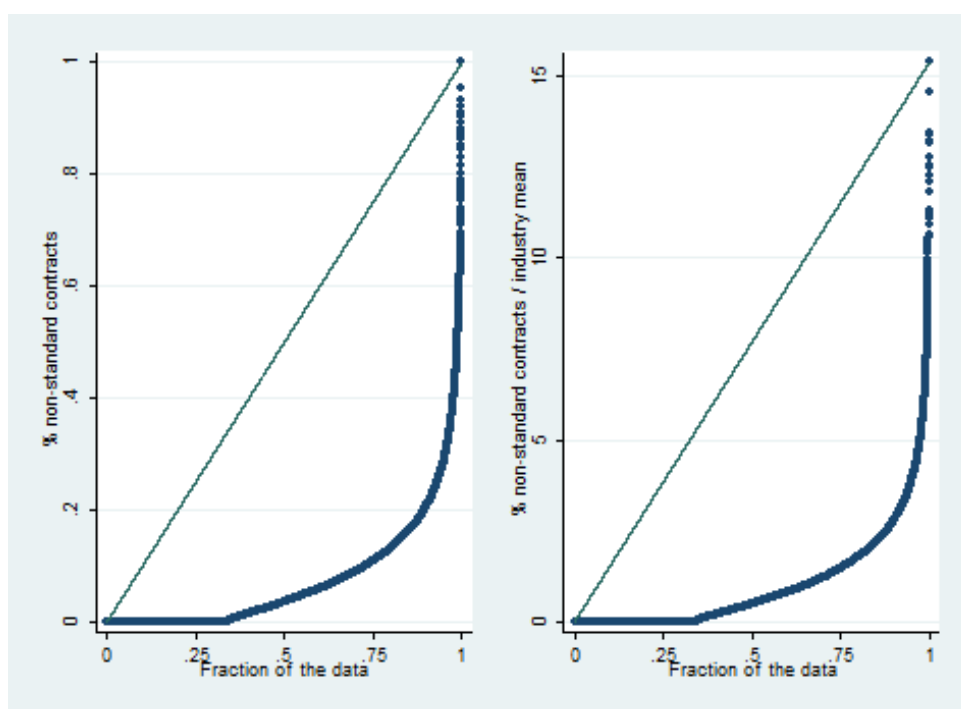
- Hunter, Laurie, Alan McGregor, John MacInnes, and Alan Sproull. 1993. The “flexible firm”: strategy and segmentation. *British Journal of Industrial Relations*, 31(3): 383–407.
- Hyman, Louis. 2016. Temps, consultants, and the rise of the precarious economy. *Hedgehog Review* 18(1): 18.
- Ichino, Andrea, and Regina T. Riphahn. 2005. The effect of employment protection on worker effort: absenteeism during and after probation. *Journal of the European Economic Association* 3(1): 120–43.
- [ILO] International Labour Office. 2015. Non-standard forms of employment. Geneva: report.
- [ILO] International Labour Office. 2018. Informality and non standard forms of employment, G20 Employment Working Group meeting 20-22 February 2018, Buenos Aires.
- [ISTAT] Istituto Nazionale di Statistica. 2017. Il mercato del lavoro. Verso una lettura integrata – Rapporto 2017. Available at <https://www.istat.it/it/archivio/213888> (January 5, 2021).
- Jin, Yan, Margaret M. Hopkins, and Jenell L. S. Wittmer. 2010. Linking human capital to competitive advantages: Flexibility in a manufacturing firm's supply chain. *Human Resource Management* 49(5): 939-963.
- Kaldor, Nicholas. 1967. Strategic factors in economic development, New York State School of Industrial and Labor Relations, Cornell University, Ithaca.
- Kalleberg, Arne L. 2000. Non-standard employment relations: part time, temporary or contract work. *Annual Review of Sociology* 26 (1): 341–65.
- Kalleberg, Arne L. 2001. Organizing flexibility: the flexible firm in a new century. *British Journal of Industrial Relations* 39(4): 479-504.
- Kalleberg, Arne L. 2011. *Good jobs, bad jobs: the rise of polarized and precarious employment systems in the United States, 1970s-2000s*. New Work: Russell Sage Foundation.
- Keller, Berndt, and Hartmut Seifert. 2005. Atypical Employment and Flexicurity. *Management Revue* 16(3): 304-323.
- Ketokivi, Mikko 2006. Elaborating the contingency theory of organizations: the case of manufacturing flexibility strategies. *Production and Operations Management* 15(2): 215-228.
- Keune, Maarten. 2013. Trade union responses to precarious work in seven European countries. *International Journal of Labour Research* 5(1): 59.
- Kleinknecht, Alfred, Oostendorp, Remco M., Menno P. Pradhan, and C. W. M. Naastepad. 2006. Flexible labour, firm performance and the Dutch job creation miracle. *International Review of Applied Economics* 20(2): 171-187.
- Kleinknecht, Alfred, Flore N. van Schaik, and Haibo Zhou. 2014. Is flexible labour good for innovation? Evidence from firm-level data. *Cambridge journal of economics* 38(5): 1207-1219.
- Ko, Jyh-Jer R. 2003. Contingent and Internal Employment Systems: Substitutes or Complements?. *Journal of Labor Research* 24(3): 473–90.
- Landini, Fabio, Alessandro Arrighetti, and Eleonora Bartoloni. 2020. The sources of heterogeneity in firm performance: lessons from Italy. *Cambridge Journal of Economics* 4(33): 527-558.

- Lasagni, Andrea. 2011. Agglomeration economies and employment growth: new evidence from the information technology sector in Italy. *Growth and Change* 42(2): 159-178.
- Laverty, Kevin J. 1996. Economic “short-termism”: the debate, the unresolved issues, and the implications for management practice and research. *Academy of Management Review* 21(3), 825-860.
- Lee, Raphael S. -H., and Mathilde Pak. 2018. Pro-competitive effects of globalisation on prices, productivity and markups: evidence in the Euro Area. INSEE Working Paper. Paris: Institut National de la Statistique et des Études Économiques.
- Lepak, David. P., Riki Takeuchi, and Scott A. Snell. 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.
- Lepak, David P., and Scott A. Snell. 1999. The human resource architecture: toward a theory of human capital allocation and development. *Academy of management review* 24(1): 31-48.
- Lepak, David P., and Scott A. Snell. 2002. Examining the human resource architecture: The relationships among human capital, employment, and human resource configurations. *Journal of management* 28(4): 517-543.
- Lucidi, Federico, and Alfred Kleinknecht. 2010. Little innovation, many jobs: An econometric analysis of the Italian labor productivity crisis. *Cambridge Journal of Economics* 34(3): 525-546.
- Luo, Tian, Amar Mann, and Richard Holden. 2010. The expanding role of temporary help services from 1990 to 2008. *Monthly Labor Review* 133(8): 3-16.
- Martin, Geoffrey P., Robert M. Wiseman, and Luis R. Gomez-Mejia. 2016. Going short-term or long-term? CEO stock options and temporal orientation in the presence of slack. *Strategic Management Journal* 37(12): 2463-2480.
- Mayer, Kyle J., and Jack A. Nickerson. 2005. Antecedents and performance implications of contracting for knowledge workers: evidence from information technology services. *Organization Science* 16(3): 225-242.
- McGrath, Rita 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, Jonathan, and Maura Sheehan. 2003. Labour market deregulation, ‘flexibility’ and innovation. *Cambridge journal of economics* 27(1), 123-143.
- Millward, Neil, Alex Bryson, and John A. Forth. 2000. *All Change at Work?* London: Routledge.
- Nickell, Stephen. 1997. Unemployment and labor market rigidities: Europe versus North America. *Journal of Economic Perspectives* 11(3): 55-74.
- Nienhueser, Werner. 2005. Flexible Work= Atypical Work= Precarious Work?: Introduction to the Special Issue. *Management Revue* 16(3): 299-303.
- [OECD] Organization for Economic Co-operation and Development. 2014. Employment Outlook. Paris: Report.
- Ouchi, William G. 1980. Markets, bureaucracies and clans. *Administrative Science Quarterly* 25(1): 129-41

- Ouchi, William G., and John B. Dowling. 1974. Defining the Span of Control. *Administrative Science Quarterly* 19(3): 357-365.
- Pacelli, Lia and Roberto Leombruni. 2003. Il turnover delle imprese e dei lavoratori. In Claudio Lucifora (Ed.) *Mercato, occupazione e salari: la ricerca sul lavoro in Italia*. Milano: Mondadori Editore.
- Patel, Pankaj C. 2011. Role of manufacturing flexibility in managing duality of formalization and environmental uncertainty in emerging firms. *Journal of Operations Management* 29(1-2): 143-162.
- Peck, Jamie, and Nik Theodore. 2006. Flexible recession: the temporary staffing industry and mediated work in the United States. *Cambridge Journal of Economics* 31(2): 171-192.
- Pfeifer, Christian. 2005. Flexibility, dual labour markets, and temporary employment: empirical evidence from German establishment data. *Management Revue* 16(3): 404-422.
- Piore, Michael J., and Charles C. Sabel. 1985. *The Second Industrial Divide: Possibilities for Prosperity*. New York: Basic Books.
- Portugal, Pedro, and Jose Varejao. 2009. Why do firms use fixed-term contracts? IZA Discussion Papers No. 4380. Bonn: Institute for Labor Economics (IZA).
- Powell, Walter W. 2001. The capitalist firm in the 21st century: emerging patterns. In Paul DiMaggio (Ed.), *Twenty-first Century Firm: Changing Economic Organization in International Perspective*. Princeton, NJ: Princeton University Press.
- Quinlan, Michael. 1998. Labour market restructuring in industrialized societies: an overview. *Economic Labour Relations Review* 9(1):1-30.
- Saint-Paul, Gilles. 1996. *Dual Labor Markets: A Macroeconomic Perspective*. Cambridge, MA: MIT press.
- Sanchez, Ron. 1995. Strategic flexibility in product competition. *Strategic management journal* 16(S1): 135-159.
- Smith, Vicki. 1997. New forms of work organization. *Annual Review of Sociology* 23(1): 315-39.
- Stigler, George 1939. Production and distribution in the short run. *Journal of Political Economy* 47 (3): 305-327.
- Streeck, Wolfgang 1987. The uncertainties of management in the management of uncertainty: employers, labor relations and industrial adjustment. *Employment and Society* 1(3): 281-308.
- Szirmai, Adam, Wim Naudé, and Ludovico Alcorta, 2013. *Pathways to Industrialization in the Twenty-first Century: New Challenges and Emerging Paradigms*. Oxford: Oxford University Press.
- Teece, David, Margaret Peteraf and Sohvi Leih. 2016. Dynamic capabilities and organizational agility: risk, uncertainty, and strategy in the innovation economy. *California Management Review* 58(4): 13-35.
- Tolliday, Steven, and Jonathan Zeitlin. 1987. *The Automobile Industry and its Workers: Between Fordism and Flexibility*. New York: St Martin's Press
- Tsui, Anne S., Jone L. Pearce, Lyman W. Porter, and Jennifer P. Hite. 1995. Choice of employee organization relationship: influence of external and internal organizational factors. *Research in Personnel and Human Resources Management* 13(1): 117-51

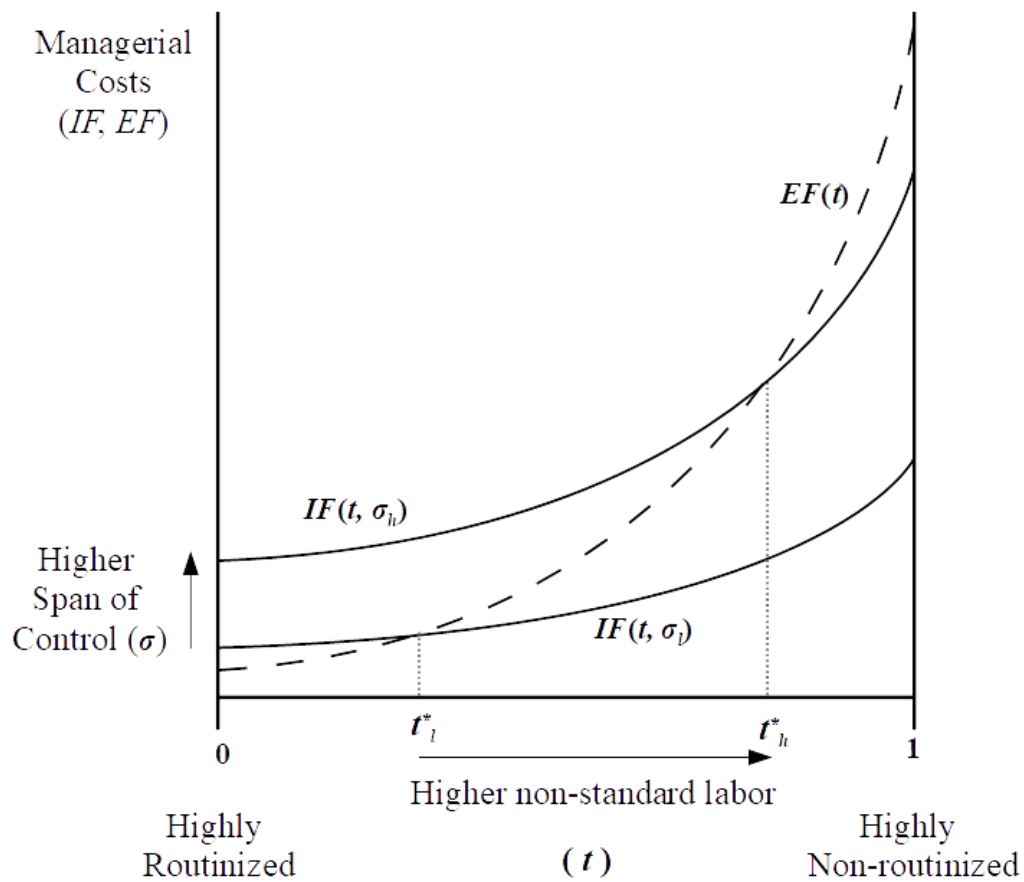
- Treu, Tiziano. 1992. Labour flexibility in Europe. *International Labour Review* 131(4-5): 497-512.
- Valverde, Mireia, Olga Tregaskis, and Chris Brewster. 2000. Labor flexibility and firm performance. *International Advances in Economic Research* 6(4): 649-661.
- Verdu-Jover, Antonio J., Javier F. Llorens-Montes, and Victor J. Garcia-Morales. 2005. Flexibility, fit and innovative capacity: an empirical examination. *International Journal of Technology Management* 30(1-2): 131-146.
- Volberda, Henk W. 1996. Toward the flexible form: how to remain vital in hypercompetitive environments. *Organization science* 7(4): 359-374.
- Volberda, Henk W. 1998. *Building the Flexible Firm*. Oxford: Oxford University Press
- Vrontis, Demetris, and Alkis Thrassou. 2013. *Innovative Business Practices: Prevailing a Turbulent Era*. Cambridge: Cambridge Scholars Publishing.
- Vrontis, Demetris, Alkis Thrassou, Gabriele Santoro, and Armando Papa. 2017. Ambidexterity, external knowledge and performance in knowledge-intensive firms. *Journal of Technology Transfer* 42(2), 374-388.
- Zhou, Haibo, Ronald Dekker, and Alfred Kleinknecht. 2011. Flexible labor and innovation performance: evidence from longitudinal firm-level data. *Industrial and Corporate Change* 20(3): 941-968.

Figure 1 – Non-standard employment: quantile distributions



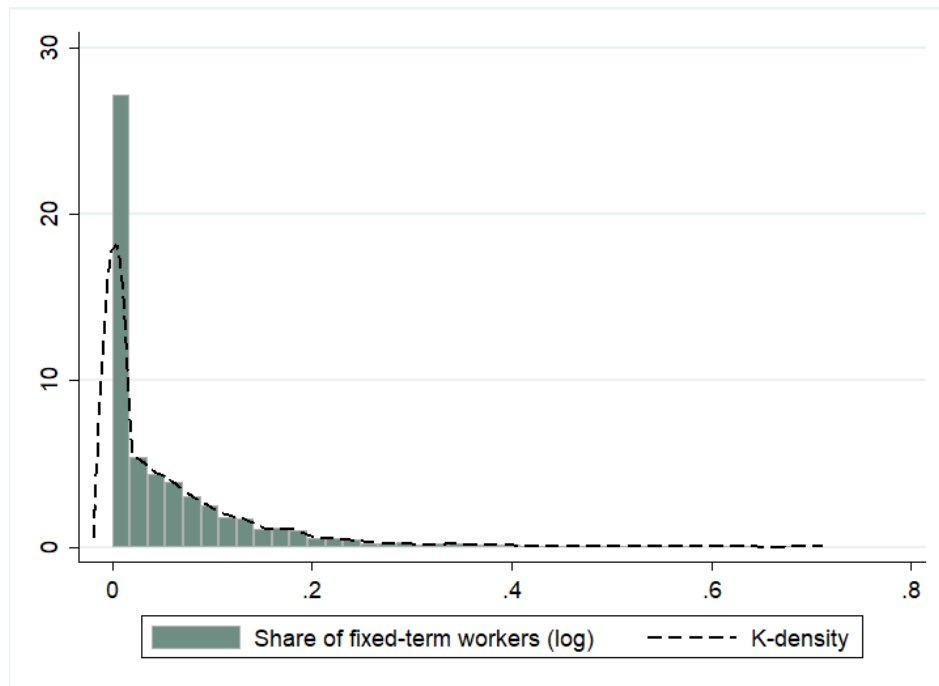
Note: The left panel reports the quantile distribution of the share of fixed-term and agency contracts for the sample of firms included in our dataset. The right panel reports the quantile distribution of the same variable after normalising the share by the industry mean. The shape of the distribution does not change significantly after the normalisation. This suggests the existence of high within-industry heterogeneity. Total obs= 26,746, firms are pooled across the three years of observation 2012-2014.

Figure 2 – Internal vs. external flexibility: managerial resources and task segmentation



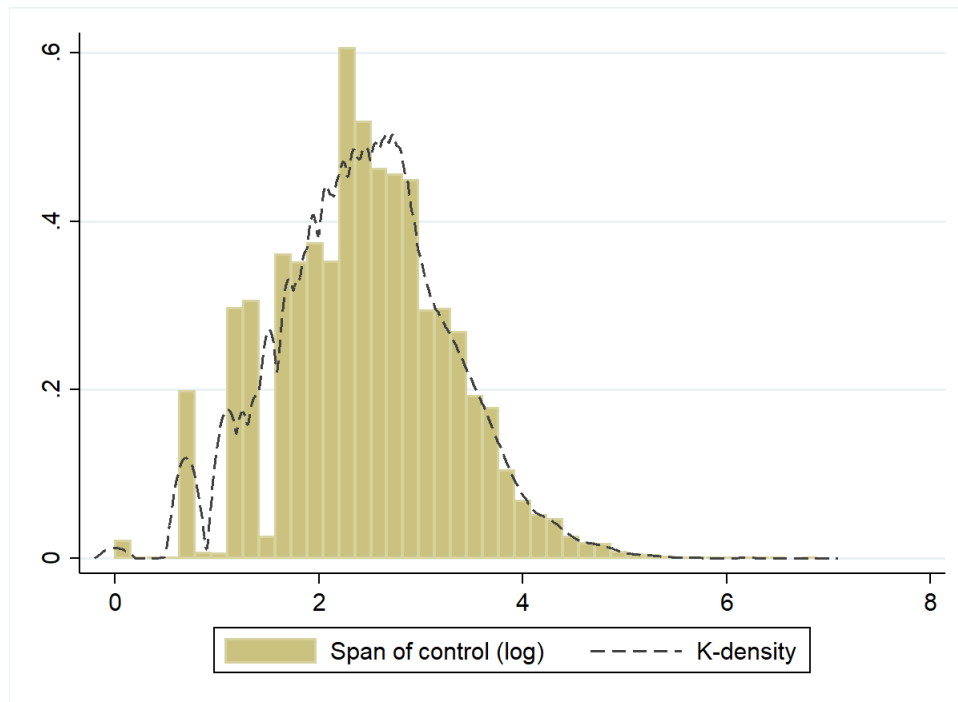
Note: the curves represent the cost of internal (continuous) and external flexibility (dashed). Firms rely on external flexibility (EF) as long as it is cheaper than internal flexibility (IF). The cutoff point at which the firm switches from EF to IF is higher, the higher the span of control, *i.e.* the scarcer managerial resources.

Figure 3 – Non-standard temporary employment: frequency distribution and kernel density



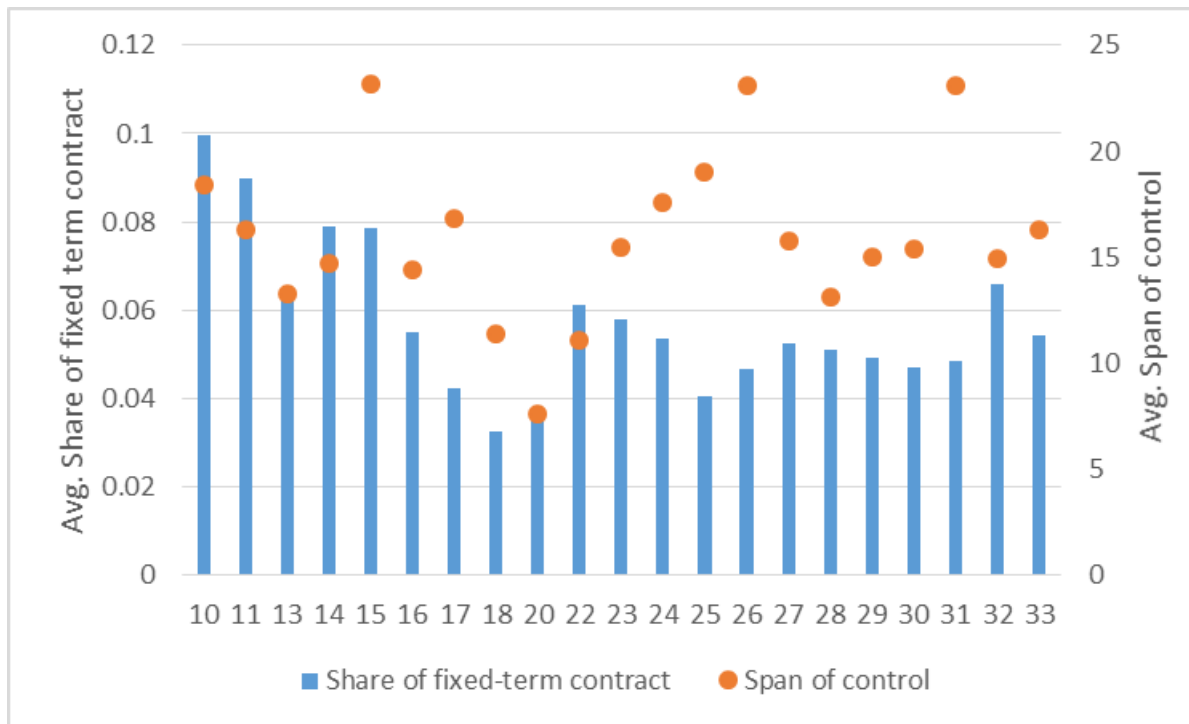
Note: Frequency distribution and Kernel density function of the share of temporary workers. The distribution is highly skewed. Total obs= 26,746, firms are pooled across the three years of observation 2012-2014.

Figure 4 – Span of control: frequency distribution and kernel density



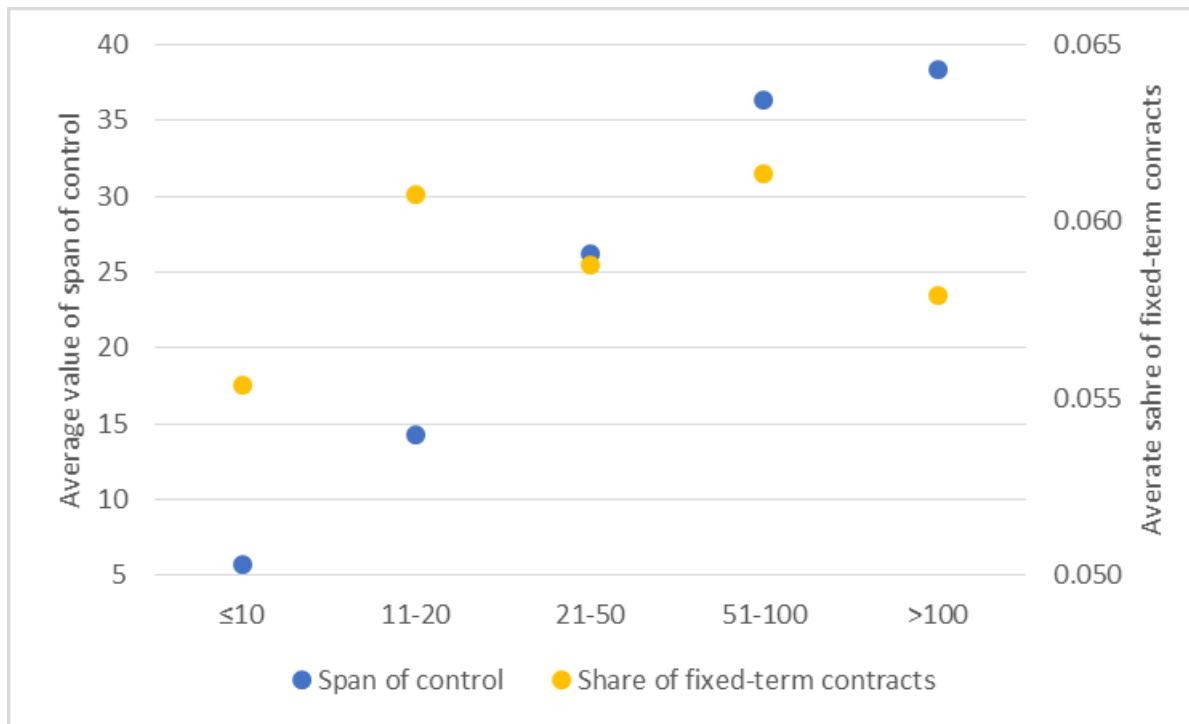
Note: Frequency distribution and Kernel density function of span of control (in logarithm). The distribution is highly skewed. Total obs= 26,746, firms are pooled across the three years of observation 2012-2014.

Figure 5 – Non-standard temporary employment and span of control across industries



Note: The span of control is not in logarithm. 10) Manufacture of food products; 11) Manufacture of beverages; 13) Manufacture of textiles; 14) Manufacture of wearing apparel; 15) Manufacture of leather and related products; 16) Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials; 17) Manufacture of paper and paper products; 18) Printing and reproduction of recorded media; 20) Manufacture of chemicals and chemical products; 22) Manufacture of rubber and plastic products; 23) Manufacture of other non-metallic mineral products; 24) Manufacture of basic metals; 25) Manufacture of fabricated metal products, except machinery and equipment; 26) Manufacture of computer, electronic and optical products; 27) Manufacture of electrical equipment; 28) Manufacture of machinery and equipment n.e.c.; 29) Manufacture of motor vehicles, trailers and semi-trailers; 30) Manufacture of other transport equipment; 31) Manufacture of furniture; 32) Other manufacturing; 33) Machinery installation. Total obs= 26,746, firms are pooled across the three years of observation 2012-2014.

Figure 6 –Non-standard temporary employment and span of control across size classes



Note: mean value of temporary employment and span of control (not in logarithm) across distinct firm's size classes. High use of temporary employment, as well as large span of control measures are concentrated mainly in firms with more than 10 employees. Total obs= 26,746, firms are pooled across the three years of observation 2012-2014.

Table 1 – Descriptive statistics: non-standard temporary contracts

	(1) All (N=26,746)		(2) Quartile n. 1-2-3 (N=20,622)		(3) Quartile n. 4 (N=6,124)		Test
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	
Span of control	15.75925	22.7243	14.73288	21.57452	18.83865	25.62534	***
Volatility of sales	0.239012	0.14935	0.231773	0.140993	0.260729	0.170178	***
Sales growth	0.045174	-0.5258	0.017445	0.439636	0.128368	0.718945	***
Seasonality index	0.12499	0.0253	0.125157	0.025654	0.124486	0.024199	*
Labor productivity	49380.07	28430.9	49193.4	28378.47	49940.16	28582.46	*
Physical asset trend	1.258833	1.120393	1.206186	1.047691	1.416789	1.301983	***
Export (d)	0.607717	0.488268	0.611914	0.487326	0.595124	0.490905	**
Profit growth	-0.69684	-0.51695	-0.71282	0.504043	-0.64889	0.551135	***
Size	34.59366	108.8964	36.74556	120.2002	28.1373	63.51431	***
Age	21.87067	14.67743	23.0986	14.61694	18.18651	14.23647	***
Group	0.305691	0.460708	0.304237	0.460095	0.310051	0.462549	

Note: significance levels: * 10%, ** 5%, *** 1%. Robust standard errors in brackets.

Table 2 – Comparison across drivers of non-standard temporary employment

<i>Models</i>	OLS			
	Management	Uncertainty	Prod. Regime	Competition
	(1)	(2)	(3)	(4)
Span of control (log)	0.020*** (0.00)			
Volatility of sales		0.054*** (0.01)		
Sales growth		0.023*** (0.00)		
Seasonality index		-0.466*** (0.16)		
Labor productivity (log)			-0.002 (0.00)	
Physical asset trend (log)			0.029*** (0.00)	
Profit growth				0.011*** (0.00)
Export (d)				-0.005*** (0.00)
Constant	Yes	Yes	Yes	Yes
Firm-level controls	No	No	No	No
Industry fixed-effects	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes
Obs	26746	26746	26746	26746
T	3	3	3	3
Adjusted R2	0.063	0.056	0.045	0.039

Note: Estimation by pooled ordinary least square with robust standard errors in brackets. In all columns the dependent variable is of the share of fixed-term contract. All estimates control for industry and year fixed effects. Significance levels: * 10%, ** 5%, *** 1%.

Table 3 – Baseline specification: panel fixed-effects model

<i>Models</i>	NS=TE (1)	NS=TE (2)	NS=TE (3)	NS=TE+AC (4)
Span of control (log)	0.072*** (0.00)	0.063*** (0.00)	0.063*** (0.00)	0.061*** (0.00)
Group (d)		0.004 (0.00)	0.003 (0.00)	0.005 (0.00)
Age (log)		-0.063*** (0.01)	-0.050*** (0.01)	-0.048*** (0.01)
Size (log)		0.036*** (0.01)	0.035*** (0.01)	0.026*** (0.01)
Volatility of sales			-0.033** (0.01)	-0.031** (0.01)
Sales growth			0.006*** (0.00)	0.008*** (0.00)
Seasonality index			0.380*** (0.15)	0.380*** (0.15)
Labor productivity (log)			0.001 (0.00)	0.013*** (0.00)
Physical asset trend (log)			0.000 (0.00)	0.004 (0.00)
Profit growth			0.003 (0.00)	-0.003 (0.00)
Export (d)			-0.004* (0.00)	-0.004* (0.00)
Constant	-0.112*** (0.01)	-0.015 (0.03)	-0.095*** (0.04)	-0.190*** (0.04)
Firms Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed effects	Yes	Yes	Yes	Yes
Obs	26746	26746	26746	26746
T	3	3	3	3
Adjusted R2	0.075	0.091	0.097	0.083
Between R2	0.023	0.054	0.044	0.070
Within R2	0.075	0.091	0.098	0.084
Overall R2	0.033	0.049	0.041	0.065
LogL	46208.36	46453.08	46546.737	44690.395

Note: Estimation by linear fixed-effects model with firms-clustered standard errors in brackets. In columns 1) to 3) the dependent variable is the share of fixed-term contract. In column 4) the dependent variable is the share of fixed-term and temporary agency contracts. All estimates control for year trends. Significance levels: * 10%, ** 5%, *** 1%.

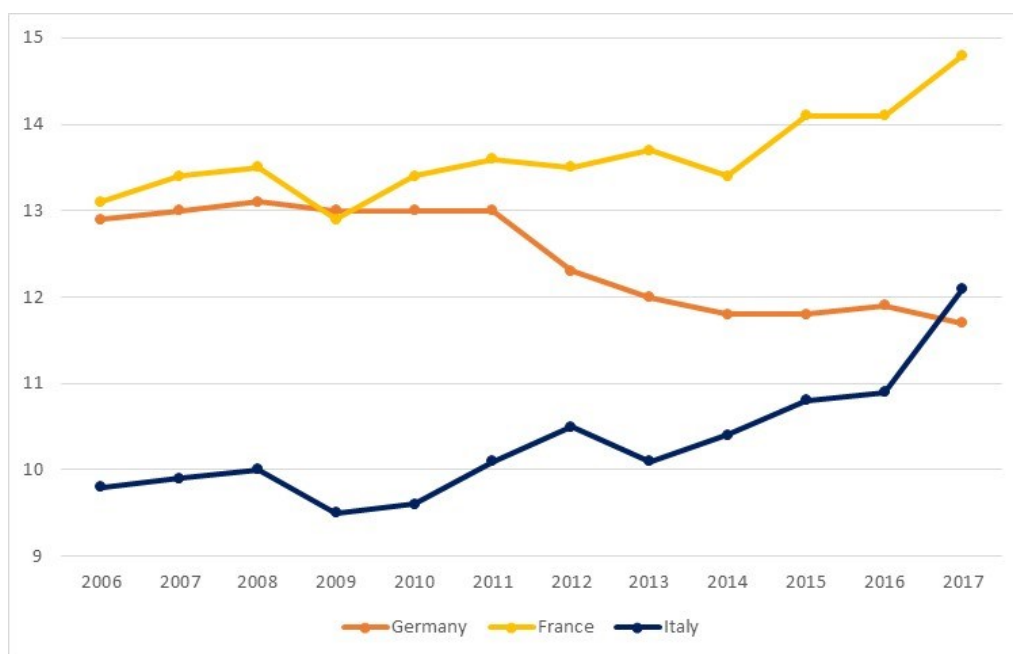
Table 4 – IV specification

<i>Models</i>	OLS 2014	I-stage	II-stage	I-stage	II-stage
	(1)	(2)	(3)	(4)	(5)
Span of control (log)	0.037*** (0.00)		0.059** (0.03)		0.082*** (0.03)
Group (d)	0.005* (0.00)	-0.176*** (0.02)	0.009 (0.01)	-0.178*** (0.02)	0.13** (0.01)
Age (log)	-0.018*** (0.00)	0.004 (0.01)	-0.018*** (0.00)	0.004 (0.01)	-0.018*** (0.00)
Size (log)	-0.010*** (0.00)	0.536*** (0.01)	-0.022 (0.02)	0.564*** (0.01)	-0.035* (0.02)
Labor productivity (log)	-0.012*** (0.00)	0.046*** (0.01)	-0.013*** (0.00)	0.045*** (0.01)	-0.014*** (0.00)
Physical asset trend (log)	0.015*** (0.00)	0.069*** (0.02)	0.014*** (0.00)	0.068*** (0.02)	0.012*** (0.00)
Profit growth	0.020*** (0.00)	-0.115*** (0.01)	0.022*** (0.00)	-0.116*** (0.01)	0.025*** (0.00)
Export (d)	-0.009*** (0.00)	0.019 (0.01)	-0.009*** (0.00)	0.019 (0.01)	-0.010*** (0.00)
Volatility of sales	0.034*** (0.01)	0.193*** (0.04)	0.029*** (0.01)	0.195*** (0.04)	0.025*** (0.01)
Sales growth	0.024*** (0.00)	0.013 (0.02)	0.024*** (0.00)	0.014 (0.02)	0.023*** (0.00)
Seasonality index	-0.169 (0.17)	-0.849 (0.92)	-0.150 (0.15)	-0.804 (0.91)	-0.131 (0.15)
Optic fibre coverage		-0.002*** (0.00)			
Optic fibre coverage (d)				-0.064*** (0.01)	
Constant	0.245*** (0.04)	-0.150 (0.23)	0.223*** (0.04)	-0.386* (0.23)	0.233*** (0.04)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Obs	8775	8775	8775	8775	8775
T	1	1	1	1	1
Adjusted R2	0.148	0.539	0.131	0.539	0.078
F-stat		311.95***		311.51***	

Note: Estimation by 2-stage least squares with robust standard errors in brackets. The sample is restricted to the 2014 cross section. Column 1) reports a benchmark ordinary least square estimation based on the same cross section. Columns 2) and 4) report results for the first stage of the IV model. Columns 3) and 5) for the second stage. In all models the dependent variable is the share of fixed-term contracts. In Columns 2) and 3) the instrument is the coverage of optic fibre infrastructure at the municipality level. In Columns 4) and 5) the instrument is a dummy variable taking value equal to one if the coverage of optic fibre infrastructure at the municipality level is positive, and zero otherwise. All estimates control for industry fixed effects. Significance levels: * 10%, ** 5%, *** 1%.

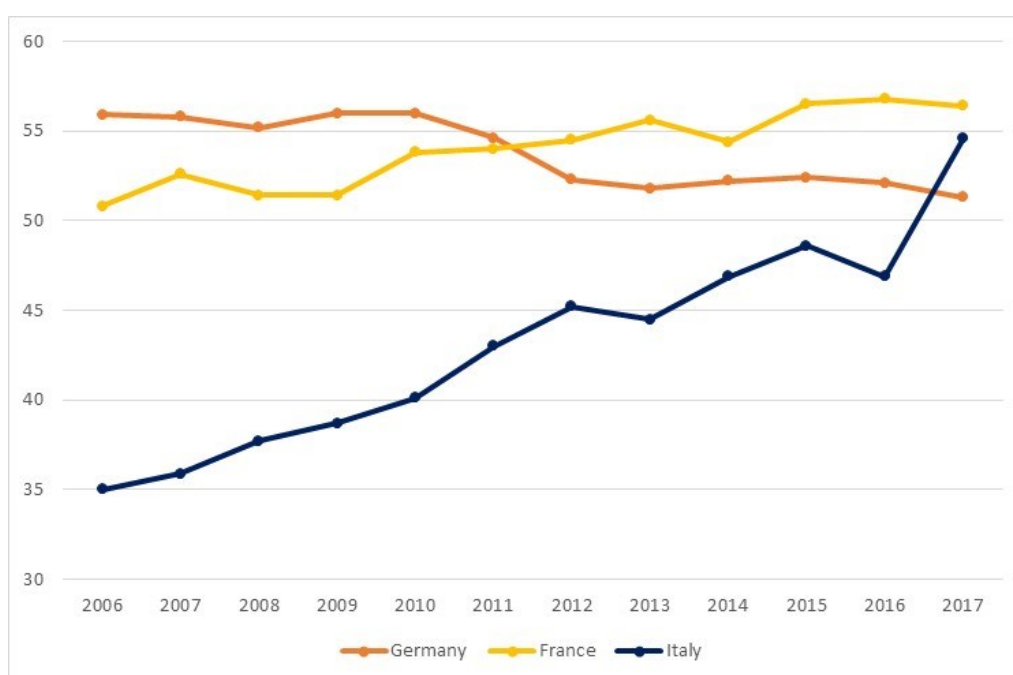
Appendix – Additional figures and tables

Figure A1 – Share of non-standard contracts across countries, 15-64 years



Source: Eurostat. *Note:* Share of non-standard contracts (total economy) between 2006 and 2017. Italy starts with lower share compared to Germany and France, but since 2009 such share has risen steadily.

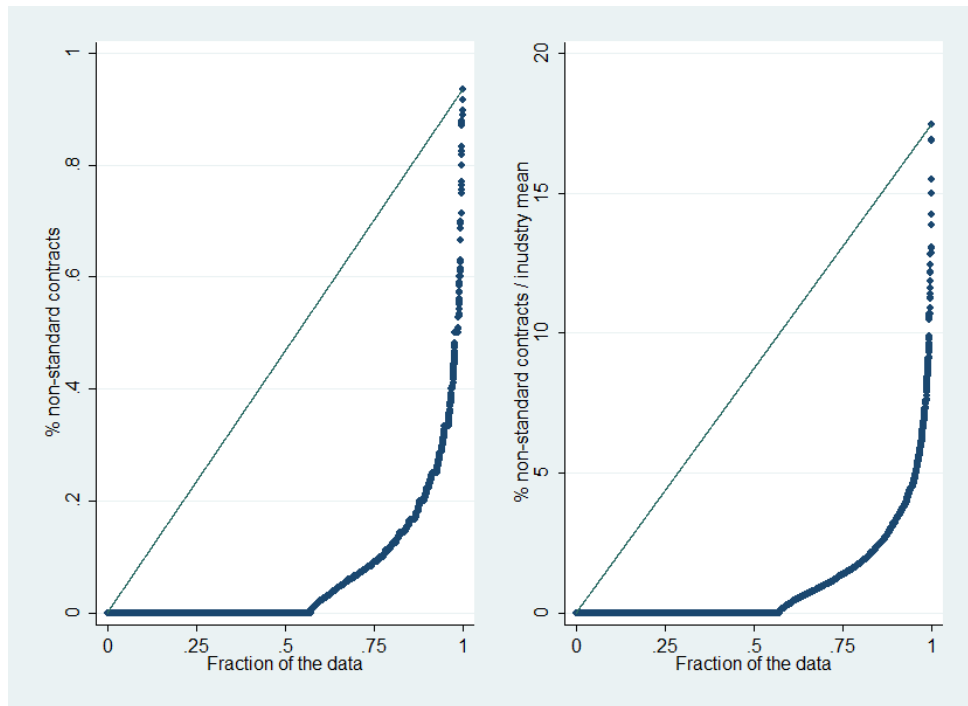
Figure A2 – Share of non-standard contracts across countries, 15-24 years



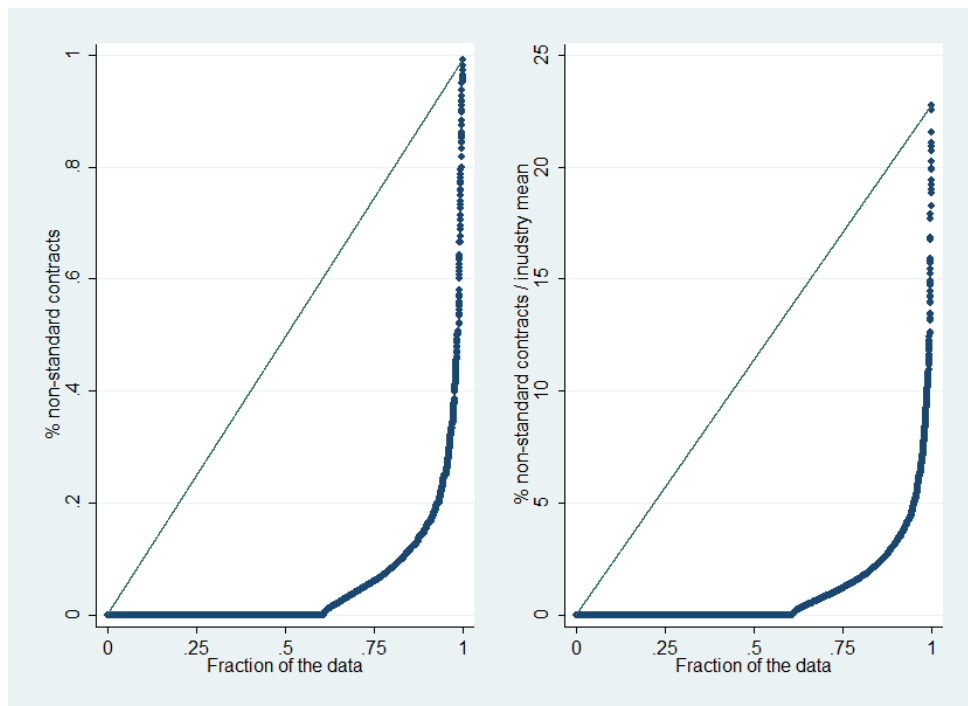
Source: Eurostat. *Note:* Share of non-standard contracts among young workers (total economy) between 2006 and 2017. Italy starts with lower share compared to Germany and France, but since 2006 such share has risen steadily.

Figure A.3 – Non-standard employment: quantile distributions (RIL Survey)

a) 2010



b) 2015



Note: Quantile distribution of the share of fixed-term and agency contracts for the sample of manufacturing firms included in the RIL Surveys 2010 (panel a) and 2015 (panel b). RIL is a country-wide survey conducted by INAPP on a large and representative sample of Italian non-agricultural firms (around 30.000 firms in each survey). For more details on sample design and methodological issues, see: <https://www.inapp.org/it/dati/ril>

Table A.1 – Explanatory variables

Variable	Measured dimension	Data source
Span of control (log)	Log of the ratio between the manual industrial workers plus office workers and the number of executives, top and mid-level managers	ISTAT ASIA Imprese and Occupazione
Volatility of sales	10-years coefficient of variation of sales, <i>i.e.</i> ratio between the average standard deviation and mean sales	ISTAT Limited Company Balance Sheets Panel
Sales growth	Yearly growth rate of sales	ISTAT Limited Company Balance Sheets Panel
Seasonality index	Based on ISTAT 2001-2014 series of monthly indexes of industrial production (2-digit ATECO), we compare the unadjusted and seasonal adjusted indexes and derive percent differences (in absolute value). The seasonality index is derived as the overall average of these monthly percent differences. The higher the index the higher the degree of sector specific fluctuations.	ISTAT
Labor productivity (log)	Log of the ration between value added and total number of employees	ISTAT Limited Company Balance Sheets Panel
Physical asset trend (log)	Log of the ratio between the value of tangible asset at time <i>t</i> and the mean value of tangible assets during the previous ten years	ISTAT Limited Company Balance Sheets Panel
Export (d)	Dummy equal to 1 if the firm is exporter (0 otherwise)	ISTAT Limited Company Balance Sheets Panel
Profit growth	Yearly growth rate of the return on sales	ISTAT Limited Company Balance Sheets Panel
Size (log)	Total number of employees	ISTAT Limited Company Balance Sheets Panel
Age (log)	Number of years since firm's foundation	ISTAT Limited Company Balance Sheets Panel
Group (d)	Dummy equal to 1 if the firm is member pf a group (0 otherwise)	ISTAT Limited Company Balance Sheets Panel

Table A2 – Correlation matrix

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)
1) Span of control	1									
2) Volatility of sales	0.0028	1								
3) Sales growth	0.0076*	-0.0157*	1							
4) Seasonality index	0.0212*	0.0560*	-0.0113*	1						
5) Labor productivity	0.0967*	0.0653*	0.0911*	-0.0991*	1					
6) Physical asset trend	0.0504*	0.0754*	0.0688*	-0.0108*	0.1112*	1				
7) Export (d)	0.1579*	0.0280*	0.0036	-0.0036	0.2854*	0.0429*	1			
8) Profit growth	-0.0531*	0.0418*	0.1103*	-0.0338*	0.3754*	0.0643*	0.0315*	1		
9) Size	0.1504*	0.0328*	0.0193*	-0.0307*	0.3126*	0.0047*	0.2356*	-0.0111*	1	
10) Age	0.2466*	-0.0253*	0.0047*	-0.0064*	0.2140*	0.0154*	0.1684*	-0.0106*	0.2537*	1
11) Group (d)	0.1249*	-0.1177*	-0.0780*	-0.0641*	0.1859*	-0.0524*	0.1682*	-0.0522*	0.0674*	0.1552*

Note: * significance level 5%