ATYPICAL CONTRACTS AND ITALIAN FIRMS' LABOUR PRODUCTIVITY *

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Introduction

Over the last decades the phenomenon of atypical employment has become of great importance for the labour market in many countries. The use of non standard contracts has widespread especially in countries characterised by a rigid employment protection legislation (EPL)[1], where the aim of a reduction of unemployment rates has been pursued through "partial labour market reforms", aimed at liberalising atypical contracts as opposed to deregulating the traditional employment relationship, strongly protected by unions (Blanchard and Landier, 2002)[2].

Following the expansion of atypical employment, several studies have investigated the consequences that such phenomenon may have on workers' careers (Casquel and Cunyat, 2004; De Graaf-Zijl et al. 2004; Gagliarducci, 2005; Güell and Petrongolo, 2007; Berton et al., 2007 and 2008; Ichino et al., 2008; Picchio, 2008) and on labour market performance (Blanchard and Landier, 2001; Cahuc and Postel-Vinay, 2001; Boeri and Garibaldi, 2005; Nunziata and Staffolani, 2005; Jaimovich and Pages-Serra, 2009). In addition, following the labour productivity slowdown experienced by some European countries from the end of the Nineties, increasing attention has been paid to the implications that the rise of atypical employment may have on productivity.

The last issue appears particularly relevant in the case of Italy, that after 2000 experienced a serious slowdown of labour productivity growth, partly attributable to the tendency to maintain labour-intensive production processes instead of pursuing a policy of innovation.

Thanks to the availability of Italian firm-level data both for large and small-medium enterprises, this paper examines the role played by atypical employment in the recent Italian productivity slowdown, to assess whether the use of external workers may harm firm's performance.

The paper is organized as follows. The first section contains a description of the Italian institutional background and presents some stylised facts concerning atypical work. Section 2 briefly reviews the existing literature on the effect of atypical work on firm's productivity, while Section 3 describes the data used in the empirical analysis. The model and the econometric approach follow in Section 4. The results of our empirical analysis are presented and discussed in Section 5, and Section 6 concludes.

1. Atypical contracts in Italy

1.1 The institutional background

The Italian labour market is characterized by a high number of contracts through which employers can choose to utilize labour.

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[1] Employment protection legislation is made up of a series of rules which regulate dismissal and which derive from both legislation and collective bargaining. Among others, EPL includes the monetary compensation necessary to put an end to the working relationship (severance pay), the notification procedures to be respected to fire a worker and the definition of the "just causes" for dismissal.

[2] See Duranti (2011) for a review of the process of liberalisation of different European countries' labour market.

Most workers are employed under the open-end contract, which still represents the standard form of employment relationship regulation. This contract, recently revised by the L. 92/2012 (*Fornero Law*), is individually dismissible only for economic or disciplinary reasons; the law requires, in firms with more than 15 workers, the reinstatement of those unfairly dismissed or the payment to them of a sum equal to 12-24 month's wages (L. 92/2012). In large firms layoffs occur mainly through collective dismissals, admitted in case of a sharp reduction or a shutdown of the activity and if the employer is planning to fire at least five workers in four months.

Reforms carried out since the mid-Nineties have introduced a great variety of non-standard contracts, among which the fixed-term contract is one of the most popular. Such a contract is of a subordinate nature and has been first liberalised in 1997 by the *Pacchetto Treu* (L. 196/1997) and then radically reformed by the legislative decree 368/2001 (implementing the European directive 70/1999 in Italy), which includes a non-discrimination clause: from both the economic and legal point of view, fixed-term employees must be treated equally to those with open-ended contracts. Even with regards to social security contributions, fixed-term employment entails the payment of contributions equal to those paid for open-ended contracts, meaning no cost-saving for the firm. Nowadays, employers can use such a contract without providing explanations of the reasons if it lasts no more than 12 months (L. 92/2012); otherwise, the employer needs to put in writing the technical, organisational, productive or substitutive reasons of a fixed-term hiring. Extensions are allowed up to a total of three years (L. 247/2007). The recent *Fornero Law* has slightly strengthened constraints on the renewal of fixed-term contracts: where an employee was previously employed on a fixed-term contract for up to six months, at least 60 days must elapse before he or she is rehired on a fixed-term contract – the previous minimum gap was 10 days. Where the previous fixed-term contract was for more than six months, 90 days must elapse – the previous minimum gap was 20 days.
Another type of non-standard subordinate labour relationship is possible through the so-called *causa mista* contracts, which are of a temporary nature and provide the worker with some training, while implying lower social security contributions to the employer. The most popular *causa mista* contract is the apprenticeship, introduced in Italy in the early Fifties and addressed to insert young people in the labour market by providing them a contextual mix of external and on-the-job training. Its duration depends on the sector of activity, while the age of the apprentices varies with the type of apprentice contract stipulated. The regulatory framework of apprenticeship has undergone significant transformations in the last years, when several reforms (L. 196/1997, d.lgs. 276/2003, d.lgs 167/2011, L. 92/2012) attempted to widen a proper use of this contract, otherwise frequently used by Italian employers as a form of cheap and temporary labour. In particular, the recent *Fornero Law* has introduced a new minimum duration of six months, except for apprenticeship contracts relating to activities that are carried out in seasonal cycles. Besides, new apprentices may be engaged only if, over the previous three years, at least 50% of apprentices have been taken on as open-ended employees.

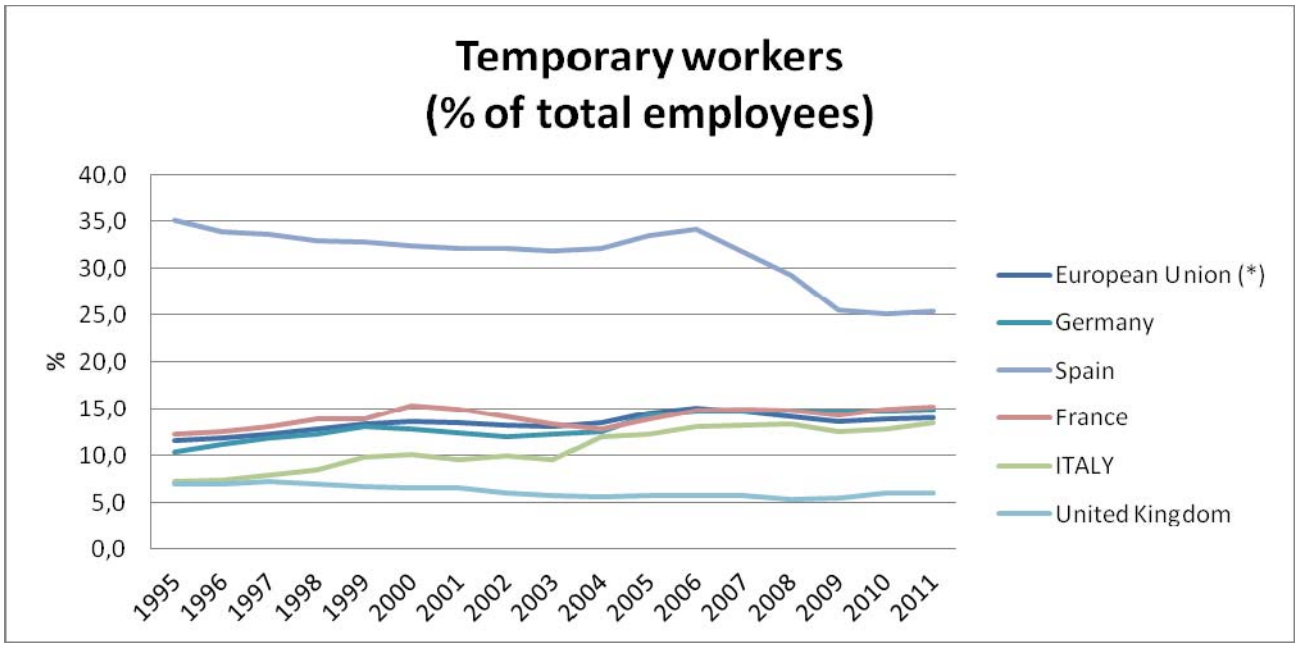
Beside the different subordinate contracts, there exist some contractual arrangements through which firms can use the labour services of external staff without actually hiring workers; in particular, Italian employers massively use temporary agency work and employer-coordinated freelance work, which provide them different types of flexibility.
Temporary agency work implies a triangular relationship, where the agency hires a worker, who is employed in a firm under the supervision of the latter. Such a contract was introduced into the Italian system by the *Pacchetto Treu* (L. 196/1997), which opted for a slight regulation, leaving much decision-making on the subject to collective bargaining. The success of this type of contract, often used by employers as a screening device, has eased its approval by unions, which have thus used it widely in collective bargaining. The L. 196/1997 also introduced the open-ended agency contract, which involves paying the worker a stand-by availability allowance. The large flexibility provided by the agency contract has a cost to the employer, who must pay agency costs.
Employer-coordinated freelance contracts are of a semi-subordinate nature, since the collaborator is formally a self-employed, albeit working in practice in a position of subordination. Such contracts are in place since the early 1970s and have been overused by Italian firms in the Nineties, because of their very limited social security fee; in 2003 the *Biagi Law* has regulated them, allowing their use only for the performance of one or more specific projects or parts of them, autonomously organised by the worker depending on the result. More recently, the *Fornero Law* has provided that an

employer-coordinated freelance worker's compensation may not be lower than the minimum compensation accorded by the national collective agreements to employees of the sectors performing similar activities.

1.2 Stylised facts concerning atypical work in Italy

Atypical work spread in Italy later than in most European countries and today the phenomenon still appears to be small-sized if analysed in comparative terms (Figure 1). Italy has, in fact, a smaller number of atypical workers than the European average (around 13% of total employees), even though this share has significantly increased over the last twenty years: in 1987 atypical workers accounted for only the 5.3% of total Italian employees[3].

Figure 1 – Temporary workers as a share of total employment



Source: Eurostat

Notes: (*) (EU12-1994, EU15-2004, EU25-2006, EU27).

The Longitudinal Survey on Firms and Employment (*Rilevazione longitudinale su imprese e lavoro*, Rlil)[4] distinguishes among the different atypical contracts available to Italian firms, enabling a deeper descriptive analysis of the phenomenon from a demand-side point of view. Table 1 shows that the atypical subordinate contracts, that are fixed-term and apprenticeship, are used by 19.6% of Italian firms[5], while external contracts (agency work and employer-coordinated freelance work) are employed in 34.9% of them. Among atypical subordinate contracts, the fixed-term one is the most used by firms, while apprentices are employed only by 2.1% of enterprises. The employer-coordinated freelance contract is the most common among Italian firms, being used by 33.7% of them; on the contrary, temporary agency contract is employed only by a small percentage of Italian firms (2.8%). The use of all forms of atypical work increases with firm size, being considerable for enterprises with more than 50 workers; this is confirmed by an alternative dataset, Invind (Bank of Italy), where large enterprises are more represented. Rlil data show that the usage of atypical contracts varies not only with firm dimension but also with the geographical area and the business sector of the firm. Indeed, atypical contracts are used more in Northern Italy than in the South; moreover, firms operating in the secondary sector make larger use of atypical contractual forms, with the exception of employer-coordinated freelance work, more frequent in service firms[6].

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[3] The international comparison is based on Eurostat data, which include among atypical also those with a *causa mista* contract.

[4] Rlil is a survey carried out in 2005 and 2007 by ISFOL. The Rlil sample for 2007 contains information on 24,230 firms of private non-agricultural sectors; these firms are mostly small-sized (almost 90% of the sample has less than 50 employees).

[5] Only firms employing at least one worker are considered in the analysis.

[6] See Duranti (2009) for a logit estimation of the firm's characteristics influencing the probability of using different types of atypical work.

Table. 1 Firms using atypical contracts, by size, geographic area and economic activity, 2007. %

	Apprenticeship	*Fixed term contract*	*Atypical subordinate contracts*	*Employer-coordinated freelance contracts*	*Temporary agency contracts*	*Atypical external contracts*
1-15 workers	1.3	14.3	15.4	30.5	1.0	31.1
16-50	5.1	41.0	43.5	53.9	10.0	58.8
51-100	22.8	70.1	72.3	70.8	34.3	76.8
More than 100	13.1	68.8	71.5	69.7	35.8	79.3
North-west	3.0	16.7	18.4	35.3	4.2	36.8
North-east	2.0	22.4	23.4	35.6	3.7	37.6
Centre	1.9	18.8	20.1	35.4	1.7	36.0
South and islands	1.3	15.5	16.6	27.6	0.8	28.1
Secondary sector	2.6	20.2	22.0	30.5	4.3	32.5
Tertiary sector	1.9	17.2	18.2	35.4	1.9	36.2
Total	2.1	18.3	19.6	33.7	2.8	34.9

Source: Rlil

The Labour Force Survey (*Indagine sulle Forze di Lavoro)* by ISTAT enables to analyse the issue of atypical work from a supply side perspective, providing detailed information on the features of Italian workers employed under a non standard contract. The analysis by level of education shows that atypical workers are generally more educated than standard ones, since 19.7% of them holds a university degree or a higher qualification (Table 2). The overrepresentation of atypical among workers with a high level of education is mostly due to fact that people holding temporary contracts are frequently young: Istat (2012) reports that in 2011 the 35% of Italian workers aged between 18 and 29 were employed under non standard contracts, while this share was much lower (13.4%) for the total workforce.

Table 2. Standard and atypical workers by level of education, 2011. %

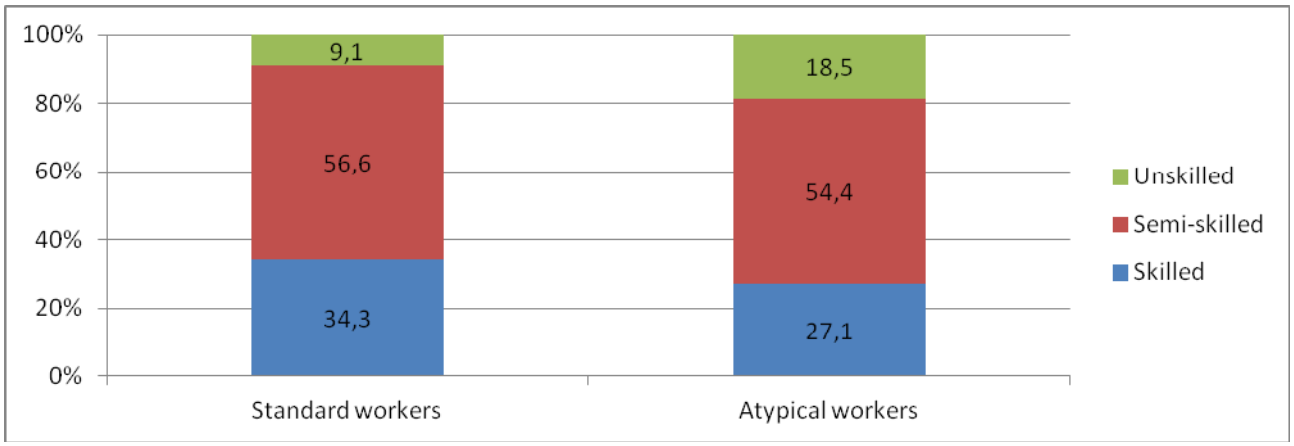
	Standard workers	*Atypical workers*
Low	35.7	34.4
Medium	47.1	45.8
High	17.2	19.7
TOTAL	100.0	100.0

Source: Labour Force Survey, Istat

Notes: according to the International standard classification of education (ISCED) the low level of education includes those who have at most obtained a Licenza di scuola media, while the medium and the high level include respectively those with a *Diploma di scuola media superiore or a post-secondary non-tertiary qualification* and those holding a *Laurea triennale, specialistica* or a higher qualification.

Despite their average high level of education, atypical workers are overrepresented in unskilled occupations: as shown in Figure 2, the share of workers with a temporary contract employed in unqualified occupations is more than twice that of standard employees (18.5% vs. 9.1%).

Figure 2 - Standard and atypical workers by type of occupation, 2011. %



Source: Labour Force Survey, Istat

Notes: Skilled workers are legislators and senior officials and managers, professionals, technicians and associate professionals. Semi-skilled workers include clerks, services workers, agricultural, craft and related trade workers, plant and machine operators and assemblers. Unskilled workers perform elementary tasks in all economic activities..

2. Atypical labour and firm's productivity: theoretical background

In the literature several arguments have been proposed to explain the way through which the use of flexible labour can bring about lower productivity growth.

A first channel through which atypical labour impacts on productivity is represented by a reduction in the firm's propensity to innovate. Indeed, the availability of several forms of flexible and often cheap labour provides firms the incentive to maintain a labour intensive production, following a 'low road' to competitiveness based upon cost-cutting[7]. Moreover, short-run labour relations may favour the leaking of trade secrets and technological knowledge, thus discouraging R&D investments and innovation (Lucidi and Kleinknecht, 2009). A negative impact of 'low road' human resource management practices on innovation is found for the British economy by Michie and Sheehan (1999), who anyway stress the possibility of a reverse causality problem[8].

A second way of transmission from flexible labour to low productivity growth concerns training and human capital accumulation. Indeed, employers may be reluctant to invest into the human capital of fixed-term workers, because the payback period of the investment would be too short. In addition, temporary workers themselves may hesitate to acquire firm-specific skills if they do not feel a long-term commitment to their employers (Lucidi and Kleinknecht, 2009). Moreover, a massive usage of atypical work and the consequent high personnel turnover may hinder the accumulation of 'tacit' knowledge, thus weakening a firm's historical memory (Kleinknecht et al., 2006). Empirical evidence of the lower probability of atypical workers of being involved in any work-related training has been provided for the UK by Arulampalam and Booth (1998) and for Spain by Albert et al. (2005).

A third channel through which the use of temporary work contracts may hinder productivity growth is represented by lower workers' effort. Starting from the assumption that atypical contracts are often used by employers as screening tools, some empirical studies (Engellandt and Riphahn, 2005 for Switzerland and Ghignoni, 2009 for Italy) find that temporary workers are incentivised to provide higher effort (measured as the number of unpaid overtime hours) in order

7 Following a strand of literature (Vergeer and Kleinknecht, 2007; Lucidi, 2008; Lucidi and Kleinknecht, 2009), such a firm strategy may be favoured by a modest real wage growth. This is what happened in Italy from the Nineties onwards because of the combined effect of the new system of wage bargaining introduced in the early Nineties and of the lower wages usually paid to atypical workers (for some empirical evidence on the lower wages of temporary workers, see Bentolila and Dolado, 1994; Rossetti and Tanda, 2005; Picchio, 2006).

8 It is possible that non innovative firms have a high share of temporary workers because managers fear that they would have to reduce their workforce soon because of the loss of firm's competitiveness.

to increase the probability of moving on to a permanent contract. However the analysis on the Italian labour market highlights that temporary workers provide higher effort than permanent workers only if they expect their contract to be converted into a permanent one. The same intuition characterises Sànchez and Toharia (2010), who find that an increase in the proportion of fixed-term workers has a negative effect on the average effort level of the firm, because it makes conversion of one's fixed-term contract less probable.
A fourth channel indicates that temporary contracts may negatively affect productivity because the latter is positively related to experience, and atypical workers are less experienced than those holding an open ended job. A recent contribution by Daveri and Parisi (2010) provides some evidence on the occurrence of this effect in the Italian labour market.

Finally, atypical labour relations may influence productivity through a reduction in workplace cooperation, which increases the probability of opportunistic behaviour and therefore the costs for monitoring and control[9].
Despite the numerous arguments in favour of the hypothesis of a negative relationship between atypical contracts and productivity, the use of temporary workers might even have some benefits on firm's performance. Theoretically, flexible contracts allows firms to adapt more rapidly to fluctuations of demand, thus increasing marginal efficiency and determining productivity gains through a reduction of labour hoarding (Malgarini et al., 2010). Moreover, 'more flexibility' (and thus higher labour turnover) might be favourable to a firm's innovation activity, because a larger inflow of new people may enrich the pool of a firm's innovative ideas and open up new networks. Altuzarra and Serrano (2010) provide some evidence of the occurrence of such effect, finding that the probability that a Spanish firm will innovate and invest in R&D increases as the rate of atypical workers increases, but only up to a certain threshold, above which it decreases. Similarly, Zhou et al. (2010) find that high shares of employees on temporary contracts have a positive impact on firm's innovation performance[10]. Finally, the use of atypical contracts makes easier for a firm to replace less productive people by more productive ones, favouring the screening process and thus increasing the possibility of a good matching (Kleinknecht et al., 2006).

Since it is hard to predict theoretically whether the disadvantages of atypical labour will or will not prevail on its advantages, several studies have engaged in an empirical exploration of the relationship between the use of flexible contracts and productivity growth[11]. Most studies, however, are confined to using country or sector data (Bassanini et al. 2008; Lisi, 2009; Damiani and Pompei, 2010) and only a few evaluate the productivity impact of the use of atypical work using firm-level data, the main reason being due to the fact that data on temporary workers are absent from most enterprise data sets. Empirical analysis has been developed in countries where the use of atypical contracts is substantial or has increased disproportionally in the last years. For example, a few studies examine the impact of the use of temporary workers in Dutch firms (Dekker and Kleinknecht, 2004; Kleinknecht et al., 2006) and some others evaluate the occurrence of such effect in Spain (Sanchez and Toharia, 2000; Dolado and Stucchi, 2008, Alonso-Borrego, 2010), finding some evidence of a negative effect of atypical work on labour or total factor productivity growth. Hirsch and Mueller (2012) investigate the effect of temporary agency work on German firms' productivity, allowing for a flexible relationship between the two variables. Using a large panel of plants the authors find a non-linear hump-shaped relationship productivity effect of temporary agency work use with a maximum positive effect for firms hiring a share of about 11 per cent of temporary external workers over total workforce.
The boom of atypical contracts and the productivity slowdown simultaneously occurred in Italy at the beginning of the new century has stimulated the empirical analysis of the relationship between the two events at the firm level. Boeri and Garibaldi (2007) found a negative effect of the share of fixed-term contracts on labour productivity growth in a sample of

[9] Naastepad & Storm (2005) find a statistically significant negative association between the strength of employment protection legislation (as measured by the OECD EPL-index) and their index of supervision intensity.
[10] The authors specify that the use of temporary workers has a positive effect on "imitative" (or "new to the firm") products and not to "new to the market" products.
[11] These studies are included in the wider stream of literature on the effects of the Employment Protection Legislation (EPL) and the consequent stability of the workforce on productivity (see Blakemore and Hoffman, 1988; Auer at al., 2005; Autor et al., 2007; Bassanini et al., 2009).

Italian manufacturing firms already during the period 1995–2000. The same result is obtained by Lucidi (2008) and Lucidi and Kleinknecht (2009), who highlight the relevance that not only the flexibilisation of the labour market but also the reforms of wage bargaining have had on the Italian productivity slowdown. More recently, Lotti and Viviano (2011) have provided further evidence for the existence of a negative relationship between the use of fixed-term contracts and the lower labour productivity of manufacturing Italian firms. Finally, the analysis of Addessi (2011), based on a panel of Italian manufacturing enterprises, points out that effect of atypical work on productivity dynamics may be persistent since the labour-contract choice affects not only workers' productivity but also their contribution to its long term evolution.

3. The data

We now turn to the description of the datasets used in the empirical analysis. Data on firms are derived from two surveys carried out every year by the Italian Institute for Statistics (ISTAT) and belong to the Structural Business Statistics (SBS)[12] which describe the structure, main characteristics and performance of economic activities within the business economy in the European Union. The Small and Medium Enterprise Survey (*Indagine sulle Piccole e Medie Imprese, PMI*) covers a representative sample of enterprises with less than 100 workers while the Large Enterprise Accounts (*Sistema dei Conti delle Imprese, SCI*) covers all enterprises with at least 100 workers[13].
These data report the number of employees and labour costs by contract types and by qualification (blue-collars, white-collars, managers, apprentices) and data on the firm's balance sheet. Unfortunately, they do not include information about the educational levels of the workforce and workers' skills. However, after changes in the questionnaire, additional information on external atypical workers and their cost has been collected[14]; therefore we have selected the period 2003-2008 for our empirical analysis.

As underlined by Lucidi (2012), the availability of information on working hours is very relevant to measure labour productivity in a framework of increasing use of part-time employees and atypical workers with flexible working hours. Therefore we exploit this information to measure labour productivity as value added per hour worked. This is a unique feature of our data and it has never been used before in the related literature. Another interesting feature of this dataset is that it includes balance sheet data at the firm level therefore no merging procedure with additional dataset is required. Then we have no limitation in our analysis concerning the legal status of the firm and no cut-off on its annual turnover, as frequently happens when merging several data sources. Another characteristic of these data, crucial for investigating the issue of atypical work and its relationship with productivity, is the availability of information on several categories of subordinate and external atypical workers, including their cost and worked hours. In our analysis we consider these two categories of flexible employment: the subordinate temporary workers – apprentices and fixed-term workers – and the external staff – agency and employer-coordinated freelance workers --. Finally, data refer to both manufacturing and service sectors and cover also micro-firms which characterize the Italian business economy. We believe that these features allow an original empirical analysis and an innovative contribution to the literature in this field.

However, these datasets have a major drawback for our purposes. For confidentiality reasons, the surveys do not allow us to link firms over time, so that the data can only be accessed either as a repeated cross-section or as a pseudo-panel. As we need to investigate the productivity issue in a dynamic perspective we have decided to build a pseudo-panel for SMEs and one for Large Enterprises (LE). The use of pseudo-panel data was introduced by Deaton (1985)

[12] These data are collected within the context of Council Regulation 58/97 on structural business statistics. According to this regulation, the SBS surveys must be fully representative at the local level and for some firm class-size (typically 1–9 workers, 10–19, 20–49 and 50+). SBS cover the business economy, which includes industry, construction and services. SBS do not cover agriculture, forestry and fishing, nor public administration and (to a large extent) non-market services such as education and health.
[13] The sample of SMEs varies over time and it includes about 50-60 thousands firms. The average population of large enterprises is about 10,000 units.
[14] Namely data refer to employer-coordinated free-lance workers (*collaboratori coordinati e continuativi and collaboratori a progetto*) and agency workers (lavoratori somministrati).

who suggested forming cohort-level data if repeated cross sections are available: a cohort is defined as "a group with fixed membership, individuals of which can be identified as they show up in the surveys" (Deaton, 1985, p. 109). Collado (1997) extends the approach of Deaton to dynamic models. The main assumption behind the construction of a pseudo-panel is that individuals which share the same time invariant characteristics – and therefore will be allocated to the same cohort – have similar behavior and can then be treated as a single individual. Cohort data have been widely built from household or individual budget surveys while more seldom these data are based upon firm microdata which are less widespread and more protected for confidentiality issues[15].

Although microeconomic heterogeneity is reduced in pseudo-panels, they show some advantages over genuine panels. First, researchers can prolong the time period by using repeated cross section data. Second, pseudo-panel data tend to deal with the attrition problem which is suffered by genuine panels. These data allow for exit and entry but yet maintain the nature of the panel data over time.
However, the definition of cohorts creates a trade-off between the number of observations per cohort and the number of cohorts. Indeed if the first dimension is favored over the second, one runs the risk of grouping in the same cohort individuals with heterogeneous behaviors. Conversely, if a large number of cohorts is designed to preserve variability within the panel, it is possible to obtain a very low number of observations for each cohort thus leading to inconsistent estimators (Verbeek and Njiman , 1992; Verbeek, 2008). This trade-off must be taken into account in the design of cohorts.

To construct the pseudo-panel data set based on cross-sectional information, we grouped firms by industry and region; for enterprises with several establishments, the region was assigned according to the geographic location of the headquarters. The lowest regional level refers to the 20 Italian regions while the industry is considered at 5-digits NACE classification of economic activities. A firm's sector and headquarter should remain unchanged over a short time horizon, and the location decision should not be influenced by the decision about labour contract types. To transform the original data into a pseudo-panel, the following steps were performed. First, extreme and unreliable values were cleaned from the dataset by a trimming procedure which excluded observations falling outside the first and last 0.1 percentiles. Moreover, firms without any employee were excluded from the dataset. Then, to trace individual firms and to account for dependency of observations over time, a synthetic identity number was generated using firm characteristics that are time invariant (economic activity sector and region). The next step involved the calculation of the pseudo-firms or cells with the means of the variables according to the identification number and year. Finally, we built an unbalanced pseudo-panel selecting cohorts which are in the dataset for at least three years in the period considered. Through this procedure, the large original dataset was reduced to a total of about 15,000 cohorts of large enterprises and more than 45,000 cohorts of SMEs. In the Technical Appendix, Table A.1, yearly numbers of firms and cohorts after every step of the procedure above are reported.

Table 3 summarizes the main differences between the pseudo-panel and the original data. As the pseudo data are averages of the firm level data belonging to each cohort, variability between observations is reduced. However, there are not large differences in the mean values of variables considered in our analysis especially as far as large enterprises are concerned because each cell of the new data is quite close to the original dataset.

[15] Some examples of applied studies based upon firm pseudo-panel are Dwenger et al. (2011), Caponera et al. (2008). Boeri and Garibaldi (2007), who describe in the Appendix the construction of a pseudo-panel used in the first part of their empirical work.

Table 3 - Descriptive statistics in firm level and cohort data

	SME			LE		
	Original	Pseudo		Original	Pseudo	
	Mean	Mean	Sd	Mean	Mean	Sd
Labour productivity	43.20	35.11	48.97	35.53	39.37	79.76
External temporary labour cost relative to employees labour cost	1.58	1.48	2.08	1.33	1.08	2.03
Training expenses per hour worked	0.05	0.04	0.40	0.06	0.06	0.45
Investment per hour worked	8.33	6.18	31.30			
Share of external temporary hours worked	0.03	0.03	0.09	0.04	0.05	0.11
Share of temporary employee hours worked	0.15	0.13	0.34	0.02	0.02	0.08

4. Specification and estimation methodology

The labour productivity equation has been specified both in static and in dynamic form. In the first case a pooled and a fixed effect model have been estimated; the latter can capture the unobserved time-invariant variables at the cohort level, such as the level of technological development and the business sector.

However, the fixed-effects model does not take into account the time-varying unobserved heterogeneity within cohorts, such as productivity shocks, which flows into the idiosyncratic error and make it correlated to covariates, producing biased coefficients. Moreover, a fixed effects model does not prevent the occurrence of endogeneity and reverse causality problems; for example, a productivity shock can affect the composition of the workforce, and not the other way round.

To address the problem of both time-invariant and time-varying unobserved heterogeneity, we decided to estimate a dynamic model using the system GMM estimator (GMM-SYS), which uses both time differencing of the model and instrumenting endogenous covariates with both lagged levels and lagged differences of the same (Blundell and Bond, 1998). To take account of productivity catch-up processes among cohorts and to control for the variation in the utilisation of productive capacity during the period[16] we included the lagged dependent variable among the regressors, which should not be correlated with the idiosyncratic error thanks to the use of the system GMM estimator.

With regard to instruments, the usual rule in the GMM estimation is to start from the first lag for pre-determined variables, and from the second for endogenous ones (Roodman, 2006). However, the standard approach to validate the instruments choice is to look at the Hansen test for over-identifying restrictions, and at the difference-in-Hansen test, which allows testing the validity of instruments subsets. According to these observations, we decided to include instruments starting from (t-1) for pre-determined variables and from (t-2) for endogenous ones and, in order to limit the instruments count[17], we chose to stop at (t-3).

According to Roodman (2006), the adoption of an unbalanced panel requires the use of the "forward orthogonal deviations" transformation proposed by Arellano and Bover (1995) instead of the standard first differences transformation when estimating GMM regressions. In fact, the first difference transformation increases gaps in unbalanced panels, while forward orthogonal deviations, subtracting from each observation the average of all available future observations, expunge fixed effects (as the first differences transformation does) but minimizing data loss.

[16] According to Lucidi (2008), the inclusion of lagged productivity growth allows to control for the variation in the utilisation of productive capacity during the period, so that a firm which had an abnormally low productivity growth at the beginning of the period for transitory reasons and then returns to its 'normal' level, is not considered a fast-growing firm.

[17] This has to be done because the Hansen test is weakened by the inclusion of a number of instruments excessively high compared to the number of observations.

Since the model is estimated in first differences, the equation will show first-order serial correlation; however, what matters in a first differenced model is the absence of second-order serial correlation. Therefore, tests of first and second-order serial correlation are reported together with the estimation results.

The estimated dynamic productivity equation has the following form:

$$\log prod\_gr_i = \alpha_i + \beta_1 \log prod\_gr_{i,t-1} + \beta_2 \log w\_rel_{it} + \beta_3 \log train_{it} + \beta_4 \log inv_{it} + \beta_5 \log etw_{it} + \beta_6 \log dtw_{it} + year + u_i + \varepsilon_i$$

where the dependent variable is the growth of value added per hour worked (measured in logarithms) and right-end side variables include the lagged level of the dependent variable and other determinants. We have chosen as a regressor the hourly external temporary labour cost relative to standard labour cost (*w_rel)* to measure if productivity growth is affected by the relative convenience between contract types. We include the training expenses as a measure of investment in human capital formation (*train*) and, only for SMEs, investments in equipment and machinery as a measure of technological change (*inv*). Two flexibility indicators are considered: the share of external atypical workers (*etw*) and the share of subordinate atypical workers (*dtw*) on the total number of employees. In a further specification, we transformed each share in a categorical variable assuming three values, indicating respectively no utilisation, low utilisation (equal or less than the median share recorded in the sample), or high utilisation (more than the median share recorded in the sample). All variables are in logs, monetary variables are standardized by the total worked hours and deflated by the appropriate price deflators. Finally, time dummies are included to control for productivity shocks common to all firms.
To evaluate the validity of the GMM-SYS estimation, two tests are used. The Arellano–Bond test tests for the absence of second-order autocorrelation in the transformed idiosyncratic errors while the Hansen test tests the validity of instruments. Both tests are included in results' tables.
In order to assess the different impact that atypical labour has on SMEs and LEs, this model was estimated separately for the two groups; such a distinction appears to be particularly relevant in a country where the economy is based mainly on micro enterprises. Moreover, in view of the different usage of atypical work in the secondary and tertiary sector, the equation was estimated separately for industry and service firms. Both distinctions are rare in the literature but the results appear to be interesting and deserve attention.

5. Estimation results[18]

Our first estimation is based on a pooled-OLS which provides some preliminary evidence on the impact of atypical labour and labour productivity at the firm level. The results for the total economy, presented in Table 4, show a negative relationship (in both SMEs and LEs) between the use of external workers and the growth of labour productivity; it is interesting to note that the share of subordinate atypical workers has instead a positive effect on the dependent variable, statistically significant only in large firms.
In order to correct for the bias caused by unobserved heterogeneity, we also estimate the productivity equation using the fixed effects within estimator, whose results are presented in Table 5. Results of the fixed effects estimation confirm the negative effect of the use of external workers on labour productivity growth, especially in LEs; on the contrary, the coefficient of the share of subordinate atypical workers appears to be less statistically significant.

[18] All estimates have been carried out for the total economy and by sector of activity (manufacturing and service sector). The complete sets of results are available from the authors upon request.

Table 4. Pooled OLS productivity regression

	SME	LE
External temporary labour cost relative to standard labour cost	-0.008	-0.001
	(0.007)	*(0.008)*
Training expenses per hour worked	0.005*	0.016***
	(0.004)	*(0.005)*
Investment per hour worked	0.003	
	(0.004)	
Share of external temporary hours worked	-0.006*	-0.016***
	(0.004)	*(0.006)*
Share of temporary employee hours worked	0.007	0.007*
	(0.005)	*(0.004)*
Constant term	-0.016	-0.008
	(0.039)	*(0.042)*
Time dummies	Yes	Yes
Size dummies	Yes	Yes
Number of observations	2927	1497

Table 5. Fixed effects productivity regression

	SMEs		LEs	
	Manufacturing	Services	Manufacturing	Services
External temporary labour cost relative to standard labour cost	-0.021**	-0.029**	0.022*	0.043
	(0.012)	*(0.013)*	*(0.013)*	*(0.027)*
Training expenses per hour worked	0.013***	0.010	0.014	0.022
	(0.004)	*(0.007)*	*(0.010)*	*(0.016)*
Investment per hour worked	0.030***	0.052***		
	(0.010)	*(0.012)*		
Share of external temporary hours worked	-0.025***	-0.007	-0.041***	-0.041**
	(0.007)	*(0.010)*	*(0.011)*	*(0.020)*
Share of temporary employee hours worked	-0.013*	-0.004	-0.007	0.005
	(0.009)	*(0.013)*	*(0.010)*	*(0.013)*
Constant term	-0.193***	0.053	-0.045	-0.214
	(0.163)	*(0.073)*	*(0.141)*	*(0.166)*
Time dummies	Yes	Yes	Yes	Yes
Number of observations	4643	3643	1868	1283
R-sqr within	0.033	0.035	0.037	0.095
R-sqr between	0.021	0.013	0.002	0.070
R-sqr overall	0.023	0.018	0.004	0.070

Since the fixed effects results may still suffer from simultaneity bias because plants may choose their inputs in response to time-varying unobserved heterogeneity (such as productivity shocks), we estimate the productivity equation in a dynamic form, applying the GMM-SYS estimator discussed in Section 4. The p-values of the Hansen reveal that results, which are presented for the total economy (Table 6) and for manufacturing and service sectors separately (Table 7), are statistically valid in all estimates but those for large enterprises in both the total economy and in the service sector.

Table 6 - System-GMM productivity regression - Total economy

	SME	LE
Labour productivity growth (t-1)	-0.348***	-0.298***
	(0.019)	*(0.038)*
External temporary labour cost relative to standard labour cost	-0.057	-0.073**
	(0.057)	*(0.037)*
Training expenses per hour worked	0.017***	0.035***
	(0.005)	*(0.009)*
Investment per hour worked	0.063***	
	(0.009)	
Share of external temporary hours worked	-0.019*	-0.104***
	(0.011)	*(0.022)*
Share of temporary employee hours worked	-0.021**	0.022*
	(0.009)	*(0.012)*
Constant term	-0.202***	-0.240**
	(0.007)	*(0.120)*
Time dummies	Yes	Yes
Number of observations	6272	2497
Number of instruments	77	64
Hansen (p-value)	95.26 (0.013)	87.78 (0.003)
AR(1) (p-value)	-7.65 (0.000)	-4.37 (0.000)
AR(2) (p-value)	-0.69 (0.488)	-0.92 (0.326)

Table 7 - System-GMM productivity regression - Sectoral estimates

	SMEs		LEs	
	Manufacturing	Services	Manufacturing	Services
Labour productivity growth (t-1)	-0.379***	-0.328***	-0.280***	-0.304***
	(0.028)	*(0.024)*	*(0.061)*	*(0.048)*
External temporary labour cost relative to standard labour cost	-0.047	-0.115*	0.039	-0.003
	(0.061)	*(0.062)*	*(0.047)*	*(0.035)*
Training expenses per hour worked	0.018***	0.014*	0.016	0.042***
	(0.006)	*(0.008)*	*(0.011)*	*(0.014)*
Investment per hour worked	0.050***	0.073***		
	(0.013)	*(0.012)*		
Share of external temporary hours worked	-0.019*	-0.021	-0.040*	-0.085***
	(0.011)	*(0.017)*	*(0.023)*	*(0.029)*
Share of temporary employee hours worked	-0.028**	0.011	0.015	0.028**
	(0.011)	*(0.016)*	*(0.014)*	*(0.014)*
Constant term	-0.214***	-0.200**	0.040	-0.103
	(0.072)	*(0.100)*	*(0.124)*	*(0.159)*
Time dummies	Yes	Yes	Yes	Yes
Number of observations	3535	2737	1459	1038
Number of instruments	77	77	64	55
Hansen (p-value)	75.92 (0.213)	74.48 (0.248)	66.06 (0.146)	74.28 (0.005)
AR(1) (p-value)	-5.41 (0.000)	-5.62 (0.000)	-3.10 (0.002)	-2.38 (0.017)
AR(2) (p-value)	-2.31 (0.021)	1.36 (0.174)	-0.74 (0.458)	-1.58 (0.115)

The lagged dependent variable gets a negative coefficient, suggesting that firms with poor productivity performance at the beginning of the period are growing faster, thanks to some sort of catch-up process. Coefficients show that SMEs' productivity dynamic is more path dependent than that of LEs, which exhibit a lower productivity growth persistence. The relative labour cost of atypical workers shows a negative sign, indicating that the higher is the relative cost of external workers with respect to dependent workers, more negative is the impact on productivity growth. As for the training expenses, the estimation results show a positive and statistically significant sign; the coefficient appears to be of a bigger size in the manufacturing sector, suggesting a higher return of investment in training compared to services. Also the investment variable shows a positive and statistically significant coefficient, which is higher in the tertiary sector compared to the secondary one. Results confirm the negative impact of external atypical work on labour productivity growth for both manufacturing and service firms of all dimensions. Evidence on the effect of atypical subordinate work is less clear-cut because SMEs show a significant negative coefficient (at least in the estimation for the total economy and for the manufacturing sector) while LEs a positive but not statistically significant one. This may partly reflect the lower incidence of atypical work in LEs but also suggests a different use of atypical work in firms of different sizes, with small and medium enterprises more inclined to use flexible staffing arrangements as a part of a cost-cutting strategy.
Similar results have been obtained inserting in the productivity equation categorical variables concerning atypical work. The results, which are statistically valid only for SMEs, are presented in the Appendix (Tables A.1 and A.2).

6. Conclusions

In the last 15 years the Italian labour market has undergone several reforms aimed at flexibilising labour relationships and thus increase labour demand. Such reforms have radically changed the Italian labour market, which is now segmented into two groups: the open-ended, well-protected employees on one side, and the atypical workers, with instable careers and wages, on the other one.
However, a growing stream of literature has highlighted that the spread of temporary contracts might have negative consequences not only on the workers' side but also on firms' performance, causing a slowdown in labour productivity.
The empirical analysis presented in this paper contributes to the debate on the relationship between the utilization of flexible labour and firm's productivity growth by exploiting a unique database which contains information on working hours and allows distinguishing SMEs from LEs and manufacturing and service firms. The results provide some evidence in support of the existence of a trade-off between firms' utilisation of flexible contracts and labour productivity growth which appears stronger for SMEs, where atypical work, both dependent and external, is more likely to be used as a "low road" strategy based on cost-cutting, thus causing a slowdown in productivity growth.

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Technical Appendix

Table A.1 Firms and cohorts in the pseudo-panel

	Small-Medium Enterprises			Large Enterprises		
	number of firms	number of cohorts	cohorts without outliers	number of firms	number of cohorts	cohorts without outliers
2003	39311	8636	8413	10016	2905	2836
2004	36170	8590	8311	10299	2899	2737
2005	33701	8467	8231	10495	2954	2848
2006	32202	8291	8081	10787	3000	2887
2007	29552	8003	7764	11149	3069	2989
2008	53943	8952	8796	11246	2787	2720
TOTAL			49596			17017
Total cohorts with at least 3 observations in the considered period			45281			15512

Table A2. System-GMM productivity regression - Total economy

	SME	**LE**
Labour productivity growth (t-1)	-0.343***	-0.286***
	(0.019)	*(0.029)*
External temporary labour cost relative to standard labour cost	-0.020	-0.036***
	(0.056)	*(0.012)*
Training expenses per hour worked	0.020***	0.037***
	(0.005)	*(0.008)*
Share of external temporary hours worked-categorical variable	-0.066**	-0.113***
	(0.030)	*(0.028)*
Share of temporary employee hours worked-categorical variable	-0.022	0.009
	(0.015)	*(0.016)*
Constant term	0.135**	0.272***
	(0.054)	*(0.059)*
Time dummies	Yes	Yes
Number of observations	6532	4019
Number of instruments	64	65
Hansen (p-value)	56.98 (0.401)	127.30 (0.000)
AR(1) (p-value)	-8.07 (0.000)	-3.50 (0.000)
AR(2) (p-value)	-0.57 (0.571)	0.89 (0.373)

Table A3. System-GMM productivity regression - Sectoral estimates

	SMEs		LEs	
	Manufacturing	**Services**	**Manufacturing**	**Services**
Labour productivity growth (t-1)	-0.377***	-0.320***	-0.297***	-0.308***
	(0.028)	*(0.025)*	*(0.036)*	*(0.040)*
External temporary labour cost relative to standard labour cost	0.037	-0.088	0.060	0.011
	(0.058)	*(0.074)*	*(0.056)*	*(0.043)*
Training expenses per hour worked	0.015***	0.024***	0.024**	0.060***
	(0.006)	*(0.009)*	*(0.010)*	*(0.014)*
Share of external temporary hours worked-categorical variable	-0.077**	-0.061	-0.058	-0.168***
	(0.031)	*(0.048)*	*(0.040)*	*(0.065)*
Share of temporary employee hours worked-categorical variable	-0.035*	-0.017	0.005	0.009
	(0.018)	*(0.026)*	*(0.018)*	*(0.027)*
Constant term	0.154**	0.129	0.134*	0.447***
	(0.061)	*(0.092)*	*(0.074)*	*(0.113)*
Time dummies	Yes	Yes	Yes	Yes
Number of observations	3695	2837	2492	1527
Number of instruments	64	62	64	64
Hansen (p-value)	62.83 (0.219)	50.76 (0.562)	76.64 (0.028)	97.38 (0.000)
AR(1) (p-value)	-5.76 (0.000)	-5.78 (0.000)	-4.23 (0.002)	-2.45 (0.014)
AR(2) (p-value)	-2.31 (0.021)	1.26 (0.209)	-0.94 (0.348)	1.03 (0.303)