

Flexible employment, job flows and labour productivity

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Abstract

In this paper we aim at providing evidence on the effects of flexible employment on job flows and labour productivity. We use panel data on firms with balance sheet information together with a detailed account of the type and number of employment contracts used by the firm. As a source of identification, we exploit variation in the legislation that affects the costs of using fixed-term and apprenticeships contracts over regions and industries. Based on these institutional changes, we can set up a difference-in-difference framework for estimation. We consider the impacts of these institutional changes on employment flows. Next, we assess their impact on labour productivity and investments. Results indicate that the reform of apprenticeships seems to have been successful in increasing turnover of workers capital-labor substitution in favour of labor, with an overall productivity-enhancing effect. Changes in fixed-term contracts instead do not seem to have had the intended results, i.e. may have made the use of these contracts more costly rather than less costly as already pointed out by some literature in labor law.

Keywords: employment contracts, productivity, institutional changes
JEL code: J24, J41

1. Introduction

In the past two decades the major policy response to high unemployment rates in Europe has been the reduction of employment protection legislation through the liberalization of temporary contracts.¹

A large literature has established the importance of temporary contracts in affecting job flows by increasing both workers' hiring and firing, however theoretical models investigating temporary contracts are inconclusive about employment, unemployment and productivity, depending whether temporary contracts are considered dead-end jobs or stepping-stones. Although much less researched in theory and in practice, it is plausible that temporary contracts also have a bearing on firms' investment decisions, on the capital-labour ratio and, eventually, on productivity.²

The purpose of this paper is to evaluate the effects of institutional changes of two different types of temporary contracts in Italy. We analyze the effects of these changes on investment, capital-labour substitution, labour productivity and job reallocation.

The first institutional change has to do with the implementation of a national law (legislated in 2001) that made the use of fixed-term contracts by firms easier by cancelling the need of giving a justification for the use of these contracts.³ While the law set out nationally a general framework for the use of fixed-term contracts, the actual implementation of its provisions required their approvals through the rounds of collective bargaining that took place sector-wise in the following years. The actual way in which each sector of the economy implemented the law was therefore different, and the timings of implementation varied according to the staggered structure of collective bargaining

¹ Among the countries in the European Union, six liberalized temporary contracts over the 1980s (other six already had no limits on the use of temporary contracts). For instance, France deregulated temporary contracts in 1986, lifting the limitations on the purpose of these contracts and lengthening their maximum duration (previously between 6 to 12 months) up to 24 months. A counter-reform in 1990 reduced the applicability of these contracts, lowered their maximum duration to 18 months, and imposed a severance payment equivalent to 5 percent of gross salary. Germany moved in 1985 from a restrictive casuistic to a widespread allowance of temporary contracts for any new hiring and former apprentices. Also, the maximum length was extended from six months to up to two years. In Italy, fixed-term contracts were limited to seasonal and training jobs before 1987. Since then, temporary contracts are allowed through collective agreements and prior administrative authorization.

² A literature exists in the evaluation of the effects Employment Protection Legislation on productivity: Autor et al. (2007), Bassanini et al. (2009) and Cingano et al. (2008 and 2009), discussed in the next section.

³ Permanent workers are those with contracts of indefinite duration. Temporary workers are those with a fixed-term contract. The maximum duration of the latter is usually between one and three years. The application of temporary contracts is often ruled by the principle of causality, i.e., aimed at jobs that are occasional or seasonal, jobs that fill temporary vacancies, apprenticeships, and jobs for carrying out a task or service predetermined in time.

rounds. This features of the implementation stage therefore generates variation across sector and over time in firms' exposure to the new provisions, which we exploit in estimation.

The second reform has to do with apprenticeship contracts (for young workers at a reduced contribution rate) and was meant to stimulate the use of these contractual arrangements mainly by weakening the need of training certification and extending the scope of their applicability up to 30 years old individuals. The relevant law was legislated in 2003 but required regional governments to issue implementation guidelines, which happened differentially by region in the following years. This feature of the legislative process generates variation across regions and time in firms' ability to use the new contracts, that can be exploited for estimation.

An important by-product of this paper is that we establish and estimate an elasticity of substitution between different types of temporary contracts. Economic models necessarily simplify the actual use of temp and perm contracts and consider one single type of temp contract. However in practice Italian employers can use four types of temp contracts with different characteristics: apprenticeships (apprendistato), fixed-term (tempo determinato), cococo (a mix of consultants hired on a temp basis) and temporary agency jobs (interinali). We show that reforms intended to ease the use of one contract can have unintended consequences due to partial substitutability of various types of contracts.

Using three waves of Excelsior-Aida data, we find that the reform of apprenticeships seems to have been successful because it actually increased turnover of workers and induced capital-labor substitution in favour of labor and increased productivity.

The reform of fixed-term contracts, instead, does not seem to have had the intended results. The fact that the implementation of the national law required the approval through collective bargaining rounds may have altered the original spirit of the law and made the use of tempo determinato more costly rather than less costly, as already pointed out by some literature in labor law. It reduced job turnover of other types of contracts and of open-ended contracts (as shown by high estimates of substitution elasticities) and induced the use of more capital per worker. The higher capital intensity did not suffice to avoid a fall in productivity.

2. Related literature

This paper is not the first to assess temporary contracts. A number of previous studies have concentrated on the influence of fixed-term contracts on the hiring and firing dynamics of the labor market. These models conclude that fixed-term contracts are used as buffer-stock and boost the number of hirings and firings in the economy while the variation of aggregate employment remains ambiguous. Some examples are the labor demand models by Aguirregabiria and Alonso-Borrego (1999), Bentolila and Bertola (1990), Bentolila and Saint-Paul (1992), and Boeri and Garibaldi (2007). A different view is taken in the matching economies by Blanchard and Landier (2002), Cahuc and Postel-Vinay (2002), and Wasmer (1999). Here temp contracts are churning policies where workers may be stuck in dead-end jobs or unemployment for long before finding a permanent job. In this scenario two-tier reforms of the labor market create a dual labor market with higher unemployment and lower productivity.

A second line of research is more empirical and addresses specific issues. The transition from fixed-term to permanent contracts has been analyzed by Booth et al. (2002) for the U.K., Güell and Petrongolo (2000) for Spain, and Holmlund and Storrie (2002) for Sweden.

There are a series of papers like Ichino et al (2008) showing that being assigned to a temp contract has a causal effect on the probability of finding a permanent match. The bottom line of this research is that temp contracts are good screening devices and stepping stones into permanent jobs. The implication of these models is an increase in productivity.

The research on temporary contracts and layoff cost has shown how existing quantitative results on employment and productivity depend crucially on different modelling choices (Ljungqvist, 2002). To date there are no empirical papers which look at the effects of temporary contracts on productivity, but the literature on temporary contracts is very much related to the literature on EPL and there are some recent papers on the effects of EPL on productivity.

Temporary contracts and EPL are related because, although regulations vary, a general feature of fixed-term contracts is that severance payments and dismissal protection are low and many countries reduced EPL relaxing the rules about the use of temp contracts.

OECD produced different indices of employment protection, including those related to the regulation of permanent and temporary contracts. When the index is built

considering only the legal treatment of fixed-term contracts, the negative correlation between EPL and job flows is significantly stronger. In the following we do not review the huge literature on EPL and job flows but we briefly refer to the literature that looks at EPL and investment and EPL and productivity.

There are theoretical reasons to expect an ambiguous effect of temp contracts and EPL on the capital labour ratio. Assume a restriction on the use of temp contracts or an equivalent increase in EPL and assume that firms cannot fully transfer the increase costs onto lower wages i.e. the restriction of temp contracts entails higher costs for firms (Leonardi and Pica, 2008).

In perfect labour markets an increase in the cost of labour will in general imply substitution of labour with more capital. However, in models with wage bargaining between workers and firms there may be the opposite effect. When there is wage bargaining, workers will use the protection of EPL to claim higher wages (Bentolila and Dolado 1994, and Garibaldi and Violante 2005). EPL will strengthen the outside option of workers and worsen the outside option of firms in the wage bargain. As a result, EPL may result in a higher bargained wage and a reduction of firms investment to avoid workers capturing part of the investment returns (“hold up” problem).

A different case arises in the longer run when firms are not held up by irreversible investments and technology adoption becomes an issue. More EPL means that labour is more costly and when adopting new technologies firms will choose more capital intensive technologies (see among others Caballero and Hammour, 1998, Alesina and Zeira, 2006 and Koeniger and Leonardi, 2007).

The impact of EPL on labour productivity is also, in principle, ambiguous. On the one side, EPL hampers the reallocation of workers and jobs across industries and firms, therefore when the importance of reallocation for productivity is large, productivity falls. On the other side, EPL may have a positive effect on productivity via specific investments and learning-by-doing. Mixed results are also found in studies that focus on partial EPL reform via the introduction of temporary contracts. A screening period of temporary contracts may lead to better matches, increasing productivity, but the incentives for specific investments and the period for learning-by-doing may fall, reducing productivity.

Other papers emphasize the effects of EPL on reallocation via entry and exit of firms. Hopenhayn and Rogerson (1993) show how the distortion induced by firing

restrictions pushes firms to use resources less efficiently. As a result, employment levels adjust at a lower speed and productivity is reduced. Poschke (2007) emphasises the role of firing costs in the selection of the most efficient firms and the exit decision of low productivity firms, if exiting firms cannot avoid paying them. Samaniego (2006) claims that firing restrictions are more costly in industries characterised by rapid technological change such as ICT. Countries where regulations are more stringent will therefore tend to specialise in industries with a slow rate of technical change.

Some studies emphasize the obstacle of EPL to undertake risky activities. Bartelsman and Hinlopen (2005) find that EPL has a significant negative effect on investments in ICT. They run regressions using data for 13 OECD countries for the period 1991-2000. They conclude that EPL reduces the incentive for firms to invest in innovative activities with high returns and a high risk of failure because firms want to avoid the risk of paying high firing costs.

Ichino and Riphahn (2005) and Riphahn (2005) claim that layoff protection (or the lack thereof during the probation period) might also affect productivity by reducing worker effort because there is less threat of layoff in response to poor work performance or absenteeism.

More stringent EPL may also promote specific investments and result in more learning-by-doing, which may increase productivity. EPL also provides insurance against uninsurable labour income risk, and this may allow for better search of jobs.

Belot *et al.* (2007) propose a framework where, by providing additional job security, protection against dismissal may increase workers' incentives to invest in firm-specific human capital, therefore enhancing productivity. On the other hand, higher firing costs raise separation costs, increase the bargaining power of the worker, and thereby raise wages. Only at low levels of employment protection is an increase in EPL beneficial to productivity-growth, and the positive effects of employment protection are larger in sectors where firm-specific skills matter more.

Wasmer (2006) suggests that by inducing substitution of specific for general skills, firing restrictions may have a negative effect on productivity when workers need to be reallocated across industries and industry-specific skills useless. Lagos (2006) claims that if

stringent EPL raises reservation wages, average productivity can increase simply because firms become more selective and less productive matches are not realised.

Bertola (2004) shows that the additional insurance via severance pay may also result in a productivity gain in the spirit of Acemoglu and Shimer (1999), making workers more willing to leave their low-productive job to look for a more productive one.

The empirical part of most of the papers reviewed, if present at all, is based on cross-country regressions on aggregate outcomes. However, this approach potentially suffers from well-known severe problems. First of all, reverse causality: the strictness of EPL may depend on labour market conditions. Second, omitted variables may bias the results: EPL may pick up the effect of other factors unobserved by the econometrician that drive the cross-country differences in labour market performance. Third, most studies focus on overall EPL, without distinguishing between EPL provisions for fixed-term and permanent contracts.

As far as we know, very few studies go beyond country-level data. Scarpetta *et al.* (2002) analyse the effects of EPL and centralized bargaining on firm productivity and firm dynamics using harmonized data for 17 manufacturing industries in 18 countries, over the period 1984-1998. They find that strict EPL has a significant negative impact on productivity only in countries with an intermediate degree of centralisation/coordination in wage bargaining.

Autor *et al.* (2007) study the impact of adoption of wrongful-discharge protection norms in the US, using cross-state differences in the timing of adoption. Exploiting microdata, they find that capital deepening is increased while TFP is reduced. Quantitatively, they calculate a drop in productivity, with an average elasticity in the order of 0.03 to 0.04. Similar findings are provided by Cingano *et al.* (2008) using Italian data to examine a 1990 reform that raised dismissal costs for firms with fewer than 15 employees only.

Micco and Pagés (2004) analyse the difference in the effects of EPL across sectors within a certain country. They argue that EPL is more binding in sectors that are more susceptible to technological and demand shocks. They use data for the manufacturing sector for 18 countries during the 1980s and 1990s. They find a negative relationship

between layoff costs and the level of labour productivity especially in those sectors with higher needs for flexibility.

Bassanini et al. (2009), uses sectoral harmonized data from EUKLEMS for 17 industries in 18 industrial economies over the past two decades. They consider EPL together with other labour market institutions and the extent to which EPL is binding in particular industries. They find a negative effect of EPL on total factor productivity (TFP) and conclude that reforms of overly strict dismissal regulation in many OECD countries can be justified on the grounds of fostering TFP growth.

3. Institutional background

As in other European countries, labour market flexibility has increased in Italy over the last ten years, the result of a series of measures which introduced various kinds of fixed-term and temporary contracts without changing the legislation on permanent, open-ended, contracts. The most important legislation was:

1. the “Treu-Package” (named after the then minister of labour) which in 1997 legalised temporary work agencies and liberalised both apprenticeship and fixed-term contracts;
2. Decree-Law No. 368 of 2001 which eased restrictions on fixed-term contracts further;
3. the “Biagi Law” (named after the legal expert killed by terrorists) which in 2003 introduced a number of new contracts to the legislation designed to make it easier to employ workers on a temporary basis. New and more flexible forms of apprenticeship were also included in this new law.

Our analysis, which considers the three-year period 2004-2006, focuses on the second and third of these reforms only, and therefore on the two employment contracts that have been reformed: the fixed-term contract of the 2001 Decree-Law and the new apprenticeship contract of the “Biagi Law”. These two measures were implemented at different times in different regions and in different sectors of the economy and this variation in the institutional setting across regions and sectors and over time allows us to use a difference-in-difference approach.

We discuss each of the two measures in turn.

The “new” apprenticeship contract.

Legislation to regulate apprenticeship schemes has existed for a long time and has also been reformed several times. This type of contract is widely used because it is convenient for employers for various reasons. Firstly, they have lower labour costs for apprentices and pay a wage that is set by national collective bargaining agreements at a level that is significantly lower than the norm. Also they pay social security contributions at a lower rate. Finally, firms pay no dismissal costs when contracts expire and this is why they are attracted to it as a useful substitute for fixed-term contracts.

The lower labour costs are intended to compensate firms for the training costs that they incur. However the training content of this type of employment is usually low, even if it is regulated by labour laws. Firms are required to share training costs by giving apprentices time off work (for a minimum number of paid hours) to attend external training courses that are provided by local authorities or accredited training institutes (and sponsored by the Regions) outside the premises of the firm. At the end of the training periods, each apprentice should receive a certificate for the qualification they have acquired in their field of work.

There are, nevertheless, limitations on this training activity: lack of public funding for training, a lack of infrastructures for training courses and little control over compliance with compulsory training obligations by firms using these contracts. These are some of the reasons which explain the low level of formal training that is provided. As a consequence most of the training is in the form of the on-the-job type.

The “Biagi Law” liberalised this contract further. A new form of apprenticeship was introduced (*apprendistato professionalizzante*) with the same reduced labour costs as before. The new legislation abolished the certification of qualifications and extended the scope of the contract to include persons under the age of 30 (the previous age limit was 25). A further change designed to make the contract easier to use was the introduction of an option to perform training at the workplace as a substitute, at least in part, for external training courses provided by local authorities and accredited training institutes. This last amendment made it even more difficult to monitor compliance with this obligation by firms.

However, before the new law could be implemented, it required sets of regulations to be issued by the regions. The regions have exclusive power to legislate over vocational

training and should therefore have issued regulations to govern the training content of the new apprenticeship contracts based on the guidelines set by national law.

The regions were, nevertheless, very slow in issuing these regulations, partly because they lacked the funds needed to organise the external training for apprentices (despite the reduction in the quantity of this type of training by the national legislation). Although slow to act, some passed legislation earlier than others. Some regions also enacted regional legislation which at least initially was incomplete, consisting of administrative measures to start experimental projects for the new contract in specific economic sectors (mainly commerce, banking and tourism). These experimental projects were implemented in 2005.

In the meantime firms were able to continue to recruit apprentices on the basis of the previous Law No. 196 of 1997, although under less favourable conditions than those of the new legislation. In regions and sectors in which regulations for the new type of contract had not been introduced, firms continued to use the former apprenticeship contract, even though the conditions were less attractive than those of the legislation for the new “*apprendistato professionalizzante*” contract.

No regions passed any measures in 2003 and 2004. In addition to those regions which introduced experimental schemes in specific sectors already mentioned, in 2005 two regions, Emilia Romagna and Tuscany, enacted regional laws to enable the use of the new contract by all firms. Another four regions followed suit in 2006: Friuli, Marche, Sardinia and the autonomous province of Bolzano.

In order to overcome this legal confusion the government enacted a new law towards the end of 2005 whereby the training content of the new contracts could be established on the basis of national collective bargaining agreements to substitute those regulations which regions had until then failed to issue. Trade unions were also in favour of the use of the new apprenticeship contract and national agreements were signed accordingly in 2006. While agreements were not reached in all sectors, they were definitely concluded in the most important: foodstuffs, chemicals, energy, commerce, banking, construction, wood, textiles, transport and mechanical engineering.

The “new” fixed-term contract

Legislative Decree No. 368/2001 introduced important changes to fixed-term employment contracts. They included two changes of particular importance for the purposes of this study.

The first and definitely the most important modification concerned what are termed the “reasons”, i.e. the specific circumstances in which this type of contract may be used. Prior to 2001 these were very specific with full details given (e.g. peaks in production, replacement of workers on sick leave, etc.). The new law liberalised the contract abolishing the detailed list of specific reasons and introducing the following single general reason: “reasons of a technical, organisational, production or replacement nature (Art. 1, paragraph 1).

While this decision by government was intended to allow employers greater flexibility in the use of this type of contract, on the other hand it made the requirements for the use of these contracts very generic. This inevitably produced uncertainty over the contents of the legislation and how to apply it (Aimo, 2006). Uncertainty over the contents has generated different interpretations of the law. The most important point in question concerned whether or not employers could recruit workers on fixed-term contracts without necessarily demonstrating the temporary nature of the work performed by those employed on those contracts. In technical terms it was held that the use of a time limit no longer needed to be justified by the temporary nature of a firm’s requirements, as if fixed-term and open-ended contracts were both equally valid alternatives.

This remained a minority interpretation. Additionally, the first tests in the courts confirmed that the “standard” contract is the open-ended contract (there is no “alternative” to it as such) and fixed-term contracts must be justified by the temporary nature of the work which the worker is employed to do.

Finally, it is far from easy for employers to demonstrate the temporary nature of work and at the same time to comply with this general “reason” clause. They are forced to deal with an inevitable degree of uncertainty in the use of this type of contract.

The second change introduced by the new law, which is of particular interest here, is that it has removed important powers from the trade unions. Under the previous legislation collective bargaining agreements could list additional “reasons” for the use of fixed-term contracts over and above those contained in the legislation. Unions had broad powers within collective bargaining agreements. Additional “reasons” could be introduced in national collective bargaining agreements, which could be specific to economic sectors.

The new law removed this power from trade unions with the precise intention of preventing the use of national collective bargaining agreements to set conditions for specific cases and pull the teeth from the general character of the “reasons” clause, thereby limiting the freedom of employers to use the contract.

However, the law does allow national collective bargaining agreements to set quantitative limits (“contingents”) on the use of this type of contract. This power was also recognised in the previous legislation and had in fact been widely used. Ceilings on use existed in almost all sectors.

Our study does not address the effects of the new 2001 law. This is not possible with the available data. Moreover, if the new law has generated any effects then they have occurred in a generalised manner and econometric study of them would create problems with the study of the effects of institutional changes that are well known in the literature. The purpose of this study on the other hand is to analyse the impacts of institutional changes which have affected certain parts only of the labour market and not others.

The case of fixed-term contracts lends itself to this type of analysis because a series of national collective bargaining agreements were renegotiated after 2001 (especially in 2005 and 2006) which to a certain extent changed the regulatory framework for new fixed-term employment contracts. The renegotiation of collective bargaining agreements only occurred in some economic sectors (at least in the period considered) and different contracts introduced different regulations. Our analysis of the impacts of fixed-term contracts is based on these differences.

While trade unions generally proposed different solutions in the various national collective bargaining agreements, they did not fully relinquish their regulatory functions in compliance with the law (Zappalà, 2004). In many cases trade unions postponed detailed regulation until the negotiation of later collective bargaining agreements. This occurred in two important cases: mechanical engineering and banking. In other cases, as in the commerce and construction sectors, the “reasons” clauses of the national collective bargaining agreements were based on those contained in article one of the law with no significant additions made to it. Finally, a number of other collective bargaining agreements did in fact introduce “reasons” clauses. They did not and could not counteract the law, but on the one hand they underlined the normal and standard nature of open-ended contracts and on the other they listed, by way of a non limiting example, a series of circumstances in which it could be assumed that a fixed-term contract was of a temporary

nature. There was no impairment of the scope and effect of the law, although further regulation of employment contracts was introduced. At first sight this would seem to limit the flexibility of the law and perhaps it did. However, it is very important not to overlook a consideration made by many who have studied the issue, which is that “employers ... have shown in many cases that they find it useful and convenient to negotiate, in order to establish in advance a range of hypotheses which integrate the general “reasons” ... with the very plausible objective of reducing uncertainties over interpretation which necessarily accompany the interpretation in law of a general clause, even if this means limiting their own individual power to negotiate” (Aimo, 2006, p. 472). According to some, in practice collective bargaining in these cases has even produced the effect of facilitating and not restricting the use of fixed-term employment contracts. It is difficult to say with precision whether the final effect in these cases of national collective bargaining agreements which have further regulated the “reasons” has been that of greater flexibility or greater rigidity.

4. Estimating framework

We are interested in assessing the impact of the reforms to fixed-term contracts and apprenticeships contracts on measures of workers flows and productivity. Indeed it is not entirely appropriate to refer to a reform of fixed-term contracts since, as discussed in the introduction, the need of approval through collective bargaining round may have altered, sector-wise, the original spirit of the reform. However, for expositional simplicity, in the remainder we will refer to the institutional changes as the reform of fixed-term contracts. Let d_{it}^F and d_{it}^A be dummy variables indicating whether in year t ($=2004, \dots, 2006$) firm i was exposed to the reform of temporary contracts (F) or apprenticeships (A). As explained in the institutional section, variation in the first dummy variable occurs over industries and time, whereas the reform of apprenticeships varies over regions, industries and time.

We start by looking at the impact on workers flows. Specifically, we consider the year to year percentage employment (E) change defined as

$$EC_{it} = \frac{E_{it} - E_{it-1}}{\frac{1}{2}(E_{it} + E_{it-1})} \quad (1)$$

This measure is similar in spirit to the one adopted by Autor et al (2007): the use at the denominator of the average employment level in the two years considered –as opposed

to the employment level in the base year—ensures that the measure is bounded. Differently from them, however, we are also interested in the direction of changes, and therefore use the signed employment variation, not the absolute value of the change, at the numerator. The measure is therefore bounded between -2 and 2.

Our estimating equation is:

$$EC_{it} = \beta'x_{it} + \gamma_T d_{it}^T + \gamma_A d_{it}^A + \varepsilon_{it} \quad (2)$$

where x_{it} is a vector containing year, region and industry dummies plus a constant, while the γ coefficients pick up the effect of the two reforms on employment flows at the firm level. Essentially, we identify the effects of interest via a difference-in-difference framework, with the source of identification being provided by the exogenous variation in firms sector and region. Recall from the data section that we have detailed information on the type of employment contracts utilised by the firm. We are therefore able to estimate the reform impact on employment flows considering either total employment and employment in each contact type. The latter exercise is relevant in that it enables an indirect assessment of the degree of substitutability between different types of employment contracts. In other words, the effectiveness of reforms in one type of employment contracts greatly depends on the extent with which firms are able to substitute across contract types. Estimating the impact of reforming one type of contract on flows in other contract types is a way to assess the existence of substitution effects over contracts.

Next, we investigate the impact of the reforms on labour productivity and investments. We define productivity as the ratio between value added and total employment, including all types of temporary employment contracts. We investigate variations in productivity and investments when firms are exposed to the reforms using the same estimating framework laid out with equation (2).

Finally, in order to provide a direct assessment of substitution effects across different types of contracts, we also estimate the parameters of a production function. We assume that production occurs according to a Cobb-Douglas technology in capital and labour, and that labour is of multiple types. We allow labour inputs to differ according to the contract type, distinguishing between permanent and temporary employment contracts and, within the latter, among the four types of temporary contracts that were available to firms. We

model the substitution across type of labour contracts using a nested CES technology. In sum, our production function is:

$$Y_{it} = K_{it}^{\alpha} [L_{pit}^{\sigma} + (\sum_{\tau} L_{\tau it}^{\rho})^{\sigma/\rho}]^{(1-\alpha)/\sigma} \quad (3)$$

where Y is value added, K is capital, L_p is permanent labour and L_{τ} represents varieties of flexible labour. Using this nested CES specification, parameters s and r govern the substitution process across labour inputs. In particular $\eta_{\rho} \equiv 1/(1-\rho)$ is the substitution elasticity between varieties of flexible labour, while $\eta_{\sigma} \equiv 1/(1-\sigma)$ is the substitution elasticity between permanent and flexible labour.

5. Data and descriptive statistics

The data set used in this paper is a balanced panel of about 13000 firms observed over the years 2004-2006. Firm-level information on the types of employment contracts used within the firm is derived from the Excelsior database, a survey conducted by Unioncamere (the Association of Italian Chambers of Commerce) with the aim of providing information on firms' occupational needs, in particular the skill requirement of prospective hires. The sample used in the paper consists of those firms for which information on the various types of employment contract used by the firm, whether permanent, fixed-term, apprenticeships, agency workers, or "collaborators". Agency workers and collaborators are termed atypical employees, in the sense that they are not employees of the firm *strictu sensu*. For all types of contracts except the latter there are correspondent forms of employment outside Italy. The latter type, instead, is peculiar of the Italian labour market. Collaboration contracts (*Collaborazioni Coordinate e Continuative*) were introduced with the income policy agreements of 1998 and were meant to provide a contractual framework for individuals who were not employed by the firm but individually provided their working services to the firm, either immaterial (consultants) or material. The labour costs associated with these contracts were rather low thanks to a reduced regime of compulsory pension contributions, which induced many firms to adopt them even in cases in which the worker was actually an employee of the firm. In later years, the pension wedge was slightly increased and the requirements for using these contractual forms became stricter, imposing to use them only if the tasks to be performed had a fixed term themselves (*Contratti a Progetto*), but still they remained and

still are a relevant form with which Italian firms can use labour inputs, which is different from all the other ones listed above. Besides this information, Excelsior also provide details on the industry (3-digit) and geographical location of the firm, which is essential in constructing the treatment indicators discussed in the institutional section.

The other relevant piece of information used in the paper is the balance sheet information for the firms covered by Excelsior, which is derived from the ASIA database, which is an archive of firm data maintained by the National Statistical Institute. In particular, ASIA provides information on firms' value added and capital stock. From this archive we also derived information on total "typical" employment, i.e. workers employed on permanent or fixed term contracts.

In Table 1 we provide a description of firms workforce composition by type of employment contract. The average proportion of permanent contracts is 88 percent. The most utilised form of flexible employment is given by fixed-term contracts, whereas apprenticeships and the two forms of atypical employment absorb on average 2 percent of firm employment each. There is some deal of variation in this distribution. Permanent contracts are more frequent in the mining, energy and transports sectors, and are particularly under-utilised in the (private) education sector. Fixed-term contracts are more frequently utilised in the hotel, education and 'other services' sectors. Apprenticeships are more frequent in the hotel sector, whereas education is the sector that by far employs collaboration workers more extensively. Besides industries and time, the other relevant variable that we use for assessing firms' exposure to the institutional reforms is location; the data in Table 1, however, do not reveal any evident pattern in contract type workforce composition by geographical area. The last rows of the table look at contract type workforce composition by exposure to institutional reforms and, again, do not show any clear pattern.

6. Results

In this section we first assess whether employment protection legislation affects the level of job reallocation. Then we look at the effects on labour productivity and at the effects on capital and investment normalized by unit of labour. Lastly, we use information on the various contract type to estimate the substitution elasticities within temporary workers and between temporary and permanent workers, which we argue may have played a relevant role in mediating the effects of the reforms on firms' allocative decisions.

6.1 Job reallocation, labour productivity and investments

Regarding job reallocation, the reform designed to make the use of *apprendistato* easier had a positive effect on job flows of *apprendistato* contracts and *interinali* which is reflected in a positive effect on JC and JD at the aggregate level (Table 2 columns 1 and 2) but had no effects on the use of other atypical contracts.

All columns includes region, year and sector dummies to absorb institutional, technological and time specific effects. We also tried to include industry-by-time dummies to control for differential trends by industry in the outcome variable. For example some industries may experience faster (e.g. the computer industry) or lower-than-average (e.g. manufacturing) capital adjustment or job reallocation or productivity growth in all regions. In the same column we also include region-by-time dummies to control for all region-specific time-varying characteristics (for example all regional-level institutions) which have the same effects across industries. Notice that we cannot introduce firm fixed effects because this set of dummies absorbs the main effect of the reform, as this variable only varies by region and time (*apprendistato*) or by sector-time (*tempo det*).

In Table 3 we explore the effect of the reforms on labour productivity finding strong and significantly negative coefficients of around -0.02 in log productivity for *tempo determinato* and insignificant results for *apprendistato*. The results are substantially unchanged whether we control for the level of capital or not. The first two columns of the table show the results in levels of productivity which are insignificant.

In Table 4 we look at the effects of the reforms on investments per capita and the capital-labour ratio. It shows that both reforms are negatively associated with investments. The reform of *apprendistato* reduces the capital-labour and the investment-labour ratio at the firm level. The reform of *tempo determinato* increases the capital-labour and the investment-labour ratio. Negative results on the capital-labour ratio are consistent with results on I/L that show that investment is actually falling relative to the units of labour employed.

6.2 Substitution effects

The reform of tempo determinato (it is controversial whether this reform makes more or less costly the use of tempo determinato contracts) had an insignificant effect on tempo determinato contracts but reduced significantly the turnover in apprendistato, interinale, tempo indeterminato and the total. This suggests substitutability between contracts of various types, which is something that has always been known among employers but has never been investigated by economists.

We estimate a simple production function where 4 types of non-permanent contracts are partial substitutes and the entire group of non-permanent contracts is substitute with open-ended contracts. Table 5 shows that the elasticity of substitution across atypical contracts is high and significant, higher than the elasticity of substitution between open-ended contracts and all atypical contracts.

7. Conclusions

The overall picture shows that the reform of apprendistato seems to have been successful because it actually increased turnover of workers and induced capital-labor substitution in favour of labor and increased productivity.

The reform of tempo determinato instead does not seem to have had the intended results. It may have made the use of tempo determinato more costly rather than less costly as already pointed out by some literature in labor law.

If reallocation of labour is important and the reform of tempo determinato hampers job reallocation across and within firms (for example because it raises costs of consultancy for fear of the courts), then productivity falls. Indeed, finding a negative effect of tempo determinato on job reallocation is a pre-requisite to claim that higher costs hamper the optimization of resources and allocative efficiency (Bertola, 1990). We find that capital intensity is increased after the reform of tempo determinato which may be interpreted as another piece of evidence that the reform made the use of labor more costly relative to capital. As shown by estimates of substitution elasticities, the reform did not affect significantly job flows of tempo determinato but affected negatively job flows of other types of contracts and of open-ended contracts.

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Table 1: Firm workforce composition by type of employment contract

	Permanent	Temporary	Apprenticeships	Agency	Collaborators
Overall	0.88	0.06	0.02	0.02	0.02
2004	0.87	0.05	0.02	0.02	0.03
2005	0.88	0.06	0.02	0.02	0.02
2006	0.88	0.06	0.02	0.02	0.02
Minino	0.91	0.04	0.02	0.01	0.03
Manufacturing	0.89	0.05	0.02	0.03	0.02
Energy	0.91	0.04	0.01	0.01	0.03
Construction	0.88	0.06	0.03	0.01	0.02
Retail trade	0.88	0.05	0.03	0.02	0.02
Hotel and restaurant	0.79	0.14	0.04	0.02	0.01
Transports	0.90	0.06	0.01	0.01	0.02
Real estate	0.86	0.06	0.02	0.01	0.05
Private education	0.70	0.15	0.01	0.01	0.14
Private health	0.86	0.09	0.00	0.00	0.04
Other services	0.83	0.11	0.02	0.01	0.04
North west	0.89	0.05	0.02	0.03	0.02
North east	0.87	0.06	0.02	0.02	0.02
Centre	0.86	0.06	0.03	0.02	0.03
South and Islands	0.88	0.06	0.02	0.01	0.03
Reform of temporary contracts					
No	0.87	0.06	0.02	0.02	0.03
Yes	0.89	0.05	0.02	0.02	0.02
Reform of apprenticeships					
No	0.88	0.05	0.02	0.02	0.03
Yes	0.88	0.06	0.02	0.02	0.02

Table 2: Effects of reforms on workers flows

	<u>Employees</u>		<u>Employees + atypical</u>		<u>Permanent</u>		<u>Temporary</u>		<u>Apprenticeships</u>		<u>Agency</u>		<u>Colaborators</u>	
Reform of														
Apprenticeships	0.0052	(1.89)	0.0089	(2.76)	-0.0016	(0.29)	0.0357	(1.18)	0.1758	(3.93)	0.1168	(2.70)	0.0255	(0.63)
Temporary	-0.0114	(4.94)	-0.0114	(4.53)	-0.0104	(2.64)	-0.0310	(1.46)	-0.0899	(2.80)	-0.0600	(2.27)	-0.0102	(0.37)
Number of observations	33796	-	33796		33790		22700		12419		13460		16855	

Note: the dependent variable is the measure of workers flow defined in the text, applied to the overall firm labour force and by type of employment contract. Regressions include controls for time, region and industry. Robust variance estimates account for repeated observation on the same firm over time.

Table 3: Effects of reforms on labour productivity

Reform of	Productivity				Log-Productivity			
	Without capital		With capital		Without capital		With capital	
Apprenticeships	1147.49	(1.90)	1061.184	(1.79)	0.0118	(1.78)	0.0113	(1.71)
Temporary	1256.036	(1.08)	1191.585	(1.02)	-0.0212	(2.15)	-0.0216	(2.20)
	50695		50695		50417		50417	

Note: see Table 2

Table 4: Effects of reforms on investments and capital-labour ratio

	log(I/L)		Log(K/L)	
ref_app	-0.1649	(3.22)	-0.0561	(3.29)
ref_det	0.1310	(2.39)	0.1671	(7.24)
	33796		50520	

Note: see Table 2

Table 5: Substitution elasticities between types of labor and between labour and capital

	Pooled		2004		2005		2006	
$\eta\rho$	1.3343	(9.64)	1.2178	(10.65)	1.8272	(1.71)	1.4544	(7.39)
$\eta\sigma$	1.0633	(294.22)	1.0695	(127.73)	1.0583	(271.23)	1.0601	(489.47)
N. Obs.	50695		16899		16898		16898	