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ABSTRACT

In this paper, we assess the effects of the Italian labour market reforms which began in 2001 and which led to widespread deployment of temporary work contracts. Using a hitherto unexploited administrative dataset of work histories for the period 2003-2010, we estimate transition probabilities in the states of non-employment and employment and find a small positive effect on job creation, imputed to the reforms. Estimates also indicate a large increase in transitions to temporary contracts, which offset the reduction in permanent employment flows, although transition probabilities for men and women explain little heterogeneity. While we do find a substitution effect of the reforms on the transition between temporary and permanent contracts, the increased probability of being employed in temporary jobs mostly involved young people and workers in the depressed areas of the south of Italy.

Keywords: labour market policy, atypical contract, panel data, inverse probability of weighting estimator

JEL Classification: J64, J41, J58, C33

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1. Introduction

Italy, like most European countries over the last twenty years, has introduced several reforms to enhance labour market flexibility and promote employment. These reforms generally revised Employment Protection Legislation, mostly providing more flexible types of contracts for new hirings (atypical contracts), without modifying rules for workers who already had permanent (open-end) contracts.

A large body of literature has debated the role of temporary contracts in European countries with respect to the effects on workers' perspectives and contractual careers (Blanchard and Landier 2002; Dolado et al. 2002; Estevão 2003; Güell and Petrongolo 2007; Mourougane and Vogel 2009). The empirical literature on the effects of flexibility in the Italian labour market focused on the Treu Package (Law 196/1997) and showed highly variable transition probabilities between occupational states in relation to contractual terms[1]. In particular, the probability of finding permanent positions increased with contract duration and was positively influenced by the addition of training, but decreased with the number of repeated short-term contracts and career interruptions. Most studies in this field have also highlighted the risk of rising labour market segmentation, because less favoured workers (young people, women, and people living in Italy's southern regions) remained trapped in positions of temporary employment.

However, evidence of the effects of the reform of fixed-term contracts in 2001 and of the Biagi reform, implemented in 2003, which increased labour market flexibility more extensively, is still scanty, and the overall influence remains unclear (Bruno et al. 2012; Cappellari et al. 2012; Picchio and Staffolani 2013). One reason may be the long-lasting lack of adequate pre- and post-reform data, a problem which this paper overcomes by using a hitherto unexploited panel of individual work histories from 2003 to 2010, obtained from a joint project carried out by the Italian Treasury and the "Giacomo Brodolini" Foundation (the AD-SILC dataset).

We evaluate the effects of these reforms on entry into the labour market and transitions across non-employment and employment states, in order to answer the following research questions: How has enhanced flexibility shaped job creation and reallocation in the labour market? Have disadvantaged groups (young people, women, and workers in the South of Italy) been positively affected by the spread of temporary contracts? We first estimate transition probabilities between states of non-employment and employment (the *two-state model*), and then extend analysis to distinguish temporary and permanent employment (the *three-state model*). Within the field of temporary employment, we also identify the specific effects of two atypical types of contracts, i.e., apprenticeships and fixed-term contracts. We propose an estimation method based on Markov chains of order one to account for the relative importance of each of the transition probabilities and measure the effects of new atypical contracts on individual employment histories.

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[1] See Barbieri and Scherer 2009; Berton et al. 2011; Boeri and Garibaldi 2007; Gagliarducci 2005; Giannelli et al. 2012; Ichino et al. 2005, 2008; Picchio 2008; Kugler and Pica 2008.

Matching previous literature, our main results indicate a slight improvement in the probability of entering the labour market from a state of non-employment through a temporary contract. We also observe a significant increase in transitions to temporary employment, largely offset by a decrease in flows to permanent employment - an empirical fact particularly evident in young workers. When we estimate the probabilities of transition for temporary workers in initial state, the results indicate a large increase of temporary contracts which constrains slightly the permanent contracts. Even if these results are emphasised for apprenticeships and fixed-term contracts, especially in the depressed areas of southern Italian regions, they remain unchanged for various socio-demographic decomposition of workers, and under the potential caveats.

The paper is organised as follows. Section 2 describes the dataset. Section 3 gives a stylised model for labour market employment. Section 4 presents the identification and estimation strategies. Section 5 discusses the results; conclusions are made in Section 6.

2. Data

The AD-SILC database merges the dataset "IT-SILC (2005)" provided by the Italian Institute of Statistics (ISTAT) with the administrative archives of the Italian Institute of Social Security (INPS). It contains the work histories of about 56,000 workers, and includes the amount of national insurance contributions paid for each type of contract, the beginning and end dates for each contract, data on maternity leave, accidents and/or injuries, and time off for illness. All this information, including workers' age, gender, date of birth, place of birth, and place of residence, are recorded as a panel data framework; education, marital status and nationality are listed cross-sectionally for the year 2005 by the IT-SILC dataset.

In particular, administrative data from the INPS archives merge information from the Register of Active Workers (*Casellario degli Attivi*), established in 2005, and the Register of Pensioners (*Casellario dei Pensionati*), introduced in 1971. The purpose of these registers is to collect social security information on each worker and contribute to monitoring and evaluation of labour market and social security policies. Merging registers overcomes the limitations of the previous datasets, such as the labour force survey prepared by ISTAT (Forlani 2008), which collected information from several sources: i) workers' data regarding "hiring and firing", from the Workers' Compensation Authority (INAIL); ii) data on residence from the Ministry of Internal Affairs, and iii) data covering time off for injuries and illness provided by public institutions (e.g., *Ministero della Sanità Pubblica*).

Data on working experience were extracted from the AD-SILC dataset, according to the amount of national insurance contributions paid in each type of contract. Our strategy classifies each worker within a given contract, when the amount of national insurance contributions paid within that contract is prevalent, irrespective of whether the worker in question has several contracts in a given year and/or different kinds of contracts. This allowed us to select the working experiences of 22,632 employees aged between 15 and 64 for the period 2003-2010. As a partial

limitation to the use of the dataset, workers employed by the public sector were excluded from this analysis, since INPS does not distinguish between temporary and permanent contracts in the public sector and private employees who retired or died during the analysed period. In addition, we excluded self-employed workers because, during the analysed period, many laws were passed specifically for them, complicating proper identification of the labour market reforms in which we were interested.

Temporary jobs in the AD-SILC dataset included workers in leasing, seasonal work, work on projects, apprenticeships and fixed-term contracts. We removed from the dataset workers on leasing contracts, because detailed information on them was not available[2]. We were also obliged to exclude seasonal workers, due to the large quantities of missing data. The sample finally comprised 17,339 individuals, for a total number of 156,364 observations within the panel framework. Table 1 reports the composition of our sample, distinguishing between non-employment and various types of employment contracts. In particular, we considered permanent contracts and three types of temporary contracts, i.e., work on projects, apprenticeships, and fixed-term contracts.

Work on projects (*contratto di collaborazione a progetto*, "co.co.pro.") was a novelty of the Biagi reform (Law 30/2003), which replaced collaboration contracts (*collaborazione coordinata e continuativa*, "co.co.co.") introduced by the so-called Treu Package (from the name of the Ministry for Labour). Formally, workers were collaborators in a company working on a clearly defined professional project. De facto, this type of contract turned out to play a key role in the growth of temporary job relations and many workers ended up by providing services which were very similar to those of permanent jobs. Despite the importance of work on projects, we could not identify its effects after the Biagi reform, because the AD-SILC dataset merges previous co.co.co contracts, which were still in place after that reform, with the new co.co.pro. contracts introduced in 2003.

Apprenticeship contracts[3] were also reorganised by the Biagi reform, by means of several innovations: i) an increase in the limiting age threshold (up to age 30); i) an increase in contract duration, from a minimum of 18 months to up to six years; iii) the possibility of undergoing training at the workplace as a substitute for external training courses; iv) introduction of various types of training, sometimes also linked to higher education or university.

Fixed-term contracts were allowed for technical and productive reasons and in order to replace absent workers. In 2001, Law 368, based on an EU directive, relieved employers of being obliged to define the specific reasons for using fixed-term contracts and eliminated mandatory limits to their renewal. Innovations in apprenticeships and fixed-term contracts were both implemented as from 2005, and the AD-SILC dataset allows us to identify their effects (see Section 4.2). Later, Law 247/2007 introduced changes in maximum duration (i.e., three years) for fixed-term contracts

[2]For an extensive discussion on leasing contract and temporary work agencies in Italy, see Ichino et al. (2005).

[3]Apprenticeship contracts were introduced for the first time with Law 25/1955, and are defined as contracts in which employers are responsible for providing or arranging to provide vocational training.

Table 1: Distribution of panel data by employment status

Employment status	Number in sample
Permanent contracts	75,654
Fixed-term contracts	9,152
Work on project contracts	5,068
Apprenticeship contracts	5,413
Non-employment	61,077
Total	156,364

stipulated with each employer. However, the new reform of fixed-term contracts was only applicable as from April 1 2009.

Lastly, the category "non-employment" includes all subjects in the dataset who had no contract recorded by INPS during the period of this analysis. As a limitation, the AD-SILC dataset does not distinguish between unemployed and inactive subjects, although the available information allows us to check the empirical analysis for instances of long-term unemployment (person unemployed for more than one year), first-time job-seekers, and unemployed persons receiving social security benefits or redundancy payments.

2.1. Descriptive statistics

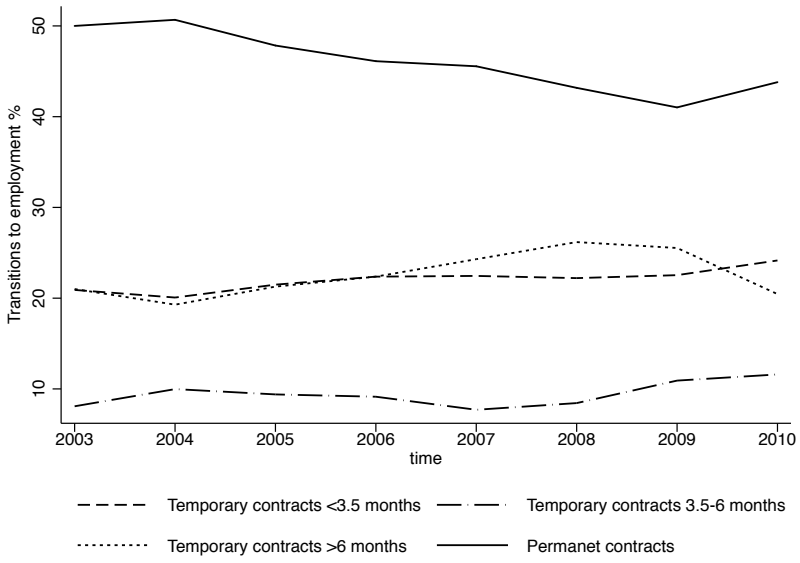
The economic literature shows that, when legal constraints on the termination of permanent jobs coexist with weak constraints on the creation of temporary jobs, it is profitable for firms to hire new workers with temporary contracts. Very short-term temporary contracts are better explained by the heterogeneity of the duration of expected production opportunities, combined with high termination costs for permanent jobs[4].

To highlight these motivations, which underlie the increased numbers of temporary contracts in Italy, we present some empirical evidence of flows in employment status and transitions between non-employment and temporary contracts. Figure 1 plots the outcomes from a count model which analyses entries into the labour market from a state of non-employment. We distinguish three duration periods for temporary contracts: less than 3.5 months, between 3.5 and 6 months, and more than 6 months. This distinction is in line with the length of the trial period for permanent contracts in the Italian labour market, which is specified by collective bargaining agreements as between 1 and 6 months.

Figure 1 shows that, in 2003 and 2004, about 50% of entries into employment were permanent

[4]See, for example, Cahuc et al. (2012).

Fig. 1.— Percentage transitions from non-employment to permanent and temporary employment



contracts, whereas this type of contract decreased by 7-8% after 2005, the year when the labour market reforms came into effect (see next section). Restricting analysis to temporary contracts shorter than the trial period of permanent contracts, we find that, on average, 22-23% of new hirings were shorter than 3.5 months and 7-9% shorter than 6 months. In addition, more than 20% of entries were for temporary jobs longer than the maximum trial period.

To investigate this point further, Table 2 lists the percentage of transitions into temporary employment from non-employment, distinguishing among the three contract categories (work on projects, apprenticeships, fixed-term) and durations. The results show that most of the entries in the apprenticeship and fixed-term categories were shorter than the trial period of permanent contracts. This is at odds with the hypothesis of temporary jobs as a screening device to hire potential candidates for permanent positions, but is consistent with the idea that firms use temporary contracts to exploit new production opportunities with short expected durations. The only exception among temporary contracts was work on projects, which gave rise to durations longer than six months, a result which may be explained by the specific nature of work required for these external hirings, generally involving special skills.

3. A stylised empirical model for the labour market

Let us assume that there are N individuals indexed by $i \in I \equiv (1; ....; N)$, potential participants in the labour market. Let $y_i \in \{-1; +1\}$ denote the achievements of the employment status of

Table 2: Percentage transitions from non-employment to temporary employment

	Duration of contract (months)		
Temporary contract	< 3.5	$3.5 - 6$	> 6
Work on projects	7.15	13.10	47.603
Apprenticeship	18.88	24.27	16.44
Fixed-term contracts	73.96	62.62	35.95

worker i. In the *two-state* model, we assume that employment status is binary so that $y_i = +1$ if the worker is employed (E), and $y_i = -1$ if non-employed (NE). We define an employment profile $\mathbf{y} = (y_1, ..., y_N)$ as the vector of the employment status of N workers. Let $\Omega = \{-1; +1\}^N$ denote all possible states of the employment profile so that the number of different states of Ω is given by $|\Omega| = \{2\}^N$.

Employment status arises from the match between optimal choices of firms and workers, and the observed profile depends on some key variables in the labour market. Theoretical models investigate the main driving forces of the employment choices of firms and workers and suggest, for example, the use of variables such as labour productivity, reservation wage, the rate at which differing jobs become non-productive, and contract duration (Cahuc et al. 2012).

We define a *stochastic employment rule* through a latent surplus function, $y_i^*(t)$. This latent function generates a positive or negative value of $y_i^*(t)$ based on the expected surplus which the key variables of the labour market produce. This function is assumed to be linear in parameters:

$$y_i^* = b_i(\widetilde{\mathbf{x}}_\mathbf{i}) + \epsilon_i \tag{1}$$

where $\widetilde{\mathbf{x}}_\mathbf{i} \subset \Re^k$ is the $1 \times K$ vector of individual and labour market characteristics for choices i of firm and worker and $\epsilon_i \in \Re$ is a random shock. Assuming that stochastic errors ϵ_i are independent and identically distributed, the probability that worker i is employed $y_i = +1$, conditional on $\widetilde{\mathbf{x}}_i$ is given by

$$\pi_i \left[y_i = +1 | \widetilde{\mathbf{x}}_\mathbf{i} \right] = \int_D f(\epsilon_i) d\epsilon_i \tag{2}$$

where $f(\epsilon_i)$ and $F(\epsilon_i)$ are the density and distribution functions of shock ϵ_i, respectively, and $D = \epsilon_i \in \Re | y_i^* \geq 0$ denotes the area from which the integral is taken.

To operationalise the *stochastic employment rule*, we use the binary indicator function $\mathbb{1}[-1; +1]$, counting when the person involved is observed in a state of non-employment or employment. Given the basic two-state labour market matching rule (i.e. *the two-state model*), we can write:

$$\begin{cases} y_i = +1 \quad if \quad (y_i^*) \geq 0 \\ y_i = -1 \quad if \quad (y_i^*) < 0 \end{cases} \tag{3}$$

where the latent surplus function, $y_i^* \geq 0$, indicates the condition for the state of employment and $y_i^* < 0$ defines that of non-employment. Note that, the positive or negative sign of y_i^* depends on the interaction between the key variables of the matching labour market model.

Since a large number of temporary and permanent jobs co-exist in the labour market, the previous rule should be extended to analyse job flows to temporary and permanent states. Thus, we extend the stochastic rule based on the maximum expected surpluses to these two segments of the labour market, and denote the partitioned latent surpluses as $y_{i,\tau}^*$ and $y_{i,P}^*$. This explicitly implies considering two employment states, temporary (E_τ) and permanent (E_P), together with non-employment. We formalise the three-state binary rules (i.e., *the three-state model*) as follows:

$$\begin{cases} y_{i\tau} = +1 \quad if \quad y_i^* \geq 0 \quad and \quad y_{i\tau}^* \geq y_{iP}^* \\ y_{i\tau} = -1 \quad if \quad y_i^* < 0 \quad or \quad y_{i\tau}^* < y_{iP}^* \end{cases} \tag{4}$$

$$\begin{cases} y_{iP} = +1 \quad if \quad y_i^* \geq 0 \quad and \quad y_{i\tau}^* \leq y_{iP}^* \\ y_{iP} = -1 \quad if \quad y_i^* < 0 \quad or \quad y_{i\tau}^* > y_{iP}^* \end{cases} \tag{5}$$

The binary rules of models (4) and (5) which classify workers' state in the labour market are useful not only to evaluate the overall effects of the increase in temporary job contracts after the Italian reforms of 2001 and 2003, but also to examine the specific effects of various kinds of temporary jobs. We therefore replicate the three-state model, considering each temporary job, i.e., apprenticeships and fixed-term contracts, one by one, together with the states of non-employment and permanent work.

We discuss this point further in the empirical section, and summarise here these hypotheses in the corollary given below.

Corollary 1: Given the number of temporary job contracts of interest *B=2*, the binary outcome of these states, based on equation (4), are replicated according to the following composite rule:

$$\begin{cases} y_{i\tau,B} = +1 \quad if \quad y_i^* \geq 0 \quad and \quad y_{i\tau,B}^* \geq y_{iP}^* \quad with \quad B = 1,2 \\ y_{i\tau,B} = -1 \quad if \quad y_i^* < 0 \quad or \quad y_{i\tau,B}^* < y_{iP}^* \quad with \quad B = 1,2 \end{cases} \tag{6}$$

The binary outcome of permanent contracts (i.e. equation (5)) in this formulation is:

$$\begin{cases} y_{iP} = +1 \quad if \quad y_i^* \geq 0 \quad and \quad y_{iP}^* \geq y_{i\tau,B}^* \quad with \quad B = 1,2 \\ y_{iP} = -1 \quad if \quad y_i^* < 0 \quad or \quad y_{iP}^* < y_{i\tau,B}^* \quad with \quad B = 1,2 \end{cases} \tag{7}$$

This static representation of the probability of staying in a specific employment state generally serves as an initial state. However, as we are interested in the achievement of individual employment, we examine the labour demand of firms and the supply of workers from a dynamic perspective, using a stochastic process. In particular, we assume a stochastic process in which employment-matching profiles are modelled in discrete time, $t = 0, 1, 2, ... \in Z$ and, based on the match between firms and workers *(i)*, these profiles are updated sequentially over time.

Let $\mathbf{y}(t) \equiv (y_1(t), ..., y_N(t)) \in \Omega$ denote an achieved matching profile. A sequence [($\mathbf{y}(0), \mathbf{y}(1)$, $\mathbf{y}(2)...$)] thus describes the evolution of a matching profile over time. The transition from one state to another is specified as follows. We assume that a matching profile is $\mathbf{y}(t)$ at time *t*. Taking into account the basic *two-state model*, a new matching profile in period $t + 1$ evolves from the matching profile in period t as follows. Let $\tilde{\mathbf{x}}(t) \equiv (\tilde{\mathbf{x}}_1(t), ..., \tilde{\mathbf{x}}_N(t))$ be the collection of background characteristics of persons and firms in the labour market at time t. For each achieved matching in $\Omega \in \{-1, +1\}$, we have the indicator variable $\mathbb{1}[.,.](t + 1)$ which determines the following rule:

$$\begin{cases} y_i(t+1) = +1 \quad if \quad (y_i^*(t+1)) \geq 0 \\ y_i(t+1) = -1 \quad if \quad (y_i^*(t+1)) < 0 \end{cases} \tag{8}$$

The transition rule states that the employment status generated from matching in the labour market is updated according to the conditional probability given by:

$$\pi_i \left[y_i(t+1) = +1 | y_i(t), \tilde{\mathbf{x}}_\mathbf{i}(t) \right]. \tag{9}$$

Since the stochastic process [($\mathbf{y}(0)$,$\mathbf{y}(1)$,$\mathbf{y}(2)...$)] described above follows a Markov chain on a finite state space of Ω, it is easy to check that the transition probability at time $t+1$ is independent of its history before t.

Clearly, interest in examining the probability of transition across employment states aims at evaluating the effects of labour market reforms on job flows when we use the general form of the *three-state* model or its decompositions, which specifically involve apprenticeships and fixed-term contracts. However, assuming that the reforms implemented in 2001 and 2003 act directly on atypical contracts, favouring their spread, we restrict the parameters of the transition matrix. We identify the effects of enhanced flexibility on the transition probability of individuals in states of non-employment and temporary employment at time *t*, with the expectation that this shock increases firms' hirings or renewals in temporary employment at time *t+1*.

Since the shock of the reforms does not directly affect permanent contracts, we exclude estimation of transition probabilities to the temporary employment of individuals with permanent

contracts at time t in the *three-state* model (outcomes at *t+1*). In fact, the effects of changes in the employment status at time *t+1* of individuals in permanent employment in t would be the result of terminations and later entries into temporary employment from a state of non-employment. That is, we assume that possible direct transitions from permanent contracts due to the reform are negligible.

In summary, the specifications and rules shown in this section model employment status at time t and the transition to employment status at $t+1$. In particular, the binary rule in the *two-state model* serves to stylise the "job creation" which characterises people who are non-employed at time "t" and transit to the state of employment at time "$t+1$".

Instead, we use the *three-state model* to estimate the transition from an initial "non-employment" state, (t), to potential final states (t+1). Here, "job creation" is modelled from an initial state of *non-employment* to *temporary* or *permanent employment*. The *three-state model* also allows us to define "job reallocation" characterised by transition from one temporary job to another temporary job, to a permanent position or to non-employment at time *t+1*.

Figure 2 shows the pay offs of the transition matrix according to the stochastic matching rules and assumptions of the *three-state model*.

Fig. 2.— Payoff of the transition matrix in the *three state model*

Initial state (y_t)		*Final state* (y_{t+1})	*Latent variable conditions*
$\mathbb{1}[-\mathbf{1};\ .]_t$	$\Longrightarrow$	$\mathbb{1}[-\mathbf{1}\ ;\ .\ ,\ .\ ]_{t+1}$	$if\ y_i^*(t+1) < 0$
		$\mathbb{1}[.\ ;\ +\mathbf{1}_\tau\ ;\ .]_{t+1}$	$if\ y_i^*(t+1) > 0\ and\ y_{i\tau}^*(t+1) > y_{iP}^*(t+1)$
		$\mathbb{1}[.\ ;\ .\ ;\ +\mathbf{1_P}]_{t+1}$	$if\ y_i^*(t+1) > 0\ and\ y_{i\tau}^*(t+1) \leq y_{iP}^*(t+1)$
$\mathbb{1}[\ .\ ;+\mathbf{1}_\tau]_t$	$\Longrightarrow$	$\mathbb{1}[-\mathbf{1}\ ;\ .\ ,\ .\ ]_{t+1}$	$if\ y_i^*(t+1) < 0$
		$\mathbb{1}[.\ ;\ +\mathbf{1}_\tau\ ;\ .]_{t+1}$	$if\ y_i^*(t+1) > 0\ and\ y_{i\tau}^*(t+1) > y_{iP}^*(t+1)$
		$\mathbb{1}[.\ ;\ .\ ;\ +\mathbf{1_P}]_{t+1}$	$if\ y_i^*(t+1) > 0\ and\ y_{i\tau}^*(t+1) \leq y_{iP}^*(t+1)$

Notes: y^* is the latent surplus function based in Equation 1, while $\mathbb{1}[.,.]$ and $\mathbb{1}[.,.,.]$ are the indicator variables at time t and *t+1*. Bold number is the labour employment state achieved.

4. The effects of Italian labour market reforms: methodological issues

4.1. Outcome and explanatory variables

Given our panel data, we update the notation for empirical implementation of our models. The outcome (or dependent) variable for worker's achievement i is that person's history, i.e., transition times and destination states. Let $T_{i,0}$ and $y_{i,0}$ denote the point in time when that history begins and the initial state, respectively. In this application, $T_{i,0}$ is the first year of panel data (i.e. 2003) and $y_{i,0}$ is the variable representing achievement of indicator function $\mathbb{1}[-1;+1]$ in non-employment or employment states at time 0.

Let $T_{i,j}$ and $y_{i,j}$ for $j = 1, 2, ..8$, denote subsequent transition times and destination states (with $T_{i,j-1} < T_{i,j}$ and $y_{i,j-1} \neq y_{i,j}$). Individual history is observed over period $[T_{i,0}, T_{i,T}]$, where $T_{i,T}$ represents the time of the last year of panel data (i.e. 2010). Ni is the number of transitions during $[T_{i,0}, T_{i,T}]$.

Distinction must be made in the notation between exogenous and endogenous explanatory variables. $\mathbf{y}_i(t)$ denotes the history of outcomes from the onset of time until time t (the matching profile); that is, $\mathbf{y}_i(t) = \{T_{i,j}\}_{j=0}^{J_i(t)}$, where $J_i(t)$ is the maximal integer, so that $T_{i,J_i(t)} \leq t$. Let $\widetilde{\mathbf{x}_i}$ denotes a vector of exogenous explanatory variables at time t for worker i. For the sake of generality, we omit the possibility that covariates are time-variant or time-invariant, although we separate their different influences below.

The main aim of this paper is to distinguish the effect of labour market reforms to enhance flexibility in Italy from other factors such as state dependence, personal and firm characteristics, and unobserved heterogeneity. We thus include the effects of labour market reforms in the potential outcome approach and explicitly consider them on the transition probabilities related to the states of non-employment and employment. Thus, we decompose vector $\widetilde{\mathbf{x}_i}$ into a $\mathbf{x}_i(t)$ vector of covariates and a binary exogenous variable, $\mathbf{s}[0;1]$, which captures the exposure of a subject to the reforms.

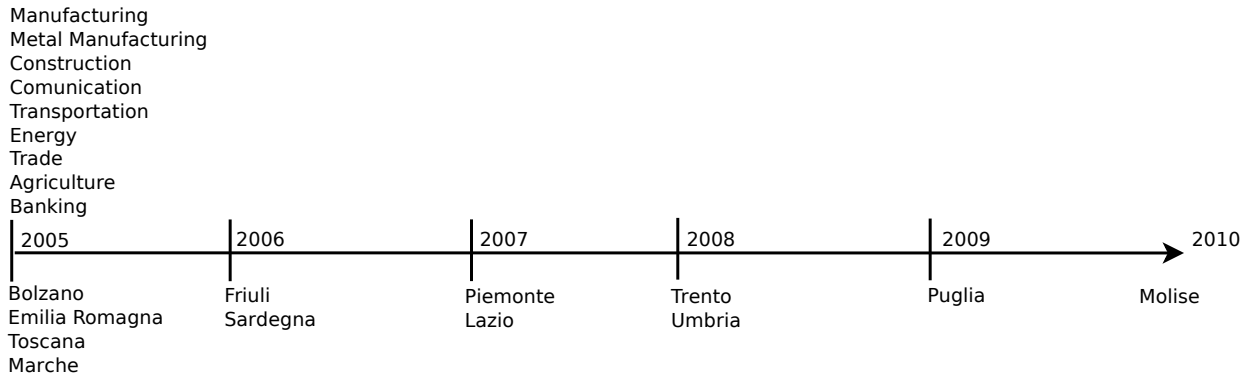
4.2. Identification strategy

In this section, we discuss the empirical strategy restricting the exogenous source of variation in the labour market to apprenticeships and fixed-term contracts, for which we have information suitable for identification. Following Cappellari et al. (2012), we exploit the progressive implementation of the reforms in various sectors and regions of Italy, to identify the causal effects of these policies on job creation and reallocation.

The apprenticeship reform resulting from the new legislation was only gradually implemented, because specific regulations were issued by each Italian region. This was slow, so that in 2005 the government stated that, in the absence of regional regulations, collective agreements at sectoral level could specify the training content of contracts. This produced two tracks before the new ap-

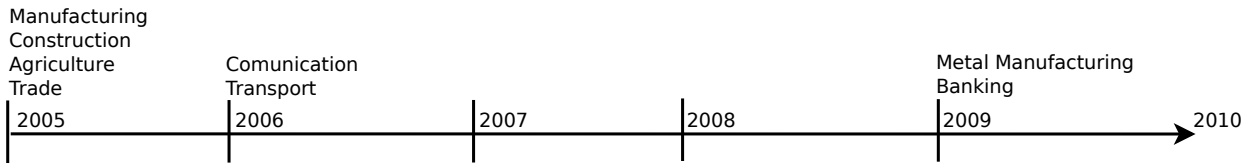
prenticeship contract could be adopted, one covering regional guidelines and the other implemented by sector-specific collective agreements. Figure 3 shows the timelines of regional applications and sector-specific collective agreements for apprenticeships in our sample period.

Fig. 3.— Timeline of implementation of apprenticeship contracts (Law 30/2003).



Similarly, the adoption of the new fixed-term contracts (Law 368/2001) was conditional upon renewal of collective agreements. Figure 4 shows the timeline for their renewal at sectoral level, which began in 2005. Conversely, we assume as negligible the effects of the later Law 247/2007, which introduced a maximum duration of three years for fixed-term contracts because, as mentioned above, it was not applied until April 1 2009. However, we explore possible effects in the section on robustness analysis, constraining sample length to 2008.

Fig. 4.— Timeline of implementation of reform of fixed-term contracts (Law 368/2001).



4.3. Parameterisation and estimation

In this sub-section, we discuss the estimation procedure to evaluate the effects of the labour market reforms on labour market performance. Following the framework presented above, we

specify as in French and Bailey (2011) a linear probability model (*LPM*) which rationalises the dynamic matching employment rules of the *two-state* and *three-state* models. As $y_{i,t}$ is the binary outcome of interest, $s_{i,t}$ is binary treatment ($\mathbf{s}$ is the binary indicator variable) which represents a formal inclusion of the exogenous variation in employment matching between t and *t+1*. To make the model empirically tractable, we also distinguish column vector k of time-invarying covariates $\mathbf{v}_i$ from time-varying covariates, $\mathbf{x}_{I-k,t}$.

Following the potential outcome approach, transition probability outcome $\mathbf{y}$ has a potential version denoted by $\mathbf{y}^{(\boldsymbol{s})}$. For any subject, the observed outcome is the potential outcome corresponding to the observed treatment in the labour market. This basic assumption is known as the *observation rule* (Lechner and Miquel 2010) or the *consistency assumption* (VanderWeele and Vansteelandt 2009).

A formulation of the *LPM* which accounts for the relationship between potential outcome $\mathbf{y}^{(\boldsymbol{s})}$ and treatment indicator $\mathbf{s}$, is given by:

$$E\left[(y(t+1)|y(t))^{(\mathbf{s})}\right] = \beta_0 + (\mathbf{s})'\beta_1, \tag{10}$$

where β_0 represents the potential outcome mean, $\boldsymbol{\beta}_1$ is the average treatment effect under identification assumptions, and $\boldsymbol{s}$ the exposure of a subject at time t to the labour market reforms. We invoke the general assumptions for causal estimation of parameters: (1) the Stable Unit Treatment Value Assumption (SUTVA), which rules out interferences; (2) the Positivity or Random Assignment, which states that the conditional probability of being assigned to treatment is neither zero nor one; (3) the Ignorability Assumption, which rules out unobserved confounders: $\mathbf{s} \perp \boldsymbol{y} \mid, \boldsymbol{x}_{I-k}, \boldsymbol{v}, \quad t = 1, \ldots, T.$

Applied to the *two-state model*, with the states of "non-employment" (NE) and "employment" (E) as response outcomes at time *t+1*, $\boldsymbol{\beta}_1$ measures the effect of the reforms in term of the probability that a non-employed worker at time t transits towards employment *(E)* at time *t+1* or, equivalently, remains in a state of non-employment if the model is estimated with *NE* as response outcome. It should be noted that the estimated parameters of LPM must be interpreted as a marginal effect of the exposure of a non-employed person to the labour market reforms on the probability of transiting to a state of employment.

The linear probability model described by Equation (10) can easily be extended to account for the *three-state model* which includes two different initial states t , *non-employment*, and *temporary employment*, and three final states *t+1*, *non-employment*, *temporary employment* and *permanent employment*. *LPM* estimates of the effects of the reforms are carried out equation by equation, and the parameters and variables are those noted in Equation 10. In fact, following the model specifications, although the effect of the reforms on work flows directly affects non-employed or temporary workers, it only has an indirect effect on permanent contracts.

This model is used again when we consider the two temporary contracts of interest, separately,

i.e. *apprenticeships* and *fixed-term contracts*. The difference is that, in the latter case, dummy variable $s_{i,t}$ captures the exposure to the reforms of a subject involved in apprenticeship or a fixed-term contract, respectively, excluding transitions from or to other temporary contracts, but considering the effects of variations in non-employment and permanent contracts.

Under *ignorability*, the causal parameters of the specification 10 can be estimated by the IPW method[5] in which a matching achievement of subject i is weighted by the inverse of the probability of its observed treatment, i.e. $\prod_{t=1}^{T} Pr(s_{it} \mid \boldsymbol{x}_{i,t}, \boldsymbol{v}_i)$. Occasion-specific probabilities are usually estimated through pooled logistic regression, that is, standard logistic regression applied to the subject-occasion dataset (any subject contributes with one record for each occasion on which it is observed). The vectors of observable time-varying and time un-varying individual characteristics x_{it} and v_i which we include in this estimate, are: individual's gender, age, highest degree of education received (primary, secondary, tertiary), and monthly duration of present contract, together with the already-mentioned three dummy variables, characterising individuals as first-time job-seekers, unemployed persons on social security benefits, and long-term unemployed persons. The statistics of exposed and non-exposed individuals to the labour market reforms, for the *three-state model*, are listed in the Appendix.

It should be emphasised that the efficiency of the IPW estimator may be unsatisfactory when the weights have high variability. In particular, subjects with tiny probabilities have large weights, which increase the variance. Although a common method of improving efficiency is the use of *stabilised weights* (Robins et al. 2000), here we use an augmented inverse-probability weighting estimator which combines aspects of regression-adjustment and inverse-probability weighted methods to estimate potential-outcome means and average treatment effects. This estimator is shown to be the double-robust estimator (Tsiatis 2006; Leon et al. 2003), which also has the advantage of providing unbiased inferences when adjustments are made for selection effects by allowing for different forms of model misspecification (Emsley et al. 2008).

5. Results

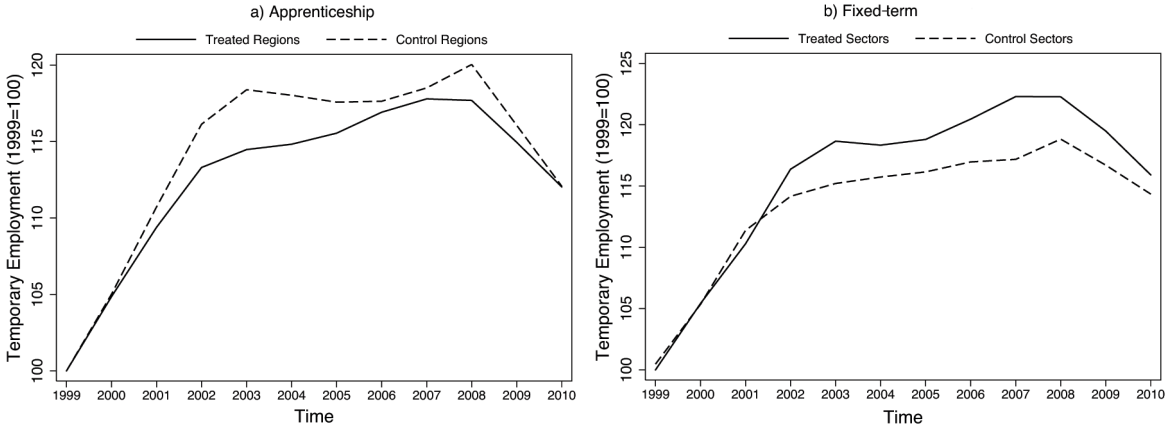
5.1. Preliminary: the validity of identification

To verify identification validity, exogeneity of labour market reforms is inferred. Decisions concerning adoption of new contracts are inferred to be independent random events varying over period, with no spillover effects. Note that regions or sectors with few entries into labour market through apprenticeships and fixed-term contracts were those which had adopted the reform earlier.

Figure 5 shows tests for new apprenticeships and fixed-term contracts, comparing the transition probabilities of being involved in these contracts for treated and non-treated samples. In particular,

[5] See, Robins et al. (2000).

Fig. 5.— Percentage of transitions from fixed-term to permanent contracts.



we compare treated and non-treated regions when new apprenticeship contracts are analysed, and treated and non-treated sectors for fixed-term contracts. Both panels show similar trends in the two series before the new contracts came into force in 2005, supporting the validity of our identification strategy.

5.2. Baseline estimates

We assess here the effect of the labour market reforms on non-employment and employment states using the *two-state* and *three-state* models.

Table 3: Estimation results, two-states model

	Non-employment		Employment	
Job creation				
Average treatment effect	-0.002	***	0.002	***
	(0.001)		(0.001)	
Potential outcome means	0.873	***	0.127	***
	(0.002)		(0.002)	
Number of observations	*48373*		*48373*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3 lists the results on job creation of *LPM* estimates according to the *two-state model*, including estimated potential outcome means and average treatment effect for treated persons exposed to the reforms.

Table 4: Estimation results, three-states model

	Non-employment		Temporary employment		Permanent employment	
a) Job creation						
Average treatment effect	-0.002	***	0.034	***	-0.032	***
	(0.001)		(0.005)		(0.005)	
Potential outcome means	0.873	***	0.061	***	0.066	***
	(0.002)		(0.001)		(0.001)	
Number of observations	*48373*		*48373*		*48373*	
b) Job reallocation (from Temporary employment)						
Average treatment effect	-0.058	***	0.067	***	-0.009	**
	(0.003)		(0.007)		(0.005)	
Potential outcome means	0.176	***	0.625	***	0.198	***
	(0.004)		(0.006)		(0.005)	
Number of observations	*16454*		*16454*		*16454*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Column 1 of Table 3 shows that exposure to the labour market reforms produced a small positive variation in new hirings of about 0.2%. This means that, because of the potential outcome of the population not subjected to the reforms of 12.7%, we find a slight positive job creation effect.

However, this estimate cannot distinguish wherever this small effect on job creation comes from new hirings in temporary or permanent employment. Table 4 lists estimates for these two sub-markets (i.e. *three-state model*). Columns 2 and 3 (part of panel a) of Table 4 show that the 0.2% increase in the transition probability of entering the labour market (Table 3) is the result of a substitution effect between temporary and permanent jobs. We estimate an increase of 3.4% in the probability of moving to temporary employment after exposure to the reforms, which offsets the reduction of 3.2% in the probability of moving to a permanent job.

The effects of the labour market reforms on the reallocation of employees (if they were already in temporary employment) are listed in panel b) of Table 4. Column 1 of this table shows that exposure to the reforms for workers who had previously had temporary jobs reduced the probability of leaving the labour market (5.8%). This effect was due to the significant increase in the probability of staying in temporary employment (6.7%), limiting the reduction of transitions from temporary to permanent employment to about 1%. These results were expected, since the reforms relaxed the mandatory limits on temporary contracts, without reducing the termination costs of permanent ones, generate incentives for firms to hire workers through temporary contracts and was

in accordance with the findings by Haltiwanger et al. (2014). These estimates were also consistent with the ones obtained by Centeno and Novo (2012) in Portugal.

Table 5: Estimation results, *three-state* model (Apprenticeships)

	Non-employment		Apprenticeship		Permanent employment	
a) Job creation						
Average treatment effect	-0.002	**	0.144	***	-0.141	***
	(0.001)		(0.007)		(0.007)	
Potential outcome means	0.771	***	0.061	***	0.168	***
	(0.006)		(0.004)		(0.006)	
Number of observations	*4393*		*4393*		*4393*	
b) Job reallocation (from Apprenticeships)						
Average treatment effect	-0.039	***	0.093	***	-0.053	***
	(0.008)		(0.017)		(0.016)	
Potential outcome means	0.102	***	0.698	***	0.200	***
	(0.009)		(0.016)		(0.014)	
Number of observations	*3127*		*3127*		*3127*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors reported in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

To complete the baseline analysis, we replicated the estimates of the *three-state* model in Tables 5 and 6 to examine separately the effects of the two contracts, apprenticeships and fixed-term contracts, on job creation and job reallocation. We stress that Tables 5 and 6 were obtained by considering the effects of variations in transitions of non-employment and permanent contracts together with those in the specific temporary contracts.

Starting with apprenticeships, we estimate the effect of the reforms on job flows for young people aged 15-29 who were eligible for this type of contract. Table 5 shows that the introduction of apprenticeship reforms increased the probability of remaining in this temporary job by 14.4%, but reduced the probability of signing permanent contracts by 14.2%. The importance of apprenticeship contracts was also confirmed for young workers with apprenticeships at *t-1*. The increase due to application of the reforms to new temporary contracts, even though more than 60% of these changes were due to exit from permanent contracts, was 9%.

Table 6 shows the results of analysis for fixed-term contracts. The magnitude of their effects on the measure of job creation is in line with that of Table 4 (around 4.0%). Note that these results diverge from those proposed by Cappellari et al. (2012), who found a reduction in job creation after the introduction of the new fixed-term contracts.

Table 6: Estimation results, three-state model (Fixed-term)

	Non-employment		Fixed-term		Permanent employment	
a) Job creation						
Average treatment effect	-0.002	***	0.040	***	-0.038	***
	(0.001)		(0.005)		(0.005)	
Potential outcome means	0.903	***	0.029	***	0.069	***
	(0.001)		(0.001)		(0.001)	
Number of observations	*41777*		*41777*		*41777*	
b) Job reallocation (from Fixed-term)						
Average treatment effect	-0.044	***	0.106	***	-0.063	***
	(0.005)		(0.011)		(0.011)	
Potential outcome means	0.195	***	0.482	***	0.323	***
	(0.006)		(0.009)		(0.008)	
Number of observations	*6287*		*6287*		*6287*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

When the estimates of job reallocation are accounted for, we show that the introduction of new fixed-term contracts reduced by 10% the probability of moving to non-employment from temporary jobs, but it also increased permanence in this state. The substitution effect between fixed-term and permanent contracts, caused by the introduction of fixed-term contracts, appears with a 6.3% reduction in the probability of moving from this employment state to a permanent job.

5.3. Focusing on subsamples of workers: a decomposition by age, gender and region

The target population of the labour market reforms in Italy also focused on disadvantaged workers, such as young people, women, and job-seekers in the depressed areas of Southern Italy (the "Mezzogiorno"). In this section, we focus on these segments of the labour market, to assess to what extent the reforms of 2001 and 2003 benefited the target population.

In the light of our previous results, we first examined whether young workers were affected by the labour market reforms in the same way as prime (i.e., those aged > 30 and < 65) or older workers. The span of the age class we chose (those aged 15-30) accounts for the upper limit of the new apprenticeship contract, which was possible only for persons under 30 years of age. We also decomposed our estimations by gender and region of residence, to examine the effects of the

reforms on women and workers in the Mezzogiorno. Table 7 (panel a) lists the average treatment effects of the reforms on the transition probabilities of workers, according to the *three-state* model.

Comparing the estimates with the *three-state* model in the baseline specification for job creation, we found a large increase in the transition probability of young workers entering the labour market with temporary employment (7.2%) and a contrasting fall (7%) in the probability of entering with permanent contracts. In addition, in the case of job reallocation, young workers in temporary employment increased their probability of staying in this state after the reforms by 13.4%, i.e., more than double that of the full sample. It should be noted that the marked reduction in job stability for young workers was only partially offset by the change in the probability of leaving the labour market from temporary employment, which decreased by 6.5%.

The middle panel of Table 7 lists the effects of the labour market reforms according to gender. For the female population, the comparison does not show significant differences in job creation with respect to the full sample but, in the case of job reallocation, the increased probability of moving to temporary contracts for women is partly due to a reduction of 2.4% in the transit to permanent employment.

The estimates for the Mezzogiorno (bottom panel of Table 7) indicate a slight increase in job creation effects (0.4% versus the Italian average of 0.2%). The transition probabilities for this area, based on the effects of new contracts to workers in temporary employment, indicate growth of 9% in persisting temporary employment. As the increased probability of remaining in temporary employment is fully offset by the reduced probability of moving to non-employment, enhancing labour market flexibility did at least achieve the aim of alleviating the negative non-employment trends in the Mezzogiorno.

The heterogeneous effects of the reforms are listed in Table 8 for apprenticeship contracts, estimates being decomposed by gender and macro-areas, and in Table 9 for fixed-term contracts, decomposed by age, gender and macro-areas. Although the estimates indicate that there is no evidence of gender differences, the slight increase in the probability of apprenticeship contracts for southern Italian workers, with respect to the means of the effects, were again due mainly to reduced transitions to non-employment. This increase, in view of the fact that individuals had received apprenticeship contracts in the previous year, confirmed that temporary employment favoured exit from non-employment for those in depressed Italian regions.

Estimates of the shock due to the reform of fixed-term contracts also highlight interesting evidence. First of all, compared with the baseline estimates, young workers aged 15-30 had a significantly increased probability of entering the labour market with this type of contract, with percentage points double those of the means of individuals who were non-employed. As regards estimates based on job reallocation, the probability of young workers of staying in fixed-term contracts increased by 13.4% , partly due to the reduced probability of remaining in a state of non-employment. Instead, the estimates of the effects of the reforms for fixed-term contracts, decomposed by gender, did not show differences from baseline estimates; in the case of decomposition

Table 7: Estimation results, three-state model, by age, gender and region

	Non-employment		Temporary employment		Permanent employment	
a) Job creation						
Age 15-30						
Average treatment effect	-0.002	***	0.072	***	-0.070	***
	(0.001)		(0.004)		(0.004)	
Potential outcome means	0.721	***	0.177	***	0.102	***
	(0.004)		(0.004)		(0.004)	
Number of observations	*10860*		*10860*		*10860*	
Female gender						
Average treatment effect	-0.002	***	0.033	***	-0.031	***
	(0.000)		(0.004)		(0.004)	
Potential outcome means	0.894	***	0.056	***	0.051	***
	(0.002)		(0.001)		(0.001)	
Number of observations	*29250*		*29250*		*29250*	
Mezzogiorno						
Average treatment effect	-0.004	***	0.031	***	-0.026	***
	(0.001)		(0.010)		(0.010)	
Potential outcome means	0.863	***	0.052	***	0.085	***
	(0.003)		(0.002)		(0.002)	
Number of observations	*17073*		*17073*		*17073*	
b) Job reallocation (from Temporary employment)						
Age 15-30						
Average treatment effect	-0.065	***	0.134	***	-0.069	***
	(0.005)		(0.009)		(0.008)	
Potential outcome means	0.168	***	0.620	***	0.212	***
	(0.005)		(0.008)		(0.007)	
Number of observations	*9602*		*9602*		*9602*	
Female gender						
Average treatment effect	-0.048	***	0.072	***	-0.024	***
	(0.004)		(0.010)		(0.009)	
Potential outcome means	0.177	***	0.628	***	0.196	***
	(0.005)		(0.008)		(0.007)	
Number of observations	*8223*		*8223*		*8223*	
Mezzogiorno						
Average treatment effect	-0.094	***	0.092	***	0.002	
	(0.008)		(0.014)		(0.013)	
Potential outcome means	0.264	***	0.563	***	0.173	***
	(0.009)		(0.011)		(0.009)	
Number of observations	*3680*		*3680*		*3680*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

by macro-areas, we again found a reduction in the probability of southern Italian workers of being non-employed, which was higher than the mean effect, confirming that, in this case, the reforms were effective.

5.4. Robustness

Let us now assess the robustness of our findings. A first check involves the possibility that effects on entry into and exit from the labour market or transitions between employment states are affected by the composition of contracts, due to the overlap of "co.co.co" contracts and work on project contracts (co.co.pro) after the reform of 2003. To address this, we restricted the length of our analysis and carried out estimates starting from 2004.

A second robustness check concerns possible effects due to Law 247/2007, which only came into force on April 1 2009. To check for this, we restricted the estimate of transition probabilities to 2008.

Table 10 lists the estimates of models with restricted samples. The average treatment effect on transition probabilities did not show any differences in the effect of labour market reforms with respect to previous estimates, except for the magnitude of some coefficients on job reallocation equations. The transition probabilities of moving to temporary employment increased slightly in the restricted sample 2003-2008 (8.3%), without any significant variation in transitions to permanent employment, which falls of about 1.4%. This led us to conclude that the increase in transition probabilities of subjects with temporary contracts, which we found in the baseline estimates, were driven by changes in temporary contracts. The estimates in panels b) and c) of Table 10 confirm the magnitude of the effects in apprenticeships and fixed-term contracts.

6. Conclusive Remarks

In this paper, we estimate the effects of the labour market reforms aimed at enhancing flexibility implemented in Italy in 2001 and 2003, on transition probabilities across various labour market states. We use hitherto unexploited administrative data merged with other official sources of information (AD-SILC data-set) to construct measures of worker flows between employment states according to temporary and permanent contracts. This procedure gives us a consistent set of facts from which we can identify employment entry/exit probabilities as well as job reallocation for workers in temporary employment.

Using our estimates, we find a slight positive creation of new jobs imputed to the reforms. Matching previous literature, we find a substitution effect between temporary and permanent contracts, i.e., a large increase in the number of temporary contracts, offset by a reduction in permanent contracts. The effect of workers' enhanced flexibility is highlighted when we estimate the probabil-

Table 8: Estimation results, three-states model (Apprenticeship), by gender and region

	Non-employment		Apprenticeships		Permanent employment	
a) Job creation						
Female gender						
Average treatment effect	-0.001		0.131	***	-0.130	***
	(0.001)		(0.009)		(0.009)	
Potential outcome means	0.786	***	0.060	***	0.154	***
	(0.009)		(0.006)		(0.008)	
Number of observations	*2236*		*2236*		*2236*	
Mezzogiorno						
Average treatment effect	-0.003	**	0.154	***	-0.151	***
	(0.001)		(0.011)		(0.011)	
Potential outcome means	0.795	***	0.030	***	0.175	***
	(0.009)		(0.004)		(0.008)	
Number of observations	*2129*		*2129*		*2129*	
b) Job reallocation (from Apprenticeship)						
Female gender						
Average treatment effect	-0.027	***	0.104	***	-0.077	***
	(0.009)		(0.024)		(0.023)	
Potential outcome means	0.092	***	0.693	***	0.215	***
	(0.011)		(0.022)		(0.020)	
Number of observations	*1407*		*1407*		*1407*	
Mezzogiorno						
Average treatment effect	-0.098	***	0.145	***	-0.047	
	(0.025)		(0.042)		(0.037)	
Potential outcome means	0.213	***	0.597	***	0.190	***
	(0.028)		(0.039)		(0.033)	
Number of observations	*538*		*538*		*538*	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $***p < 0.01$, $**p < 0.05$, $*p < 0.1$.

Table 9: Estimation results, three-state model (Fixed-term), by age, gender and region

	Non-employment		Fixed-term		Permanent employment	
a) Job creation						
Age 15-30						
Average treatment effect	-0.002	***	0.072	***	-0.070	***
	(0.001)		(0.004)		(0.004)	
Potential outcome means	0.763	***	0.104	***	0.132	***
	(0.005)		(0.004)		(0.005)	
Number of observations	*6097*		*6097*		*6097*	
Female gender						
Average treatment effect	-0.002	***	0.042	***	-0.040	***
	(0.000)		(0.005)		(0.005)	
Potential outcome means	0.922	***	0.027	***	0.052	***
	(0.002)		(0.001)		(0.001)	
Number of observations	*25539*		*25539*		*25539*	
Mezzogiorno						
Average treatment effect	-0.004	***	0.040	***	-0.035	***
	(0.001)		(0.013)		(0.013)	
Potential outcome means	0.886	***	0.025	***	0.089	***
	(0.003)		(0.001)		(0.002)	
Number of observations	*14921*		*14921*		*14921*	
b) Job reallocation (from Fixed-term)						
Age 15-30						
Average treatment effect	-0.065	***	0.134	***	-0.069	***
	(0.005)		(0.009)		(0.008)	
Potential outcome means	0.210	***	0.477	***	0.313	***
	(0.010)		(0.014)		(0.012)	
Number of observations	*2401*		*2401*		*2401*	
Female gender						
Average treatment effect	-0.034	***	0.114	***	-0.080	***
	(0.006)		(0.016)		(0.015)	
Potential outcome means	0.192	***	0.490	***	0.319	***
	(0.008)		(0.012)		(0.012)	
Number of observations	*3178*		*3178*		*3178*	
Mezzogiorno						
Average treatment effect	-0.086	***	0.113	***	-0.027	
	(0.011)		(0.021)		(0.020)	
Potential outcome means	0.281	***	0.462	***	0.257	***
	(0.013)		(0.017)		(0.015)	
Number of observations	*1683*		*1683*		*1683*	

Notes: For definiition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

ities of transition with temporary employment as initial state. In this case, estimates for the full sample indicate that the labour market reforms increased the number of transitions to temporary contracts by almost 7%. We also find a large range of transition probabilities due to the reforms for apprenticeships and fixed-term contracts, especially in the depressed areas of southern Italian regions, only partly imputed to the decrease of the flows of permanent contracts.

These facts apply to young workers, who undergo persisting temporary employment higher that given by the mean effect. However, the transition probabilities for men and women explain only a few of these differences. In this work, we did not examine either the factors causing estimated transitions to temporary employment or the negative or non-significant effects of labour market reforms on transitions to permanent employment. However, net of some estimation disturbing factors regarding the influence of the recent financial crisis, we show that our findings are valid for several groups of workers and are robust over the sample used.

Table 10: Robustness checks

a) Three-state model

	Non-employment		Temporary employment		Permanent employment	
a) Job creation						
Restricted sample: *2004-2010*						
Average treatment effect	-0.002	***	0.034	***	-0.032	***
	(0.001)		(0.005)		(0.005)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.004	***	0.036	***	-0.033	***
	(0.000)		(0.008)		(0.008)	
b) Job reallocation (from Temporary employment)						
Restricted sample: *2004-2010*						
Average treatment effect	-0.058	***	0.067	***	-0.009	**
	(0.003)		(0.007)		(0.005)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.067	***	0.083	***	-0.014	**
	(0.004)		(0.008)		(0.007)	

b) Apprenticeships

	Non-employment		Apprenticeships		Permanent employment	
a) Job creation						
Restricted sample: *2004-2010*						
Average treatment effect	-0.002	**	0.144	***	-0.141	***
	(0.001)		(0.007)		(0.007)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.003	**	0.152	***	-0.150	***
	(0.001)		(0.008)		(0.008)	
b) Job reallocation (from Apprenticeships)						
Restricted sample: *2004-2010*						
Average treatment effect	-0.039	***	0.093	***	-0.053	***
	(0.008)		(0.017)		(0.016)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.037	***	0.108	***	-0.071	***
	(0.008)		(0.018)		(0.017)	

Continued

c) Fixed-term contracts

	Non-employment		Fixed-term		Permanent employment	
a) Job creation						
Restricted sample: *2004-2010*						
Average treatment effect	-0.002	***	0.040	***	-0.038	***
	(0.001)		(0.005)		(0.005)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.004	***	0.048	***	-0.044	***
	(0.001)		(0.009)		(0.009)	
b) Job reallocation (from Fixed-term)						
Restricted sample: *2004-2010*						
Average treatment effect	-0.044	***	0.106	***	-0.063	***
	(0.005)		(0.011)		(0.011)	
Restricted sample: *2003-2008*						
Average treatment effect	-0.045	***	0.119	***	-0.074	***
	(0.005)		(0.014)		(0.013)	

Notes: For definition of measures of job creation and job reallocation, see text. Robust standard errors in brackets; $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Appendix A: Summary statistics for control variables in the *three state* model).

Variable		Full-sample	Control Sample	Treated Sample
Unemployed persons receiving S.S.B.		0.018	0.016	0.025
First-time job seekers		0.003	0.003	0.006
Long-term unemployed persons		0.357	0.387	0.209
Monthly contract duration		22.674	24.345	14.543
Gender	(Female = 2)	1.498	1.501	1.488
Age				
	15-24	0.110	0.058	0.360
	25-34	0.239	0.214	0.360
	35-44	0.265	0.285	0.171
	45-54	0.225	0.254	0.085
	55-64	0.161	0.189	0.024
Education				
	Primary	0.067	0.073	0.038
	Secondary	0.785	0.766	0.878
	Tertiary	0.009	0.010	0.006
Sector				
	Agriculture	0.004	0.004	0.001
	Energy	0.007	0.008	0.003
	Extractive sector	0.027	0.031	0.006
	Metal manufactory	0.109	0.118	0.064
	Manufactory	0.096	0.088	0.130
	Construction	0.057	0.044	0.118
	Commerce	0.137	0.104	0.292
	Communications and Transport	0.029	0.028	0.033
	Credit and Banking	0.087	0.084	0.099
	Other services	0.054	0.061	0.025
Region				
	Piedmont	0.063	0.064	0.055
	Valle d'Aosta	0.012	0.012	0.015
	Lombardy	0.128	0.134	0.096
	Bolzano-Bozen	0.023	0.024	0.018
	Trento	0.017	0.015	0.026
	Veneto	0.098	0.098	0.098
	Friuli Venezia Giulia	0.040	0.040	0.040
	Liguria	0.034	0.033	0.040
	Emilia-Romagna	0.069	0.069	0.073
	Tuscany	0.071	0.068	0.088
	Umbria	0.042	0.040	0.050
	Marche	0.054	0.049	0.079
	Lazio	0.069	0.068	0.072
	Abruzzo	0.028	0.029	0.025
	Molise	0.014	0.014	0.012
	Campania	0.068	0.069	0.063
	Puglia	0.048	0.048	0.047
	Basilicata	0.022	0.024	0.015
	Calabria	0.025	0.027	0.014
	Sicily	0.044	0.046	0.033
	Sardinia	0.031	0.029	0.042

Notes: S.S.B.: social security benefits.

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