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## Making the Italian Labor Market More Flexible: An Evaluation of the Treu Reform\*

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### *Abstract*

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The Treu Law introduced temporary contracts and extended the applicability of fixed-term contracts in order to increase the flexibility of the labour market and to reduce unemployment. The paper inquires whether the reform has affected the duration dependence related to the out-flow from non-employment, how previous atypical contract experiences affect the probability of finding a stable job and if the probability of flowing toward a permanent contract is higher moving from a non-working state rather than from an atypical job. Applying a Mixed Proportional Hazard (MPH) model with competing risk to a sub-sample drawn from the WHIP dataset, I estimate the hazard rate for the state transitions. My main findings predict an increase in negative duration dependence for non-working state out-flow, meaning an amplification of the short-term unemployed - long-term unemployed duality. It is a consequence of the larger use of atypical contracts, that would provide a screening instrument for the hiring choices of firms. Previous atypical job experiences play a negative effect on the probability of moving toward a stable job if the origin state is a non-working condition, while they have a positive role in the transition toward an atypical job. Besides, there is no evidences that the probability of finding a permanent contract is higher for workers who move from an atypical contract rather from a non-working state. Finally, a human capital accumulation effect is found to explain the transition toward a stable job. Policy recommendations include promotion of longer contracts, implementation of training programs and services to facilitate job-search.

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# 1 Introduction

From the end of the '70s, the European labour market has been characterized by high and persistent unemployment rate. A large consensus exists among economists to consider the high regulation of the labour market as the principal reason of this phenomenon. In order to solve this problem measures have been suggested for increasing flexibility in the labour market, with the introduction of atypical contractual forms (in particular, fixed-term contracts and temporary contracts) characterized by low hiring and firing costs. The reforms inspired to this principle have given, generally, good results in terms of reduction of unemployment rates and dynamicity of labour markets.

Spain is a good documented example of this phenomenon; the introduction of temporary contracts goes back to 1984 and the use of these contractual forms has increased during the last twenty years. Today more than thirty percent of the contracts existing in Spain are temporary contracts, and about ninety percent of the new contracts stipulated are of the non-permanent type. The effects on the unemployment rate, even if with delay, have been positive and, at the same time, a more dynamicity in the labour market is determined as a consequence of the increase of flow-out and flow-in unemployment and employment (cfr. Güell). However, the introduction of fixed-term contracts has generated some effects on other dimensions of the labour market. For example, Maia Güell (2003) shows that these reforms have increased the duration dependence for unemployment spells, proving increased duality between short-term unemployed (STU) and long-term unemployed (LTU).

As showed by Blanchard and Diamond (1994), if firms rank unemployed workers and hire those with the shortest spells of unemployment, then the exit rate from unemployment is a decreasing function of duration. Moreover to the extent that firms do not hire randomly, it is quite possible that duration dependence of unemployment might have increased after the introduction of temporary contracts. Furthermore, as showed by Maia Güell (2003), let us consider an extreme situation in which only certain key individual characteristics (e.g. age, gender, qualification, etc.) make unemployed workers more likely to be re-employed. An analogous ranking model based on characteristics maintain these advantages, they continue to have a higher re-employment probability when they return to unemployment after their temporary contracts finish.

Another important point here discussed considers the effect of previous atypical contract experiences on the probability of moving toward a stable job. Some studies related to the Spanish labour market, Alba-Ramirez (1998) and Amuedo-Dorantes (2000), show that the probability of obtaining a permanent contract decreases after some previous atypical contracts. On this topic, Maia Güell and Barbara Petrongolo (2004) find that the conversion rate from temporary to permanent contract is rather low and concentrates close to the deadline of the temporary contract. In the context of European labour market, Zijl, van den Berg and Heyma (2004) and van den Berg, Holm and van Ours (2002), show that the temporary contract provides a stepping stone effect toward a permanent job.

In Italy, the introduction of fixed-term contracts and temporary contracts (from now on I will indicate them jointly as atypical contracts), has been the outcome of numerous laws (see table 1) that yet have left the use of these contractual forms at the margin, at least before the introduction of the Treu Law (L. 196/97) and subsequently of the Biagi Law (L. 30/03).

In this paper I analyze the effect of the introduction of the Treu Law, which has been the first attempt to make the Italian labour market more flexible. This package has introduced temporary contracts (or interim contracts), in addition to some modifications in order to extend and to improve the fixed-term contract regulations (in particular CFL and apprenticeship contracts). The reform has been introduced in years which the Italian labour market was characterized by its highest unemployment rate (11.3%). Generally, the reform has involved a partial increase of the atypical contracts supply (between 1997 and 1999 the stock of atypical contract has increased by about 20%, see table 2), making more flexible the labour market and contributing to increase the employment growth and to reduce the unemployment rate (see table 2). The data show that the number of atypical contracts has increased by about forty percent, going from twenty to thirty percent of total contracts (table 3).

The growth of atypical contract opportunities, in addition to the effects on employment growth and on the unemployment rate, can affect other labour market dimensions. In particular, some recent studies, by Gagliarducci (2005) and Ichino, Mealli and Nannicini (2005) on the Italian labour market, show that the atypical contract experiences can affect the probability of reaching a permanent contract. Gagliarducci (2005), in a pre-reform study, shows that the probability of obtaining a permanent contract increases with the temporary contract duration, but decreases with the number of temporary contract experiences, specially if interrupted by unemployment spells. In another study, related to the post reform period, conducted using Temporary Work Agencies (TWA) data, Ichino et al. (2005), find that TWA employment creates a “springboard” toward permanent jobs, where the TWA jobs are considered as treatment assignment.

The aim of this paper is to address questions linked to the Italian labour market reform, introduced by the Treu Law. The most interesting aspect of this work depends on the availability of data on pre and post reform period. Up to my knowledge, a specific analysis of this argument is not available. In particular, here I consider whether:

1. The duration dependence related to the non-working spell has changed after the introduction of the Treu Law;
2. Atypical contract experiences in individual work histories affect the probability of obtaining a stable job;
3. An atypical contract experience provides a stepping stone effect toward a permanent contract.

The first contribution concerns the effects of the reform on the duration dependence. These effects are directly linked with the increase of the offer

of atypical contracts that is characterized by an increase in both inflows and outflows between unemployment and employment. As anticipated, from a theoretical point of view (see Güell, 2004), I predict an increase of the duration dependence, with consequent amplification of the duality between STU and LTU. In a rigid labour market, with few job opportunities, long-term unemployment may not be an indicator of low productivity. On the contrary, in a more flexible labour market, characterized by more probabilities to find a job, long-term unemployment can be an important signal of low productivity, which firms can use in order to select potential employees. In other words, this would lead to an increase in STU's, and to a reduction in LTU's probability of leaving unemployment. Given these considerations, if the empirical analysis confirms this prediction, we can conclude that the larger use of atypical contracts would provide a screening instrument for the hiring policy of firms. At the same time, we can also conclude that the increased duality between STU and LTU would require job policies in order to provide suitable training for unqualified workers.

With respect to the probability of obtaining a stable job, a negative effect is probably played by the previous atypical contract experiences. In fact, employment in an atypical contract followed by unemployment can be interpreted as an indicator of bad qualities of the worker in the previous job. It follows that direct hiring with a permanent contract is unlikely. More likely, an individual in non-working state and with previous atypical job experiences, will be hired with a new atypical contract so that the firm can test the worker's ability. As anticipated, some previous studies confirm this tendency as Gagliarducci (2005), Alba-Ramirez (1998) and Amuedo-Dorantes (2000).

On the other hand, many authors, as Zijl et al. (2004), van den Berg et al. (2002) and Ichino et al. (2005), find that the probability to move toward a permanent contract is higher if the individual starts from an atypical contract state rather than from a non-working condition. In other words, the atypical contract shows a stepping stone effect toward a stable job, which can be explained in terms of firm preferences to hire workers that have accumulated human capital during the latest situations.

In my analysis I use the WHIP (Work Histories Italian Panel) dataset, provided by the "Laboratorio Revelli" of Turin in their standard version. WHIP is a database of individual working histories, based on the INPS (National Institute of Social Security) administrative archives, that permits to construct the sequence of monthly contiguous spells. In order to obtain a homogenous sub-sample, from a legislative point of view, I have selected only observations between 1995 and 1999, concerning young individuals, of age ranging between 16 and 32. In order to catch the effects linked with the presence of repeated spells and multiple risks, I implement a Mixed Proportional Hazard (MPH) model with competing risk. The MPH model consists of a specification of the Proportional Hazard Model that allows for the presence of unobserved heterogeneity across individuals.

Anticipating my main results, I show that the duration dependence related to transitions from a non-employment state toward a permanent contract or atypical contract has slightly decreased after the introduction of the Treu Law.

In particular, I find an increase of STU hazard rate (composed by a small decrease in the probability of moving toward a permanent contract and by an increase in the probability of reaching a new atypical contract) and a significant decrease of LTU hazard rate. This evidence seems to confirm that the increase of the availability of atypical contracts could provide a screening instrument for hiring policies of firms. Besides, I find that the previous atypical contract experiences have a negative effect on the probability of moving from a non-working condition toward a permanent contract, but that the effect is reduced in the post-reform period. Finally, there are no evidences that the probability of reaching a stable job is higher if the original state is an atypical contract rather than a non-working state. However, a positive duration dependence is found for the transitions from an atypical contract toward another contract, confirming that the accumulating of human capital during an AC experience increases the probability of finding a new job.

## 2 Data and Institutional background

### 2.1 The Treu Law

I define atypical contracts all the contractual forms that do not provide a permanent work relation: fixed-term contracts (that I can not identify in the dataset), apprenticeship contracts, CFL (or work training contracts) and temporary contracts (or interim contracts). Atypical contracts are regulated by numerous laws introduced since 1955, when the first regulation related to apprenticeship contracts was established. In the latest fifty years the atypical contracts legislation has not much varied until the introduction of the Biagi Law (L. 30/03), which has provided an important revision of atypical contracts regulation. Before the introduction of the Biagi Law, the main reform implemented was the Treu reform.

The Treu Law was introduced on June, 24 1997 (law 196/97) with the aim to make the Italian labour market more flexible, in order to make it more dynamic and to promote the decrease of the unemployment rate. The main novelty of the reform consisted in the introduction of temporary contract (articles from 1 to 11) and in the creation of Temporary Work Agencies (law 469/97), so that jobcentres were privatized and decentralized. The Treu Package also modified sanctionatory discipline of fixed-term contracts (art. 12) and modified the regulation related to employment in the research sector (art. 14). Finally, it extended the CFL applicability for depressed areas and for individuals with invalidity (art. 15), and it rose from 22 to 24 the age limit for apprenticeship contracts (art. 16).

*Fixed-term contracts.* The fixed-term contract permits the hiring of a worker for a pre-determinate duration. They were introduced in Italian legislation in 1962 (law 230/62). Subsequently the fixed-term contract regulation was modified by laws 56/87 and 416/93.

*Apprenticeship contracts.* The apprenticeship contract is a contractual form

which obliges the entrepreneur to give the worker the basic notions necessary to transform him in a qualified worker. The legal duration of an apprenticeship contract ranges between 18 months and 4 years, with some exception for the hand craft sector. They were introduced with law 25/55 and were not modified until the introduction of the Treu reform.

*CFL (work training contracts).* The CFL were introduced in order ease the entry in the labour market. They have a determined duration: one year in order to acquire low qualifications and two years in order to acquire high qualifications. The CFL were introduced in 1984 with law 863/84, and they were modified with law 56/87, which extended their applicability to all economic sectors, and with law 451/94, which raised from 29 to 32 the age limit for their applicability.

*Temporary contracts.* They were introduced by the Treu Package and law 469/97, according to which jobcentres were privatized and decentralized. TWA employment represents a triangular contract, in which an agency hires a worker for the purpose of making him available for a client firm for a temporary assignment.

## 2.2 The Biagi Law

I present here a summary of the new atypical contracts introduced by the Biagi Law (law 30/03), which has implemented the latest reform of the Italian labour market. The aim of the Biagi Law was to increase in few years the employment rate in the belief that development must be accompanied by the ability to create additional workplaces. The law has introduced new contractual forms and has innovated some existing ones, affecting mainly subordinated jobs. I list the main new contractual forms:

*Job on call.* In this case workers are available for employers for intermittent job services. It can be permanent or not.

*Job sharing.* Two workers commit themselves to carry out a single job. Everybody is responsible to do the complete work.

*Part-time.* It is a job of reduced time with respect to normal hours, fixed at forty per week.

*Apprenticeship.* It provides three types of contracts. The first relates to the straight-dust of education and training. The second relates to the attainment of a qualification by job training and technical-professional learning. The third is used in order to obtain a certificate or for high-training paths.

*Insertion contract.* It substitutes the CFL (which continues to be applied in public administration). It is a fixed-term contract with a duration ranging between 9 and 18 months. It aims at easing workers' integration or reintegration by an adaptive path of professional competences.

*Co.Co.Pro..* It changes the Continuative and Coordinate Collaboration (Co.Co.Co), which are put into context in a project or a plan.

*Secondary jobs.* It refers to an activity of at most thirty days in the year with a salary of at most 3000 euro

## 2.3 Data

In my study I use the WHIP (Work Histories Italian Panel) data, in its standard version, provided by the “Laboratorio Revelli” of Turin. WHIP is a database of individual working histories, based on the INPS (National Institute of Social Security) administrative archives, and consists of a representative sample with a dynamic population of 370.000 individuals. For each individual it is possible to identify all work relationships, and their contractual forms; the information is inferred by the contributions paid to INPS. From the type of contributions it is possible to distinguish individuals employed with a permanent contract (contributions which do not provide for special term, contributions related to “reintroduction” contracts and contributions related to particular permanent contract) or with an atypical contract (contributions related to CFLs (work training contracts), contributions related to temporary (or interim) contracts and contributions related to apprenticeship contracts). Still unidentifiable are individuals employed with specific atypical contracts: workers employed with a fixed-term contract, and employed with the Continuative and Coordinate Collaboration (Co.Co.Co.) contract, since the Italian legislation classify them as self-employed.

Monthly information is available, therefore it is possible to determine the monthly duration of each spell, directly from the dataset for the employed, and indirectly the non-working ones (as the difference between the end of the previous contract and the start of the subsequent one).

The database comprises information from 1985 to 1999, but I used only the information from 1995 and 1999, related to individual with age included between 16 and 32, in order to dispose of an homogenous sub-sample from a legislative point of view (before the introduction of Treu Law, the previous change in the atypical contract legislation was introduced in 1994). However, the availability of information since 1985 and the use of a sub-sample including only young individuals, makes it possible to reconstruct individual work histories with accuracy, for example reporting the number of previous atypical contract experiences in order to evaluate their effect on the transition rates.

Constructing my sub-sample, if an individual presents, at the same time, more than one work relationship, I eliminate the shorter job relationship and, if of the same duration, I remove the part-time jobs or the work relationships characterized by fewer days of effective work. Finally, when the second job starts before of the end of the first job but ends after it, I censor at left the second work spell, and so I hypothesize that the second job starts only when the first ends. In this way, the passage from double job to single one is found as a transition from a job to another. This strategy is adopted in order to reconstruct the non-working duration spells with accuracy. By adopting this procedure I implicitly assume that the selection of young individuals and the elimination of multiple jobs leave the final sample to be representative.

The comparison between the pre reform situation and the post reform one, is carried out dividing the selected sub-sample in two sub-groups, the first related to the spells started and ended before June 24th 1997 (day in which the

Treu Package became law), and the second related to the spells started after the introduction of the law. Finally, I consider as right censored spell all the spells started before the Treu Package introduction and ended after it, censoring them on June 24th 1997. This procedure leaves me 29803 spells (13053 permanent contract spells, 3805 atypical contract spells and 12945 non-working spells) related to the pre reform period and 41003 spells (15755 PC spells, 6705 AC spells and 18543 NW spells) in the post reform one.

Table 3 reports the evolution of share of new atypical contracts stipulated in Italy from 1985 to 1999 and from 1995 to 1999. As can be noted, a heterogeneous increase of atypical contracts stipulated is found. Clearly a different growth rate is noted if the origin is placed in 1985 or in 1995: in particular it is respectively, meanly, +170% and + 38%. With respect to the period from 1985 and 1999, the higher growth rates of the number of atypical contracts stipulated are found for northern workers (about +245%), women (about +210%) and above all for high skill workers (+1500%). In particular before or up to 1985 only 1.50% of the latter group worked with an atypical contract, against about 25% in 1999. As regards the period between 1995 and 1999, I find that, from a territorial point of view, the North-east of Italy is characterized by a higher atypical job rate (34%), but also by a lower growth rate (25%). The North-west is confirmed as the area characterized by the higher growth in atypical contracts stipulated (54%), while the growth rate in the southern regions is 41%. Stronger differences are found related to gender and qualification variables. In particular, in the post-reform period the growth rate of atypical contracts has been double for women compared to men (55% against 28%), determining an overtake of female rate (in pre-reform period male rate was about 23%-25% against 20%-21% of female rate, while in 1999 this became 30% for men and 32% for women). A very strong difference in growth rate can be noticed referring to the qualification variable. Our data show that the growth rate of high skill workers (or white collars) is about 115% against 32% for low skill workers. The growth rate of the atypical contracts remains higher for the latter (33% against 25%).

The independent variables directly or indirectly available from the dataset concern individual job-related characteristics. In particular, I use information about age, gender (one dummy), territorial area (three dummies), qualification (one dummy), economic sector (two dummies), tenure, number of previous atypical contract experiences (three dummies), daily wage related to the previous job, part-time job experiences (one dummy). Finally, I introduce a variable related to the macro-area employment growth in order to capture the business cycle effect. In tables 3 and 4 I report some descriptive statistics. They show that the age is lower if the original state is an atypical contract, both in the pre and in the post reform period (respectively age 21 and 22). Instead, the mean age is about 24, 25 if the origin state is a permanent contract or a non-working condition. About 2/3 of my sample consists of male workers, and they live more probably in the northern regions (about 60%), probability that increases to 66%-68% if the origin state is an atypical contract. With regard to the South of Italy, workers who stay in a permanent contract or a non-working condition are about 24%-25%, while those who stay in an atypical contract are



about 20%, confirming that the atypical contractual forms are less stated in southern regions. With respect to qualification more than 80% of workers have a low qualification (apprentice or blue collar); this percentage rises to 90% in the pre-reform period if the origin state is an atypical contract, and to 84% in post-reform period. This trend shows that in the post-reform period the use of atypical contractual forms has experienced a main increase for white collars as well. About 30% of observations are related to individuals who have been employed in the building or in the tourism sectors. I found strong differences related to the mean wage according to contractual forms. As expected, workers employed in atypical jobs show a mean wage clearly below that of workers' employed with a permanent contract (43 euro per day against 56 euro per day, in the pre-reform period and 44 euro against 57 euro in post-reform one). The observations related to actual or previous part-time job are about 12% in the pre-reform period and 10% in post-reform one; these probabilities are smaller if the origin state is an atypical job (4% in the pre-reform and 7% in post-reform period). The amount of previous work experiences (tenure) is about 20 months. This data is heterogeneous with respect to contract types; tenure related to permanent contract is about 30 months, while the one related to atypical contract is about 12 months. Clearly this evidence is linked with the mean age of the workers who stipulate different contractual forms, as showed before, and work histories. About 57% of observations are characterized by absence of previous atypical job experiences, a percentage that rises to 65% if the origin state is a permanent contract and reduces to 51% if the origin state is a non-working condition. These values remain substantially unchanged in the post-reform period. Observations with one previous atypical contract experience is about 24% (20% if the origin state is a permanent contract, 28% if the origin state is a non-working state), while observations that are characterized by two previous atypical contract experiences are about 10% and, finally, the ones with three or more previous atypical job experiences are about 8%. The employment growth rate is substantially different between pre and post -reform period, about + 0.12% before the introduction of the Treu Package and about 1.10% after.

### 3 Empirical specification

The specification of the model is guided by the standard job-search theory. It is assumed that unemployed individuals devote some of their time searching for jobs, but also that once an individual has accepted a job and starts working, it could continue searching for a better job. Two types of jobs are considered here: permanent jobs and atypical jobs. In addition I assume that: a permanent employment is always preferred to an atypical job, except for cases in which the conditions are linked to the permanent contract (i.e. job tasks). An individual searching for a permanent employment can accept an atypical contract when the search for a stable job takes too long. I also assume that an individual employee with a permanent contract accepts to move toward an atypical contract, if this offers better working conditions and/or perspectives. Finally, the transition

from a job toward a non working state can depend on the end of the contract, dismissal, individual work preferences, etc.

Given the starting hypothesis, it is admissible that an individual stays in one of the possible origin states: permanent contract (*PC*), atypical contract (*AC*) or a non working condition (*NW*), therefore the follow transitions are admissible: *PC-PC*, *PC-TC*, *PC-NW*, *TC-PC*, *TC-TC*, *TC-NW*, *NW-PC*, *NW-TC*.

By providing monthly information, the data allow for the analysis of individual work history, permitting to identify the origin state and, in presence of uncensored spells, the type of transition. Therefore, for each individual it is possible to observe a sequence  $t_i = \{t_i^c\}_{c \in \{1 \dots C_i\}}$  of contiguous periods of time (spells) spent in different states.  $t$  indicates the elapsed duration in a particular state,  $c$  denotes the  $c$ th spell of individual  $i$  and, following the previous notations the left state indicates the state of origin, denoted by the first subscript ( $j$ ), while the right state indicated the state of destination, denoted by the second subscript ( $k$ ).

In order to catch the effects linked with the presence of repeated spells and multiple risks, I implement a Mixed Proportional Hazard (MPH) model with competing risk<sup>1</sup>. The MPH model consists of a specification of the Proportional Hazard Model that allows for the presence of unobserved heterogeneity between individuals. As noticed, duration analysis ignoring the presence of unobserved heterogeneity can imply biased estimates (Lancaster, 1990). Lancaster (1979) was the first to treat this problem, proposing an estimate of a Proportional Hazard Model with multiplicative unobserved heterogeneity. The main advantage of this empirical specification is its flexibility, which allows me to take account of the following determinants of the employment decision: state dependence, duration dependence and unobserved heterogeneity. State dependence accounts for the possibility that the transition probabilities depend on the origin and the destination states, allowing to test whether the probability of transition into a permanent contract are different for non workers and atypical employed individuals. Duration dependence accounts for the possibility that the time during which an individual has been occupied in the current state affects the transition probabilities. Finally, the unobservable heterogeneity is likely to matter in this context due to differences in tastes, ability, or other characteristics that cannot be observed by the econometrician.

A certain debate exists about the possible assumptions of unobserved heterogeneity distribution, since the MPH model estimates may be biased when the chosen distribution for the unobservable term is incorrect. Heckman and Singer (1984) showed that the problem can be avoided by using the Non-Parametric Maximum Likelihood Estimator (NPMLE) that approximates the distribution function of unobservables with a finite mixture distribution. In this case, as

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<sup>1</sup>A competing risks model can be thought as a model for multiple durations that start at the same point of time for a given subject, where the subject is observed until the first duration is completed and one also observes which of the multiple durations is completed first. The term ‘competing risks’ originates from the interpretation that a subject faces different risks  $i$  of leaving the state it is in, each risk giving rise to its own exit destination which can also be noted by  $i$ , (see van den Berg, 2005).

proposed by Heckman and Singer (1984), the estimation is implemented by an EM-algorithm.

Abbring and Van den Berg (2003b) proved that in a large class of hazard models with proportional unobserved heterogeneity, the distribution of heterogeneity among survivors converges, often rapidly, to a gamma distribution. In multiple spells duration analysis, often it is natural and convenient to assume that such duration have identical unobserved heterogeneity terms  $V$ . From this, in the MPH models for multiple-spell data, the multiple duration that a single individual spends in the same state are dependent because they are affected by the same realization of  $V$ .

Given these considerations, I assume that the hazard rate to state  $k$  after a sojourn in state  $j$  for the individual  $i$  is defined as:

$$\lambda_{ijk}(t_i^c | x_{ijk}, v_{ijk}; \beta) = \lambda_{0ijk}(t_i^c) \exp \left( x'_{ijk} \beta_{jk} \right) v_{ijk}$$

where:

1.  $\lambda_{0ijk}$  is a baseline hazard which measures the effect of the elapsed duration (duration dependence). Here assume that the baseline hazard follows a Weibull distribution and therefore it can be expressed as:

$$\lambda_{0ijk}(t_i^c) = p_{jk} t_i^{p_{jk}-1}$$

with:

- Positive duration dependence for  $p_{jk} > 1$
- Negative duration dependence for  $p_{jk} < 1$
- No duration dependence for  $p_{jk} = 1$

1.  $x_{ijk}$  is a vector of no-time varying individual covariates, which capture personal, job-related and macroeconomic characteristics;
2.  $\beta_{jk}$  is a vector of unknown parameters;
3.  $v_{ijk}$  is a random individual effect, which is intended to catch the effect of individual heterogeneity. Here I assume that it is Gamma distributed.

$$V|X \sim \Gamma(1, \theta)$$

The model is in continuous time and the unit of time is one month. The individual covariates  $x_{ijk}$  are fixed to their values at the beginning of each spell.

The individual contribution to the likelihood function of an incomplete (right censored) spell, that is, the probability of surviving in state  $j$  until time  $t$ , can be expressed as follows:

$$S_j(t_i^c|W_i; \Omega) = \exp\{-\Lambda_j(t_i^c|W_i; \Omega)\}$$

where:

$$\Lambda_j = \int_0^{t_i} \sum_{k \neq j} \lambda_{jk}(s|W_i; \Omega) \partial s^2$$

is the corresponding integrated hazard function,  $W_i = \{x_{ijk}, v_{ijk}\}_{k \neq j}$  is the vector of all observed and unobserved variables and  $\Omega$  is the vector of all unknown parameters  $(\beta, \theta)$ .

The individual contribution to the likelihood function of a completed spell of duration  $t_i^c$  spends in state  $j$  that ends in state  $k$  is therefore:

$$f_{jk}(t_i^c|W_i; \Omega) = S_i(t_i^c|W_i; \Omega) \times \lambda_{jk}(t_i^c|W_i; \Omega)$$

In the first instance, to see how the model works, suppose that there is no unobserved heterogeneity, that is,  $(v_{ijk} = 0)$ . The contribution to the log-likelihood function of an individual with a sequence of spells  $\{t_{i1}, t_{i2}, \dots, t_{iC_i}^c\}$ , then is:

$$\begin{aligned} & \ln \left( L_i \left( \Omega | t_i^1, t_i^2, \dots, t_i^{C_i}; x_i \right) \right) = \\ & = \sum_{c=1}^{C_i} \sum_{j=1}^3 \left[ \left( \sum_{k \neq j} d_{jk}^c \ln (f_{jk}(t_i^c|x_i; \Omega)) \right) + r_j^c \ln (S_j(t_i^c|x_i; \Omega)) \right] \end{aligned}$$

where  $d_{jk}^c$  is an indicator variable which equals one if the individual changed from state  $j$  to state  $k$  in the  $c$ th spell and zero otherwise, and  $r_j^c$  is a dummy variable which equals one if the  $c$ th spell is incomplete and zero otherwise. The log-likelihood function for each sub-group (the first related to the pre-reform period and the second related to the post-reform one) is the summation of the previous equation over the  $N$  individuals. This log-likelihood formulation breaks up into separable contributions from each type of transition. Therefore, given that the hazard rate depends upon disjoint sets of parameters, the sub-likelihood functions can be maximized separately and the parameters of each transition can be estimated independently. In this version, without unobserved heterogeneity, the standard errors are estimated using the Huber-White estimator in order to obtain unbiased estimates of them. Differently, the usual standard error may be incorrect because of the effects of clustered data. In this case, the variance estimator becomes:

$$Var = [I(b)]^{-1} B [I(b)]^{-1}$$

where  $B$  is a correction factor.

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<sup>2</sup>Clearly is admitted that  $j = k$  for  $PC - PC$  and  $AC - AC$  transitions.

When the unobserved heterogeneity term is introduced the model becomes more complicated. In this case, in fact, it is not possible to condition the individual probabilities on  $v_{ijk}$  since they are unobservable, but it is necessary to integrate  $v_{ijk}$  over all possible values to get the unconditional probabilities. In this sense, let us assume that individual effects are identically and independently distributed for all individuals with a joint distribution function:

$$\Gamma(v_{iPCPC}, v_{iPCAC}, v_{iPCNW}, v_{iACPC}, v_{iACAC}, v_{iACNW}, v_{iNWPC}, v_{iNWAC})$$

This specification imposes that the likelihood function maximization happens jointly, since the unobservable heterogeneity terms are correlated across different transitions. For example, the observed transition rate from atypical contract to permanent contract may be higher than the observed rate from non-working to permanent job just because individuals for whom it is easy to find regular work tend to self-select into atypical job. Then  $v_{iNWTC}$  is positively related to  $v_{iNWPC}$  and  $v_{iTCPC}$ . It is possible that persons who most easily find permanent job find less easily an atypical contract, which means that  $v_{iNWTC}$  and  $v_{iNWPC}$  are negatively correlated.

Here, in order to simplify the estimation procedure, I assume that the  $v_{ijk}$  terms are independent. In this case, then, it is possible to estimate separately the sub-likelihood function by transition type. The individual sub-likelihood function related to origin state  $j$  and destination state  $k$ , is:

$$\begin{aligned} L_{ijk}(\Omega | t_i^{c_j}, x_{ijk}) &= \\ &= \int_{-\infty}^{+\infty} \left( \prod_{c=1}^{C_{ij}} \prod_{k \neq j} f_{jk}(t_i^{c_j} | x_{ijk}, v_{ijk}; \Omega)^{d_{jk}^{c_i}} \times \prod_{c=1}^{C_{ij}} S_j(t_i^{c_i} | x_{ijk}, v_{ijk}; \Omega)^{r_j^{c_i}} \right) \times d\Gamma(v_{ijk}) \end{aligned}$$

where  $c_j$  indicates the  $c$ th spell in the state  $j$ . The log-likelihood function is obtained by summation of the sub log-likelihood function respect to  $i$ ,  $j$  and  $k$ :

$$\ln(L(\Omega | t_i^c, x_{ijk})) = \sum_{c=1}^{C_{ij}} \sum_{j=1}^3 \sum_{k \neq j} \ln(L_{ijk})$$

## 4 Results

Figures 1-10 show, as preliminary matter, how the Treu Package has affected the duration dependence, if the probability transitions from a non-working state to a permanent contract is affected by previous atypical job experiences and, finally, if an atypical job experience provides a stepping-stone effect toward a permanent contract.

Generally a slight decrease is found for duration dependence related to the transition out a non-working state, confirming (from 0.96 to 0.90 for transitions toward a permanent contract and from 0.96 to 0.92 for transitions toward an atypical contract, see tables 6a and 6b), at least partially, theoretical predictions. These findings seem to suggest that in a more flexible labour market,

characterized by higher probabilities to find a job, to be a LTU can be perceived as a signal of low productivity by firms, determining a reduction in the LTU hazard rate and, at the same time, an increase for the STU, who are more likely to receive an offer. In particular, my results show that the related probability to move out of a non-employment state is increases for the STU and decreases for the LTU. However, a territorial difference is found in absolute effect terms. In the northern regions (I show the results related to North-West), the hazard rate for transitions toward a permanent contract is slightly decreased, while in the southern regions it is clearly increased, above all for the STU. Anyway the hazard rate remains higher (about 50%) for northern workers. Not distinguishing about the destination state, the post-reform net effect is positive for the STU living in the North-West (total hazard rate increases by about 0.5%), while the net effect related to southern workers is negative (total hazard rate decreases by about 2%). In the area including the south and the islands, the total effect is visibly positive, above all for the STU (the hazard rate increases by about 2%), while for the LTU the increase is only about 0.5%-0.7%. In presence of previous atypical job experiences (see figure 10 and 11, where I present the case with three ore more previous AC experiences), these effects are confirmed, but the differences between STU and LTU, at least in the northern regions, is less strong and the STU (with no more than two months of unemployment) have a higher hazard rate, for the transition toward a permanent contract, in the post-reform period rather than in the pre-reform one.

With regard to the effect of previous atypical job experiences on the probability of reaching a permanent contract (see table 5a and 5b and figure 10 and 11), generally I find a positive effect if the origin state is a working state and a negative effect if the origin state is a non-working one. Substantially, the Treu Package has increased the positive effects and decreased the negative one, indicating that to be in a non-working condition despite previous job experiences can constitute a bad signal on worker productivity, reducing the probability to move toward a stable job. Individuals with these characteristics, on the contrary, have a higher probability to move toward a new atypical contract, meaning that firms can hire them for the purpose of testing, once more, their ability and, eventually, of hiring them in a stable position after the atypical job experience. Finally, if the state of origin is a job position, there is not a bad signal and the previous job experience is perceived as a higher accumulation of human capital.

Do atypical job experiences provide a stepping stone effect toward a permanent contract? I answer to this question comparing the probability to move toward a stable job, starting from a non-working state or from an atypical contract. The evidence shows that the hazard rate is higher if the state is a non-working condition, a trend confirmed both for the pre-reform period and the post-reform one<sup>3</sup>. However, related to this transition, a positive duration

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<sup>3</sup>In a previous version of this paper (where the firm size variable was included in my analysis, and more of 20000 observations were crossed out, because of missing information for firm dimension, most of them related to 1999), an opposite result is found related to the post-reform period. In particular, there was evidence of a stepping stone effect for atypical contract duration longer than three months. This result was strongly affected by the value of

dependence is found, therefore the probability to move toward a permanent contract increases with the contract duration, confirming the effect of a link with human capital accumulation.

In tables 5a, 5b, 6a and 6b, I present the results obtained by MPH model with competing risk and Weibull baseline hazard specification. Generally, in the post-reform period, it emphasizes a decrease of the duration dependence parameter ( $p$ ) for the transitions out of a non-working state. Referring to the transition toward a permanent contract, the model with unobserved heterogeneity, as anticipated, shows a reduction of the  $p$  parameter from 0.96 to 0.90 after the introduction of the Treu Package. In the model without unobserved heterogeneity  $p$  is reduced from 0.92 to 0.85. The transitions toward an atypical contract also are characterized by a decrease in  $p$  parameter, from 0.96 to 0.92, both in the model with unobserved heterogeneity and in the one without random effects. With regard to the transitions out of a job position, I find that after the introduction of the Treu Package all duration dependence parameters are reduced. The  $p$  parameters for the transitions toward a non-working condition, in the post-reform period (0.90 if the state of origin is a permanent contract and 0.89 if the state of origin is an atypical contract), are less than one implying a negative duration dependence. In other words, the probability to lose a job is a decreasing function of the contract duration; this indicates, once more, the important role of human capital accumulation. On the contrary, the transitions between a job to another job are characterized by a slightly (above all in the post-reform period) positive duration dependence meaning, as expected, that the probability to leave a job for another increases with the contract duration. My estimates show that unobserved heterogeneity ( $\theta$ ) is not always found, and when it is found often assumes small values with the exception of the transition from a permanent contract toward an atypical job in the pre-reform (in this case  $\theta$  assumes value equal to 16.23). With respect to the transitions out of a non-employment state to a permanent contract  $\theta$  assumes value 0.17 in the pre-reform period and 0.47 in the post-reform one, while for transitions toward an atypical contract the unobserved heterogeneity parameter is not found in the pre-reform period and it is very small (0.04) in the post-reform one.

The covariate coefficients resulting from the estimates of the model allow me to interpret the effects of the personal and job-related characteristics, and of macroeconomic conditions, on the probability of moving from a state to another. Illustrating my results, I show first the ones related to the transitions starting from a non-working state and subsequently the ones related to the transitions starting from a job position.

A positive effect is found by age variable referring to the transition from a non-working condition toward a stable job, but it decreases after the introduction of Treu Package (from +0.63 to + 0.53). With respect to the transitions toward a new atypical contract, the effect, negative in the pre-reform period

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the duration dependence parameter (1.97) for the AC-PC transition in the post-reform period, meaning that one more month of contract duration doubled the probability of moving toward a stable job. This version is available from the author on request.

became positive in the post-reform one (respectively -0.51 and +0.10). My estimates therefore show that the probability of quitting a non-working state for a stable job is higher as the age increases, because of the role of human capital accumulation. Male workers have a higher probability of leaving a non-working state than female workers (+0.07 for transitions toward PC and +0.6 for transitions toward an AC, in the pre-reform period), still the introduction of the Treu Package has increased the gender differences for the transitions toward a PC (+0.21) and it has decreased them for the transitions toward an atypical job (+0.01). From a territorial point of view to live in northern regions on average increases the probability of moving toward a new job while, as expected, southern workers find more difficult to leave a non-employment position (-0.52 for NW-PC and -0.39 for NW-AC). The introduction of the Treu Package seems to have reduced territorial duality as showed also in figures 2 and 3, even though the differences remain strong. The qualification variable shows that low skill workers have more difficulty to move toward a stable job, and the reform has slightly increased this effect (from -0.17 to -0.18). The coefficients related to the transition toward an atypical contract show a positive but not significant estimate in the pre-reform period and a negative and significant effect in the post-reform one (-0.14). Economic sector dummies, one for the building sector and another for the tourism sector, generally show a negative effect with respect to other sectors, except for the tourism dummy in the post-reform period for the transition toward a permanent contract (see tables 5a and 5b). The level of wage in the previous job shows a not significant effect, while the part-time dummy coefficient, related to previous employment, interpretable as evidence of a negative effect, increases after the introduction of the Treu Package, on the probability to leave a non-working-state (-0.18 for transitions toward a PC and -0.16 for transitions toward an AC in the pre-reform, -0.27 in the post-reform, with a not-significant estimate for transitions toward a PC). As expected, tenure variable estimates show a positive effect toward leaving a non-working state for a job position, but the introduction of the reform seems to have reduced this effect. This result confirms, once more, that firms prefer to hire workers with some work experiences. As anticipated, previous atypical contract experiences play a negative role on the probability to reach a permanent contract, while a positive effect is found related to the transitions toward an atypical job. The introduction of the Treu reform has generally reduced these effects. In both cases, my results seem to confirm that workers in a non-working position and with previous AC experiences, are more likely to be reinserted in a job state although first in an atypical job. This result depends on the fact that atypical jobs allow firms to reduce the cost of testing the workers' skills. Finally, the employment growth variable included in order to catch macroeconomic effects, shows a negative sign for the transitions toward a permanent contract and a positive effect for the transitions toward an atypical contract. The first effect is reduced after the Treu reform (from -0.17 to -0.03), while the second is increased (from +0.00 to +0.11).

With respect to the flow out of a job position, the PC-AC transition in the post-reform period is not estimated because the maximization likelihood process



does not converge. Other transitions show the following results. A substantially negative, and not always significant, effect is found related to the flow out of a permanent contract, while a generally positive effect is shown for the transitions out of an atypical job. Particularly interesting is the estimate related to the AC-PC transition. A strong effect (+1.33) is found in the pre-reform period, while in the post-reform one the effect even if positive is less strong (+0.71). Both cases are consistent with the estimates of duration dependence parameters, indicating that human capital accumulation plays a positive role in the transition from an atypical contract toward a permanent job. The gender variable shows that male workers starting from a permanent contract are more likely to reach a new job, while female workers are more likely to move to a non-working condition, implying a gender duality in the labour market. The introduction of the Treu Package has reduced the gender duality for the PC-PC transition (from 0.32 to 0.12) and increased it for the PC-NW one (from -0.02 to -0.07). Starting from an atypical contract male workers have a higher probability of leaving it, except for the AC-AC transition in the post-reform period (-0.17), implying that female workers, in the post-reform period, are more likely to have unstable work histories. On the contrary, the probability to reach a permanent job starting from an atypical contract is higher for male workers (+0.44 in the pre-reform period and +0.43 in the post-reform one). North-western workers show, as expected, that generally, the probability of reaching a new job position is higher coming from a job rather than from a non-working condition. This effect is not found for North-eastern workers, and this is evidence of a more dynamic labour market. Finally southern workers show a strong probability of leaving a job for a non-working condition rather than for a new job; however the introduction of the Treu Package has slightly reduced the territorial duality.

With regard to AC-PC transitions the positive effect related to northern workers is reduced in the North-West (from +0.45 to + 0.31) and it increases in the North-East (from +0.23 to +0.39), while the negative effect decreases in the South of Italy (from -2.37 to -1.43). With respect to the qualification variable a positive sign of the coefficients emerges, even though not always significant, implying more dynamic work histories for low skill workers, both in the transitions toward a new job and toward a non-working state. The introduction of the Treu Package substantially has increased this trend, confirming more unstable work histories for few qualified workers. With respect to economic sector dummies, significant estimates show that workers employed in the tourism or building sectors, as expected, are more likely to reach a non-working state rather than a job position, showing the instability of this type of jobs. Only some cases of wage variable show significant estimates, negative in the pre-reform period, positive and smaller in the post-reform one. The part-time variable shows a significant and positive coefficient only for PC-NW transitions in the post-reform period (+0.13), indicating that a part-time work experience is more likely to lead to a non-working state. Work experience, indicated as tenure (months previously worked), shows an expected positive sign for transitions toward a new job and a negative sign for transitions toward a non-working condition, confirming, once more, the positive effect of human capital on the probability of obtaining a job.

Previous atypical job experience dummies show rarely significant estimates, and in those cases, as expected, a positive effect is found related to the transition toward a new job and a negative effect is found for the transition toward a non-employment state. Finally, the employment growth variable, introduced in order to catch business cycle effects, not always shows significant estimates. In the pre-reform period, negative signs are found for PC-PC, PC-NW, AC-PC and AC-NW transitions (respectively -0.13, -0.08, -0.31 and -0.14). In the post-reform period only AC-NW transitions show a significant estimate (-0.11). Not all significant estimates show a plausible sign, since in a positive business cycle the decreased probability of transition toward a non-working state is plausible, but it is less possible to explain its negative sign related to the transition AC-PC.

## 5 Conclusions

The main purpose of this paper was to address questions linked to the Italian labour market reform, introduced by the Treu Law. In the first place, I was interested in possible changes in duration dependence related to the transitions starting from a non-working state. Secondly, I analyzed the effect of previous atypical contract experiences on the probability of moving towards a permanent contract. Finally, I studied if the probability of reaching a permanent contract is higher when starting from a non-working state or from an atypical job.

Empirical analysis was carried out estimating the hazard rates among the possible states: permanent contracts, atypical contracts or a non-employment condition. My estimates are obtained applying a Mixed Proportional Hazard model with competing risk to a sub-sample composed of individuals aged 16 to 32, drawn from the WHIP dataset. I use only information included between 1995 and 1999 in order to get a homogenous sample from a legislative point of view. My main findings are:

1. The larger use of atypical contractual forms, due to the introduction of the Treu Package, provided a potential screening instrument for the hiring policies of firms. In fact, in a more flexible labour market, with more job opportunities, to be LTU may be an indicator of low productivity. Empirically this finding consists in an increase of negative duration dependence for the spells starting from a non-working state; i.e. a widening between short-term unemployed and long-term unemployed duality;
2. Previous atypical contract experiences affect negatively the probability of moving towards a permanent job if the state of origin is a non-working condition. Clearly to be in a non-employment position after some job experience may be a bad signal related to the worker's abilities.
3. I do not find evidence that the probability of reaching a stable job is higher starting from an atypical contract rather than from a non-employment position. On the other hand, I find a positive duration dependence related

to the transition AC-PC, and a positive effect of previous atypical job experiences on the probability of moving towards a permanent contract. These findings seem to suggest the existence of a positive “human capital accumulation” effect on the probability of obtaining a stable job.

4. Heterogeneous effects are found related to gender, area and qualification variables. In fact, male, northern and high qualified workers show, generally, a larger probability of finding a job starting both from an atypical contract and a non-working state. The introduction of the Treu Law seems to reduce gender and territorial differences.

All these findings suggest that the introduction of the Treu Law, extending the use of atypical contract, allows for a larger efficiency in the hiring process of firms. Besides it allows for a more dynamic labour market and it has contributed to reduce, at least partially, gender and territorial duality.

On the other side, atypical job experiences can become an obstacle to the probability of reaching a stable job, if the path to a permanent contract includes periods of inactivity, and for short AC experiences, that do not permit to accumulate “human capital”.

In terms of policy implications, it can be suggested the necessity to promote longer contractual durations and to facilitate training programs, during inactivity periods, in order to increase human capital accumulation. Besides, policies should provide support to workers while searching for a job, contributing to reduce non-employment state durations. Finally, these policies are necessary above all for disadvantaged workers, as female, southern and low-skill workers, who have more difficulty in finding a job.

## References

- [1] Abbring, J.H. and G.J. van den Berg (2003a) “The identifiability of the mixed proportional hazards competing risks model”, *Journal of the Royal Statistical Society B* 65, pp. 701-710;
- [2] Abbring, J.H. and G.J. van den Berg (2003b) “The unobserved heterogeneity distribution in duration analysis”, Department of Economics, Free University Amsterdam;
- [3] Alba-Ramirez, A. (1998) “How Temporary is Temporary Employment in Spain?”, *Journal of Labor Research* 19 n. 4, pp. 695-710;
- [4] Alba-Ramirez, A. (1999) “Explaining the transition out of unemployment in Spain: the effect of unemployment insurance”, *Applied Economics* 31, pp. 183-193;
- [5] Amuedo-Dorantes, C. (2000) “Work transitions into and out of involuntary temporary employment in a segmented market: evidence from Spain”, *Industrial and Labor Relations Review* 53, n. 2, pp. 309-325;

- [6] Blanchard, O.J. and P. Diamond (1994) "Ranking, unemployment duration, and wages", *Review of Economic Studies*, n.61, pp. 417-434;
- [7] Cleves, M.A., W.W. Gould and R.G. Gutierrez (2004) "An introduction to survival analysis using STATA", Revised Edition, STATA Press;
- [8] Gagliarducci, S. (2005) "The dynamics of repeated temporary jobs", *Labour Economics*, vol. 12, n. 4, pp.429-448;
- [9] Güell, M. (2003) "Fixed-term contracts and the duration distribution of unemployment", IZA Discussion Papers 791, Institute for the Study of Labor (IZA);
- [10] Güell, M and B. Petrongolo (2004) "How binding are legal limits? Transition from temporary to permanent work in Spain", IZA discussion paper n.782, Institute for the Study of Labor (IZA);
- [11] Heckman, J.J. and B. Singer (1984) "A method for minimizing the impact of distributional assumptions in econometric models for duration data", *Econometrica*, vol. 58, pp. 1411-1441;
- [12] Honorè, B. E., (1993) "Identification results for duration models with multiple spells", *Review of Economic Studies*, n.60, pp. 241-246;
- [13] Ichino, A., T. Nannicini, e F. Mealli, (2005) "Temporary Work Agencies in Italy: A Springboard to Permanent Employment?", *Giornale degli Economisti e Annali di Economia*, 64(1) (September), pp. 1-27;
- [14] Kiefer, N.M. (1988) "Economic duration data and hazard functions", *Journal of Economic Literature*, vol. XXVI (June), pp. 646-679;
- [15] Lancaster, T. (1979) "Econometric methods for the duration of unemployment", *Econometrica*, July, n. 47(4), pp. 965-979;
- [16] Lancaster, T. (1990) "The econometric analysis of transition data", Cambridge University Press;
- [17] Martinez-Granado M. (2002) "Self-employment and labour market transitions: a multiple state model", CEPR discussion paper series, n. 3661;
- [18] Nickell, S.J. (1979) "Estimating the probability of leaving unemployment", *Econometrica*, n. 47(5), pp. 1249-1266;
- [19] van den Berg, G.J. (2001) "Duration models: specification, identification, and multiple durations. In Handbook of Econometrics, Volume V, Ed. J.J. Heckman and E. Leamer. Amsterdam: North Holland;
- [20] van den Berg, G.J., A. Holm and J.C. van Ours (2002) "Do stepping-stone jobs exist? Early career paths in the medical profession", *Journal of Population Economics*, n.15, pp. 647-665;

- [21] van den Berg, G.J. (2005) "Competing risks models", Institute for Labour Market Policy Evaluation (IFAU) Working Paper, n.25;
- [22] Zijl, M. G.J. van den Berg and A. Heyma (2004) "Stepping-stones for the unemployed: the effect of temporary jobs on the duration until regular work", IZA discussion paper, n. 1241, Institute for the Study of Labor (IZA);

## Tables and figures

Table 1. Atypical contract legislation in Italy

| Year | Law               | Contents  |
|------|-------------------|---|
| 1955 | n. 25             | Introduction of apprenticeship contracts;   |
| 1962 | n. 230            | Introduction of fixed-term contracts;   |
| 1973 | c.p.c. 409        | Discipline on trial, fiscal and social security related to collaboration contracts;   |
| 1983 | n. 79             | Extension of fixed-term contracts to all economic sectors;  |
| 1984 | n. 863            | Enlargement of part-time criteria;<br>Introduction of CFL;  |
| 1987 | n. 56             | Extension of CFL to all economic sectors;<br>Modifications to fixed-term contract legislation;  |
| 1994 | n. 236            | Stage contracts in apprenticeship;  |
| 1994 | n. 451            | Increase in the limit of age for CFL applicability;   |
| 1995 | n. 335            | Reform of compulsory and complementary social security system;  |
| 1997 | n. 196 (Treu Law) | Introduction of temporary contracts (art. 1-11);<br>Modification of sanctionary discipline of fixed-term contract (art. 12);<br>Employment in research (art. 14);<br>Variation of CFL applicability fro undeveloped area and invalids (art. 15);<br>Extension of applicability of apprenticeship contract (art.16); |
| 1997 | n. 469            | Privatization and decentralization of jobcentre;  |
| 2001 | d.lgs. n. 368     | Extension of applicability of fixed-term contracts;   |
| 2003 | n. 30             | Introduction of the Biagi Law;  |

Table 2. Unemployment rate, young unemployment rate, LTU and atypical contracts in some European countries

|         |             | 1993  | 1994  | 1995  | 1996  | 1997  | 1998  | 1999  | 2000  | 2001  | 2002  | 2003  | 2004  |
|---------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| UE15    | urate       | 10.0% | 10.4% | 10.0% | 10.1% | 9.8%  | 9.3%  | 8.5%  | 7.6%  | 7.2%  | 7.6%  | 8.0%  | 8.1%  |
|         | Young urate | 21.4% | 21.8% | 21.0% | 21.2% | 20.6% | 19.0% | 17.1% | 15.3% | 15.1% | 15.6% | 16.3% | 16.6% |
|         | LTU         | 44.0% | 48.1% | 49.0% | 48.5% | 49.0% | 47.3% | 45.9% | 44.7% | 43.1% | 40.8% | 41.3% | 42.0% |
|         | AC          | 11.0% | 11.5% | 12.0% | 12.0% | 12.4% | 13.0% | 13.4% | 13.7% | 13.5% | 13.1% | 13.1% | 13.6% |
| UE25    | urate       |       |       |       |       |       | 9.5%  | 9.1%  | 8.6%  | 8.4%  | 8.7%  | 9.0%  | 9.0%  |
|         | Young urate |       |       |       |       |       | 19.4% | 18.4% | 17.4% | 17.6% | 18.1% | 18.6% | 18.7% |
|         | LTU         |       |       |       |       |       | 47.4% | 45.1% | 45.3% | 45.2% | 44.8% | 44.4% | 45.6% |
|         | AC          |       |       |       |       | 9.3%  | 8.9%  | 8.7%  | 8.4%  | 8.0%  | 8.2%  | 8.4%  | 8.3%  |
| Italy   | urate       | 10.1% | 10.6% | 11.2% | 11.2% | 11.3% | 11.3% | 10.9% | 10.1% | 9.1%  | 8.6%  | 8.4%  | 8.0%  |
|         | Young urate | 30.1% | 29.1% | 30.3% | 30.4% | 30.2% | 29.9% | 28.7% | 27.0% | 24.1% | 23.1% | 23.7% | 23.6% |
|         | LTU         | 56.4% | 61.3% | 63.4% | 65.2% | 64.6% | 59.3% | 61.5% | 62.4% | 62.6% | 59.3% | 58.3% | 50.0% |
|         | AC          | 6.2%  | 6.8%  | 7.4%  | 7.4%  | 7.9%  | 8.6%  | 9.5%  | 10.1% | 9.8%  | 9.9%  | 9.9%  | 11.8% |
| Germany | urate       | 7.7%  | 8.3%  | 8.0%  | 8.5%  | 9.1%  | 8.8%  | 7.9%  | 7.2%  | 7.4%  | 8.2%  | 9.0%  | 9.5%  |
|         | Young urate | 15.0% | 15.6% | 14.9% | 15.6% | 16.2% | 15.0% | 12.7% | 10.6% | 12.8% | 14.2% | 14.7% | 15.1% |
|         | LTU         | 40.3% | 44.6% | 48.8% | 48.2% | 50.5% | 51.1% | 51.9% | 51.4% | 50.0% | 47.6% | 50.0% | 51.6% |
|         | AC          | 10.3% | 10.4% | 10.5% | 11.2% | 11.8% | 12.4% | 13.1% | 12.7% | 12.4% | 12.0% | 12.2% | 12.4% |
| France  | urate       | 11.1% | 11.7% | 11.1% | 11.6% | 11.5% | 11.1% | 10.5% | 9.1%  | 8.4%  | 8.9%  | 9.5%  | 9.7%  |
|         | Young urate | 27.1% | 28.6% | 27.0% | 28.5% | 28.4% | 25.6% | 23.4% | 20.1% | 19.4% | 20.0% | 21.1% | 22.0% |
|         | LTU         | 35.1% | 38.5% | 39.6% | 38.8% | 40.9% | 40.5% | 39.0% | 38.5% | 35.7% | 34.8% | 38.9% | 40.2% |
|         | AC          | 10.9% | 11.5% | 12.4% | 12.8% | 13.4% | 13.9% | 14.5% | 15.2% | 14.6% | 13.5% | 12.7% | 12.8% |
| Spain   | urate       | 18.6% | 19.8% | 18.8% | 18.2% | 17.1% | 15.3% | 12.9% | 11.5% | 10.7% | 11.5% | 11.5% | 11.0% |
|         | Young urate | 38.4% | 40.2% | 37.8% | 37.2% | 34.6% | 31.3% | 25.8% | 22.9% | 21.7% | 22.3% | 22.7% | 22.1% |
|         | LTU         | 49.5% | 55.6% | 55.9% | 52.7% | 52.0% | 50.3% | 45.7% | 41.7% | 36.4% | 33.9% | 33.9% | 31.8% |
|         | AC          | 33.0% | 34.2% | 35.2% | 33.8% | 33.5% | 33.0% | 32.9% | 32.2% | 32.2% | 31.8% | 31.8% | 32.5% |
| UK      | urate       | 10.0% | 9.3%  | 8.5%  | 8.0%  | 6.9%  | 6.2%  | 5.9%  | 5.4%  | 5.0%  | 5.1%  | 4.9%  | 4.7%  |
|         | Young urate | 17.6% | 16.4% | 15.3% | 15.0% | 13.7% | 13.1% | 12.8% | 12.3% | 11.9% | 12.1% | 12.3% | 12.1% |
|         | LTU         | 42.0% | 44.1% | 42.4% | 38.8% | 36.2% | 30.6% | 28.8% | 25.9% | 26.0% | 21.6% | 22.4% | 21.3% |
|         | AC          | 6.3%  | 6.9%  | 7.2%  | 7.3%  | 7.6%  | 7.3%  | 7.0%  | 6.9%  | 6.7%  | 6.4%  | 6.1%  | 6.0%  |

Source: European Commission, Employment in Europe in 2005

Table 3. Evolution of share of new atypical contracts stipulated, by years and population groups

| Year              | Area       |            |               | Gender  |         | Qualification |             | All     |
|-------------------|------------|------------|---------------|---------|---------|---------------|-------------|---------|
|                   | North-west | North-east | South-islands | Male    | Female  | Low-skills    | High-skills |         |
| <= 1985           | 9.34%      | 13.03%     | 11.95%        | 12.06%  | 10.33%  | 15.23%        | 1.50%       | 11.43%  |
| 1995              | 20.91%     | 27.08%     | 17.97%        | 23.51%  | 20.65%  | 24.91%        | 11.44%      | 22.51%  |
| 1996              | 20.30%     | 28.76%     | 18.22%        | 23.97%  | 21.04%  | 25.12%        | 13.37%      | 22.94%  |
| 1997              | 20.90%     | 28.28%     | 20.09%        | 24.94%  | 20.90%  | 25.93%        | 14.27%      | 23.45%  |
| 1998              | 27.75%     | 35.09%     | 29.45%        | 31.98%  | 29.91%  | 33.93%        | 21.93%      | 31.19%  |
| 1999              | 32.29%     | 34.08%     | 25.44%        | 30.32%  | 32.15%  | 32.86%        | 24.56%      | 31.00%  |
| growth rate 85-99 | 245.71%    | 161.54%    | 112.90%       | 151.44% | 211.22% | 115.77%       | 1537.30%    | 171.25% |
| growth rate 95-99 | 54.39%     | 25.85%     | 41.56%        | 28.99%  | 55.72%  | 31.95%        | 114.65%     | 37.74%  |

Source: my elaboration on WHIP dataset



Table 4. Descriptive Statistics by origin state

| Variables            | PRE REFORM       |           |                |           |               |           |                |           | POST REFORM      |           |                |           |               |           |                |           |
|----------------------|------------------|-----------|----------------|-----------|---------------|-----------|----------------|-----------|------------------|-----------|----------------|-----------|---------------|-----------|----------------|-----------|
|                      | All (obs. 29803) |           | PC (obs.13053) |           | AC (obs.3805) |           | NW (obs.12945) |           | All (obs. 40003) |           | PC (obs.15755) |           | AC (obs.6705) |           | NW (obs.18543) |           |
|                      | Mean             | Std. Dev. | Mean           | Std. Dev. | Mean          | Std. Dev. | Mean           | Std. Dev. | Mean             | Std. Dev. | Mean           | Std. Dev. | Mean          | Std. Dev. | Mean           | Std. Dev. |
| Age                  | 24.12            | 4.29      | 24.86          | 3.83      | 20.67         | 3.86      | 24.40          | 4.37      | 24.47            | 4.32      | 25.49          | 3.93      | 21.76         | 3.90      | 24.59          | 4.36      |
| Male                 | 0.65             | 0.48      | 0.64           | 0.48      | 0.68          | 0.47      | 0.65           | 0.48      | 0.62             | 0.49      | 0.62           | 0.48      | 0.63          | 0.48      | 0.62           | 0.49      |
| North-West           | 0.29             | 0.45      | 0.30           | 0.46      | 0.26          | 0.44      | 0.29           | 0.45      | 0.33             | 0.47      | 0.35           | 0.48      | 0.33          | 0.47      | 0.31           | 0.46      |
| North-East           | 0.32             | 0.46      | 0.29           | 0.45      | 0.38          | 0.48      | 0.32           | 0.47      | 0.31             | 0.46      | 0.30           | 0.46      | 0.35          | 0.48      | 0.32           | 0.47      |
| Centre               | 0.18             | 0.38      | 0.18           | 0.38      | 0.18          | 0.38      | 0.17           | 0.38      | 0.12             | 0.33      | 0.11           | 0.31      | 0.12          | 0.32      | 0.13           | 0.34      |
| South-Islands        | 0.22             | 0.41      | 0.23           | 0.42      | 0.18          | 0.38      | 0.22           | 0.41      | 0.24             | 0.42      | 0.25           | 0.43      | 0.20          | 0.40      | 0.24           | 0.43      |
| Low skills           | 0.82             | 0.39      | 0.79           | 0.40      | 0.89          | 0.31      | 0.82           | 0.38      | 0.79             | 0.41      | 0.75           | 0.43      | 0.84          | 0.37      | 0.81           | 0.39      |
| High skills          | 0.18             | 0.39      | 0.21           | 0.40      | 0.11          | 0.31      | 0.18           | 0.38      | 0.21             | 0.41      | 0.25           | 0.43      | 0.16          | 0.37      | 0.19           | 0.39      |
| Buildings            | 0.14             | 0.35      | 0.14           | 0.35      | 0.15          | 0.36      | 0.14           | 0.35      | 0.12             | 0.32      | 0.11           | 0.31      | 0.12          | 0.33      | 0.12           | 0.33      |
| Tourism              | 0.15             | 0.36      | 0.17           | 0.37      | 0.11          | 0.31      | 0.16           | 0.36      | 0.14             | 0.35      | 0.13           | 0.34      | 0.11          | 0.31      | 0.17           | 0.37      |
| Other sectors        | 0.70             | 0.46      | 0.70           | 0.46      | 0.74          | 0.44      | 0.70           | 0.46      | 0.74             | 0.44      | 0.76           | 0.43      | 0.77          | 0.42      | 0.71           | 0.45      |
| Wage                 | 52.84            | 47.26     | 56.07          | 49.62     | 43.68         | 44.25     | 52.29          | 45.26     | 53.91            | 50.03     | 57.09          | 55.32     | 44.01         | 27.95     | 54.78          | 51.06     |
| Part-time            | 0.10             | 0.31      | 0.13           | 0.34      | 0.04          | 0.20      | 0.09           | 0.29      | 0.12             | 0.33      | 0.15           | 0.35      | 0.07          | 0.26      | 0.12           | 0.33      |
| Tenure               | 29.89            | 34.46     | 27.38          | 33.06     | 11.80         | 21.78     | 37.75          | 36.44     | 30.61            | 38.00     | 31.83          | 39.30     | 13.47         | 24.25     | 35.76          | 39.17     |
| zero AC experiences  | 0.58             | 0.49      | 0.65           | 0.48      | 0.57          | 0.50      | 0.51           | 0.50      | 0.57             | 0.49      | 0.65           | 0.48      | 0.58          | 0.49      | 0.51           | 0.50      |
| one AC experiences   | 0.24             | 0.42      | 0.20           | 0.40      | 0.24          | 0.43      | 0.28           | 0.45      | 0.24             | 0.43      | 0.19           | 0.40      | 0.24          | 0.43      | 0.28           | 0.45      |
| two AC experiences   | 0.10             | 0.30      | 0.08           | 0.28      | 0.11          | 0.31      | 0.12           | 0.32      | 0.10             | 0.30      | 0.09           | 0.28      | 0.10          | 0.30      | 0.12           | 0.32      |
| three AC experiences | 0.08             | 0.27      | 0.07           | 0.25      | 0.08          | 0.28      | 0.10           | 0.29      | 0.08             | 0.27      | 0.07           | 0.25      | 0.08          | 0.27      | 0.09           | 0.29      |
| Employment growth    | 0.12             | 0.89      | 0.09           | 0.89      | 0.20          | 0.83      | 0.12           | 0.90      | 1.07             | 0.66      | 1.06           | 0.67      | 1.16          | 0.63      | 1.05           | 0.66      |

Source: my elaboration on WHIP dataset

Table 5a. MPH model hazard rate estimates with unobserved heterogeneity (Pre-reform)

| covariates       | PC-PC   |      | PC-AC  |       | PC-NW    |      | AC-PC  |      | AC-AC  |        | AC-NW   |      | NW-PC    |         | NW-AC   |       |       |      |        |      |      |       |       |      |
|------------------|---------|------|--------|-------|----------|------|--------|------|--------|--------|---------|------|----------|---------|---------|-------|-------|------|--------|------|------|-------|-------|------|
|                  | b       | s.e. | b      | s.e.  | b        | s.e. | b      | s.e. | b      | s.e.   | b       | s.e. | b        | s.e.    | b       | s.e.  |       |      |        |      |      |       |       |      |
| age              | -0.19   | 0.13 | -0.54  | 0.50  | -0.33    | 0.04 | ***    | 1.33 | 0.26   | ***    | 0.15    | 0.50 | -0.12    | 0.06    | **      | 0.63  | 0.04  | ***  | -0.51  | 0.07 | ***  |       |       |      |
| age square       | 0.00    | 0.00 | *      | 0.01  | 0.01     | 0.01 | 0.00   | ***  | -0.03  | 0.01   | ***     | 0.00 | 0.01     | 0.00    | 0.00    | **    | -0.01 | 0.00 | ***    | 0.01 | 0.00 | ***   |       |      |
| male             | 0.32    | 0.09 | ***    | 0.94  | 0.42     | **   | -0.02  | 0.03 | 0.44   | 0.19   | **      | 0.23 | 0.32     | 0.08    | 0.05    | *     | 0.07  | 0.03 | ***    | 0.06 | 0.06 |       |       |      |
| north-west       | 0.18    | 0.11 |        | 0.17  | 0.48     |      | -0.08  | 0.03 | **     | 0.45   | 0.21    | **   | 0.24     | 0.46    |         |       | 0.02  | 0.07 |        | 0.24 | 0.04 | ***   | -0.12 | 0.09 |
| north-east       | 0.26    | 0.12 | **     | 0.77  | 0.51     |      | 0.09   | 0.04 | **     | 0.23   | 0.23    |      | 0.89     | 0.44    | **      | 0.34  | 0.06  | ***  | 0.29   | 0.04 | ***  | 0.13  | 0.08  |      |
| south-islands    | -0.91   | 0.17 | ***    | -1.36 | 0.81     | *    | 0.03   | 0.04 |        | -2.37  | 0.53    | ***  | -1.97    | 0.93    | **      | -0.28 | 0.09  | ***  | -0.52  | 0.05 | ***  | -0.39 | 0.12  | ***  |
| low skills       | 0.08    | 0.10 |        | -0.05 | 0.43     |      | 0.20   | 0.03 | ***    | 0.07   | 0.22    |      | 1.40     | 1.04    |         | 0.18  | 0.08  | **   | -0.17  | 0.03 | ***  | 0.01  | 0.10  |      |
| buildings        | 0.19    | 0.11 | *      | -0.02 | 0.50     |      | 0.25   | 0.03 | ***    | -0.12  | 0.22    |      | 0.29     | 0.32    |         | 0.05  | 0.06  |      | -0.26  | 0.04 | ***  | -0.23 | 0.08  | ***  |
| tourism          | -0.24   | 0.13 | *      | -0.88 | 0.64     |      | 0.48   | 0.03 | ***    | -0.91  | 0.51    | *    | -19.48   | 7233.71 |         | 0.63  | 0.06  | ***  | -0.04  | 0.04 |      | -0.57 | 0.08  | ***  |
| wage             | 0.00    | 0.00 |        | -0.01 | 0.01     |      | -0.01  | 0.00 | ***    | -0.01  | 0.00    |      | -0.03    | 0.01    | **      | -0.02 | 0.00  | ***  | 0.00   | 0.00 |      | 0.00  | 0.00  |      |
| part-time        | 0.09    | 0.12 |        | 0.12  | 0.53     |      | 0.05   | 0.03 |        | -0.78  | 0.52    |      | -0.04    | 1.04    |         | 0.06  | 0.11  |      | -0.18  | 0.04 | ***  | -0.16 | 0.12  |      |
| tenure           | 0.01    | 0.00 | ***    | -0.01 | 0.01     |      | -0.01  | 0.00 | ***    | 0.01   | 0.00    | **   | 0.00     | 0.01    |         | 0.00  | 0.00  |      | 0.01   | 0.00 | ***  | 0.00  | 0.00  |      |
| 1 AC prev. exp.  | -0.04   | 0.10 |        | -0.70 | 0.51     |      | -0.03  | 0.03 |        | 0.00   | 0.20    |      | 0.56     | 0.33    | *       | -0.16 | 0.05  | ***  | -0.10  | 0.03 | ***  | 0.79  | 0.08  | ***  |
| 2 AC prev. exp.  | 0.05    | 0.13 |        | -0.30 | 0.61     |      | -0.09  | 0.04 | **     | 0.20   | 0.22    |      | -0.25    | 0.53    |         | -0.26 | 0.07  | ***  | -0.10  | 0.04 | **   | 0.86  | 0.09  | ***  |
| 3+ AC prev. exp. | -0.05   | 0.15 |        | 0.61  | 0.54     |      | 0.02   | 0.05 |        | 0.04   | 0.25    |      | 1.13     | 0.43    | ***     | -0.12 | 0.08  |      | -0.12  | 0.05 | **   | 0.92  | 0.10  | ***  |
| employm. growth  | -0.13   | 0.07 | *      | -0.25 | 0.32     |      | -0.08  | 0.02 | ***    | -0.31  | 0.18    | *    | -0.38    | 0.29    |         | -0.14 | 0.04  | ***  | -0.17  | 0.02 | ***  | 0.00  | 0.05  |      |
| constant         | -3.65   | 1.58 | **     | -0.69 | 5.97     |      | 1.55   | 0.43 | ***    | -22.40 | 2.99    | ***  | -8.48    | 5.38    |         | -0.89 | 0.69  |      | -10.68 | 0.47 | ***  | 2.78  | 0.81  | ***  |
| Log-likelihood   | -3206.5 |      | -323.0 |       | -15693.2 |      | -686.7 |      | -297.3 |        | -4689.1 |      | -15315.6 |         | -4556.6 |       |       |      |        |      |      |       |       |      |
| observations     |         |      | 13053  |       |          |      |        |      | 3805   |        |         |      |          |         | 12945   |       |       |      |        |      |      |       |       |      |
| individuals      |         |      | 10005  |       |          |      |        |      | 3322   |        |         |      |          |         | 9878    |       |       |      |        |      |      |       |       |      |
| failure          | 836     |      | 49     |       | 8049     |      | 186    |      | 62     |        | 2415    |      | 7946     |         | 1408    |       |       |      |        |      |      |       |       |      |

Table 5b. MPH model hazard rate estimates with unobserved heterogeneity (Post-reform)

| covariates       | PC-PC   |      | PC-AC |               | PC-NW    |      | AC-PC  |        | AC-AC  |      | AC-NW   |      | NW-PC    |       | NW-AC   |       |       |      |      |       |      |     |
|------------------|---------|------|-------|---------------|----------|------|--------|--------|--------|------|---------|------|----------|-------|---------|-------|-------|------|------|-------|------|-----|
|                  | b       | s.e. | b     | s.e.          | b        | s.e. | b      | s.e.   | b      | s.e. | b       | s.e. | b        | s.e.  | b       | s.e.  |       |      |      |       |      |     |
| age              | 0.42    | 0.14 | ***   |               | -0.24    | 0.04 | ***    | 0.71   | 0.22   | ***  | 0.21    | 0.22 | -0.41    | 0.05  | ***     | 0.53  | 0.04  | ***  | 0.10 | 0.05  | *    |     |
| age square       | -0.01   | 0.00 | ***   |               | 0.00     | 0.00 | ***    | -0.01  | 0.00   | ***  | -0.01   | 0.00 | 0.01     | 0.00  | ***     | -0.01 | 0.00  | ***  | 0.00 | 0.00  | ***  |     |
| male             | 0.12    | 0.09 |       |               | -0.07    | 0.03 | **     | 0.43   | 0.17   | ***  | -0.17   | 0.16 | 0.10     | 0.04  | **      | 0.21  | 0.03  | ***  | 0.01 | 0.04  |      |     |
| north-west       | 0.12    | 0.12 |       |               | -0.18    | 0.04 | ***    | 0.31   | 0.24   |      | 0.53    | 0.29 | *        | -0.18 | 0.06    | ***   | 0.27  | 0.04 | ***  | 0.22  | 0.06 | *** |
| north-east       | 0.04    | 0.12 |       |               | 0.00     | 0.04 |        | 0.39   | 0.24   |      | 0.68    | 0.28 | **       | 0.02  | 0.06    |       | 0.34  | 0.04 | ***  | 0.24  | 0.06 | *** |
| south-islands    | -0.80   | 0.15 | ***   |               | 0.00     | 0.05 |        | -1.43  | 0.38   | ***  | -0.63   | 0.38 | *        | -0.23 | 0.07    | ***   | -0.20 | 0.05 | ***  | -0.40 | 0.07 | *** |
| low skills       | 0.44    | 0.10 | ***   |               | 0.45     | 0.03 | ***    | 0.27   | 0.21   |      | 0.00    | 0.23 |          | 0.31  | 0.07    | ***   | -0.18 | 0.04 | ***  | -0.14 | 0.06 | **  |
| buildings        | 0.14    | 0.12 |       |               | 0.35     | 0.04 | ***    | -0.54  | 0.27   | **   | -0.31   | 0.27 |          | 0.16  | 0.06    | ***   | -0.11 | 0.04 | **   | -0.17 | 0.06 | *** |
| tourism          | 0.03    | 0.13 |       | not converged | 0.77     | 0.04 | ***    | -0.04  | 0.30   |      | -0.43   | 0.33 |          | 0.86  | 0.05    | ***   | 0.11  | 0.04 | ***  | -0.51 | 0.06 | *** |
| wage             | 0.00    | 0.00 |       |               | 0.00     | 0.00 | ***    | 0.00   | 0.00   |      | 0.00    | 0.00 | ***      | 0.00  | 0.00    | ***   | 0.00  | 0.00 |      | 0.00  | 0.00 | **  |
| part-time        | -0.11   | 0.12 |       |               | 0.13     | 0.04 | ***    | 0.32   | 0.29   |      | -0.23   | 0.35 |          | 0.08  | 0.08    |       | -0.27 | 0.04 | ***  | -0.27 | 0.07 | *** |
| tenure           | 0.00    | 0.00 |       |               | -0.01    | 0.00 | ***    | 0.01   | 0.00   | **   | 0.00    | 0.00 |          | -0.01 | 0.00    | ***   | 0.00  | 0.00 | ***  | 0.00  | 0.00 | *** |
| 1 AC prev. exp.  | 0.07    | 0.10 |       |               | -0.04    | 0.04 |        | 0.04   | 0.18   |      | -0.10   | 0.20 |          | -0.05 | 0.05    |       | -0.13 | 0.03 | ***  | 0.63  | 0.05 | *** |
| 2 AC prev. exp.  | 0.18    | 0.13 |       |               | -0.05    | 0.05 |        | 0.41   | 0.22   | *    | 0.47    | 0.22 | **       | -0.05 | 0.07    |       | -0.05 | 0.04 |      | 0.74  | 0.06 | *** |
| 3+ AC prev. exp. | 0.22    | 0.14 |       |               | 0.05     | 0.06 |        | 0.23   | 0.24   |      | 0.47    | 0.25 | *        | 0.09  | 0.07    |       | -0.07 | 0.05 |      | 0.77  | 0.07 | *** |
| employm. growth  | 0.01    | 0.06 |       |               | -0.01    | 0.02 |        | -0.11  | 0.14   |      | -0.08   | 0.14 |          | -0.11 | 0.03    | ***   | -0.03 | 0.02 |      | 0.11  | 0.03 | *** |
| constant         | -11.64  | 1.81 | ***   |               | 0.51     | 0.51 |        | -15.69 | 2.67   | ***  | -8.36   | 2.56 | ***      | 2.05  | 0.56    | ***   | -9.93 | 0.48 | ***  | -3.75 | 0.61 | *** |
| log-likelihood   | -3259.4 |      |       |               | -17560.5 |      | -921.1 |        | -889.4 |      | -7321.5 |      | -19190.9 |       | -8700.3 |       |       |      |      |       |      |     |
| observations     |         |      | 15755 |               |          |      |        |        | 6705   |      |         |      |          |       | 18543   |       |       |      |      |       |      |     |
| individuals      |         |      | 12392 |               |          |      |        |        | 5730   |      |         |      |          |       | 14061   |       |       |      |      |       |      |     |
| failure          | 759     |      |       |               | 7490     |      | 196    |        | 182    |      | 2995    |      | 7963     |       | 2805    |       |       |      |      |       |      |     |

Table 6a. Duration dependence without Unobserved Heterogeneity

| Transition | Duration dependence parameter |      |             |      |
|------------|-------------------------------|------|-------------|------|
|            | Pre-reform                    |      | Post-reform |      |
|            | estimate                      | s.e. | estimate    | s.e. |
| PC-PC      | 1.14                          | 0.03 | 1.08        | 0.03 |
| PC-AC      | 1.04                          | 0.12 | 0.99        | 0.08 |
| PC-NW      | 0.95                          | 0.01 | 0.86        | 0.01 |
| TC-PC      | 1.32                          | 0.08 | 1.07        | 0.07 |
| TC-TC      | 1.16                          | 0.12 | 1.05        | 0.07 |
| TC-NW      | 1.01                          | 0.02 | 0.89        | 0.01 |
| NW-PC      | 0.92                          | 0.01 | 0.85        | 0.01 |
| NW-TC      | 0.96                          | 0.02 | 0.92        | 0.02 |

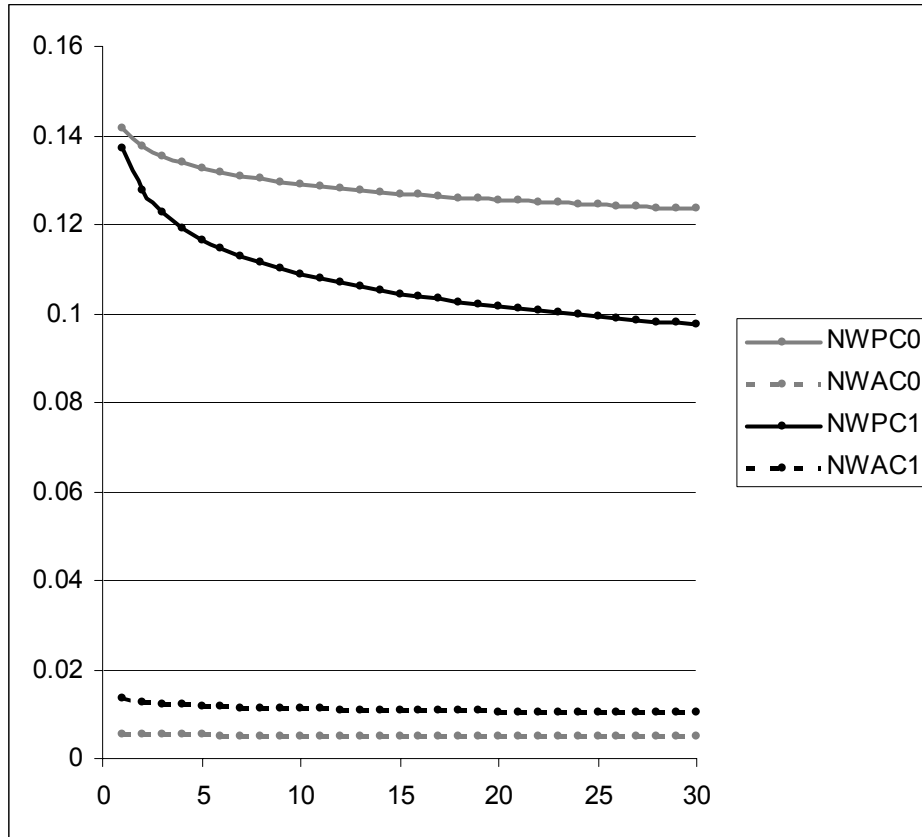
Baseline hazard: Weibull specification

Table 6b. Duration dependence with Unobserved Heterogeneity

| Transition | Duration dependence parameter |      |             |      | Unobserved Heterogeneity |       |             |      |
|------------|-------------------------------|------|-------------|------|--------------------------|-------|-------------|------|
|            | Pre-reform                    |      | Post-reform |      | Pre-reform               |       | Post-reform |      |
|            | estimate                      | s.e. | estimate    | s.e. | estimate                 | s.e.  | estimate    | s.e. |
| PC-PC      | 1.15                          | 0.03 | 1.08        | 0.03 | 0.83                     | 0.22  | 0.78        | 0.24 |
| PC-AC      | 1.10                          | 0.14 | -           | -    | 16.23                    | 17.27 | -           | -    |
| PC-NW      | 0.95                          | 0.01 | 0.90        | 0.01 | 0.00                     | 0.00  | 0.26        | 0.03 |
| TC-PC      | 1.32                          | 0.08 | 1.08        | 0.07 | 0.00                     | 0.00  | 0.00        | 0.00 |
| TC-TC      | 1.16                          | 0.12 | 1.05        | 0.07 | 0.45                     | 0.77  | 0.00        | 0.00 |
| TC-NW      | 1.01                          | 0.02 | 0.89        | 0.01 | 0.00                     | 0.00  | 0.00        | 0.01 |
| NW-PC      | 0.96                          | 0.01 | 0.90        | 0.01 | 0.17                     | 0.03  | 0.47        | 0.04 |
| NW-TC      | 0.96                          | 0.02 | 0.92        | 0.02 | 0.00                     | 0.00  | 0.04        | 0.06 |

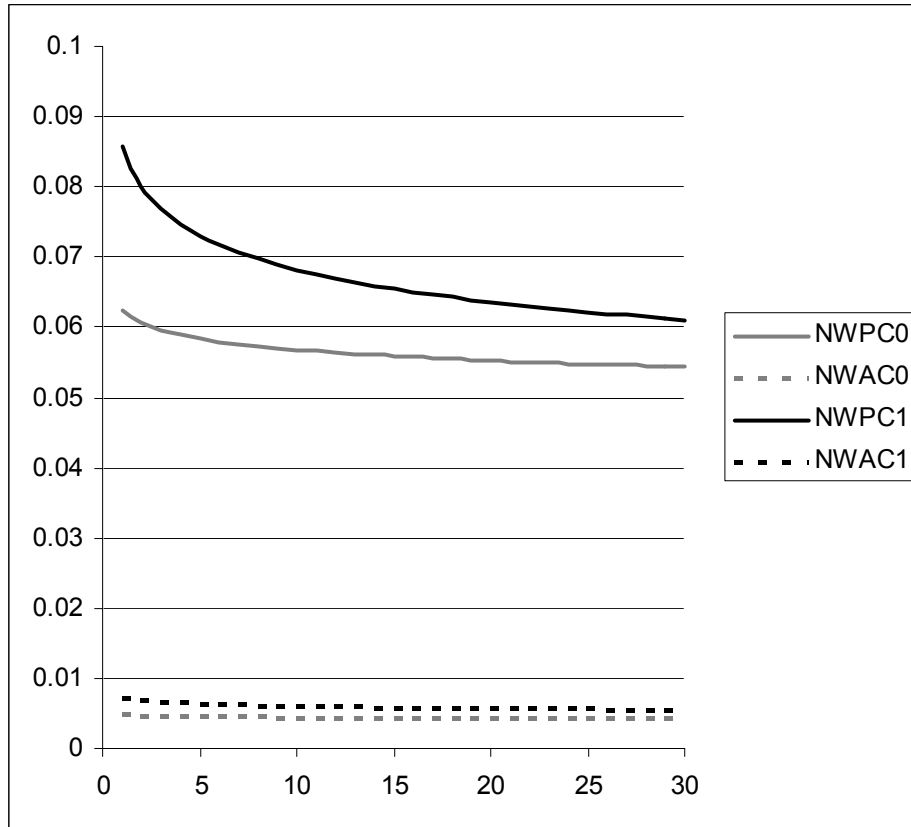
Baseline hazard: Weibull specification, Unobserved Heterogeneity: Gamma distributed

Figure 1. Monthly predicted Hazard rate: leaving a NW (North-West)



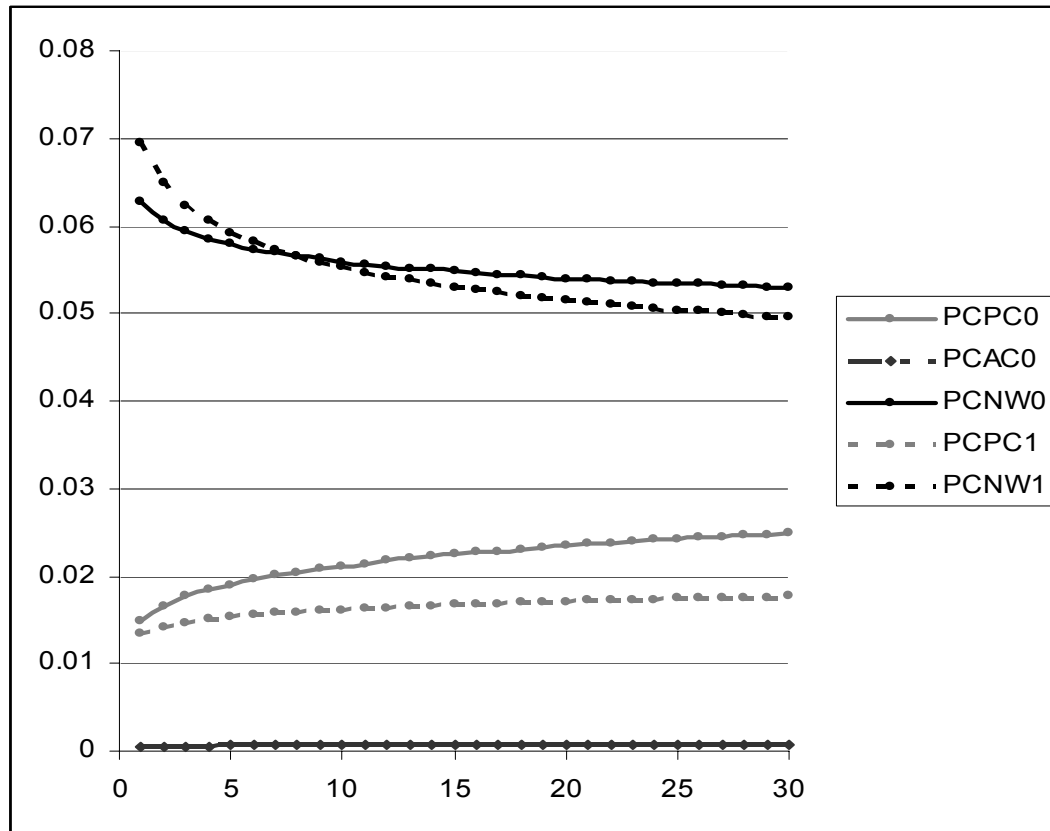
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%; 0 = pre-reform period; 1 = post-reform period.

Figure 2. Monthly predicted Hazard rate: leaving a NW (South-Islands)



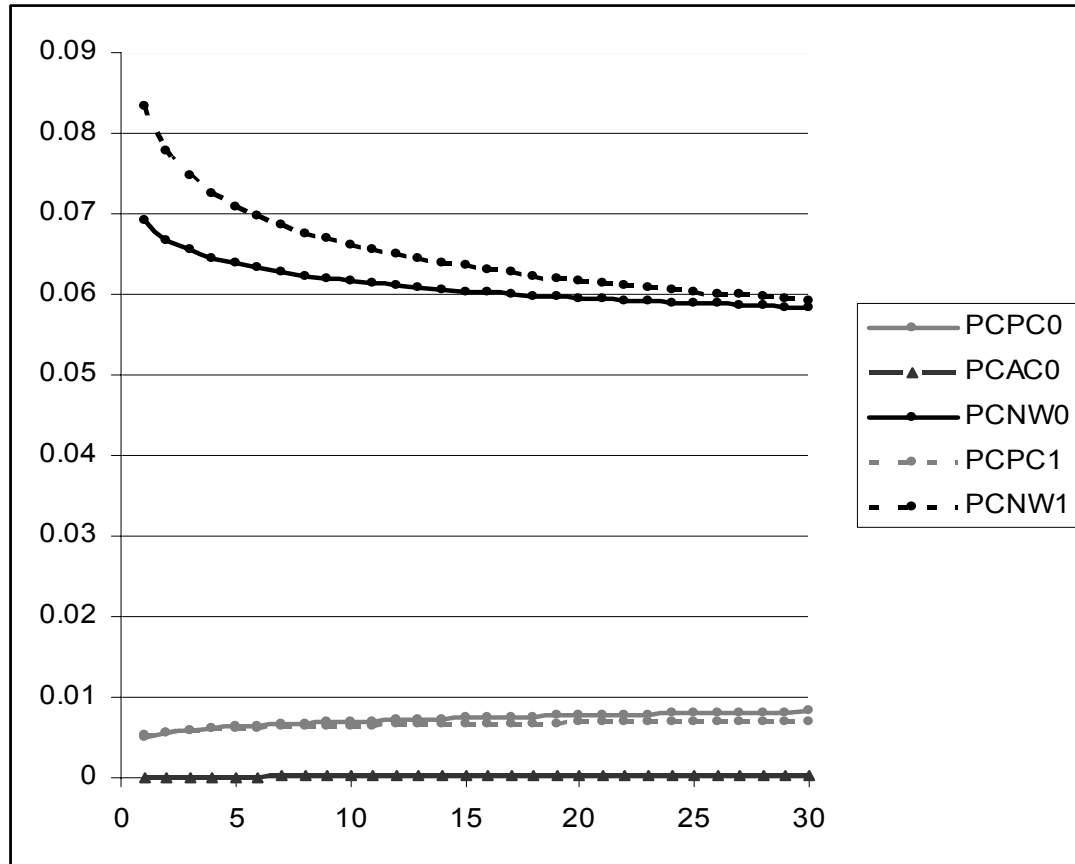
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

Figure 3. Monthly predicted Hazard rate: leaving a PC (North-West)



Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

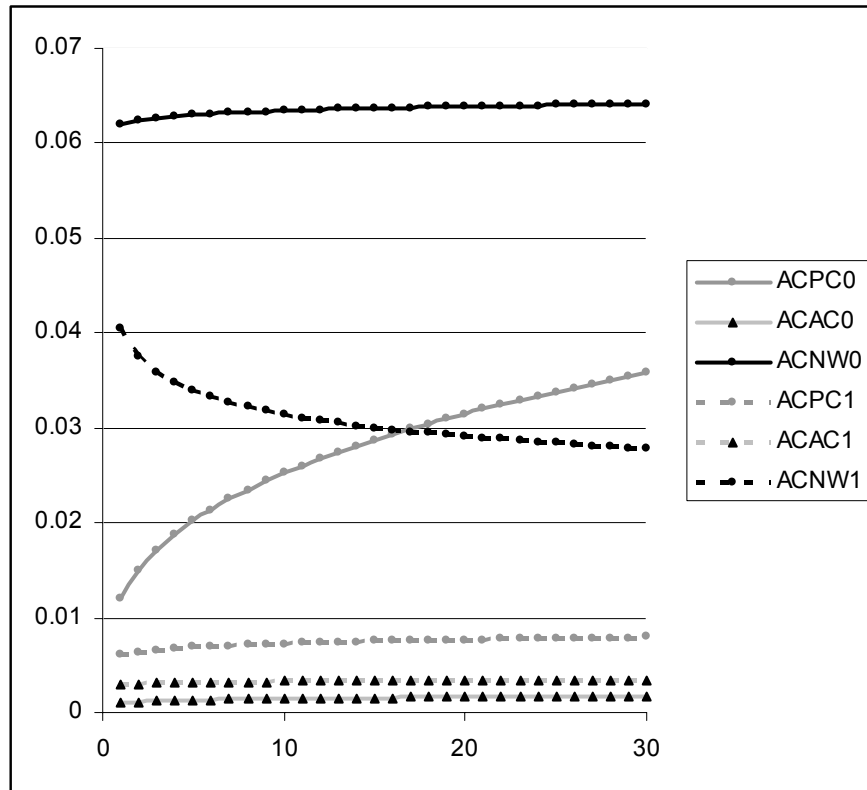
Figure 4. Monthly predicted Hazard rate: leaving a PC (South-Islands)



Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

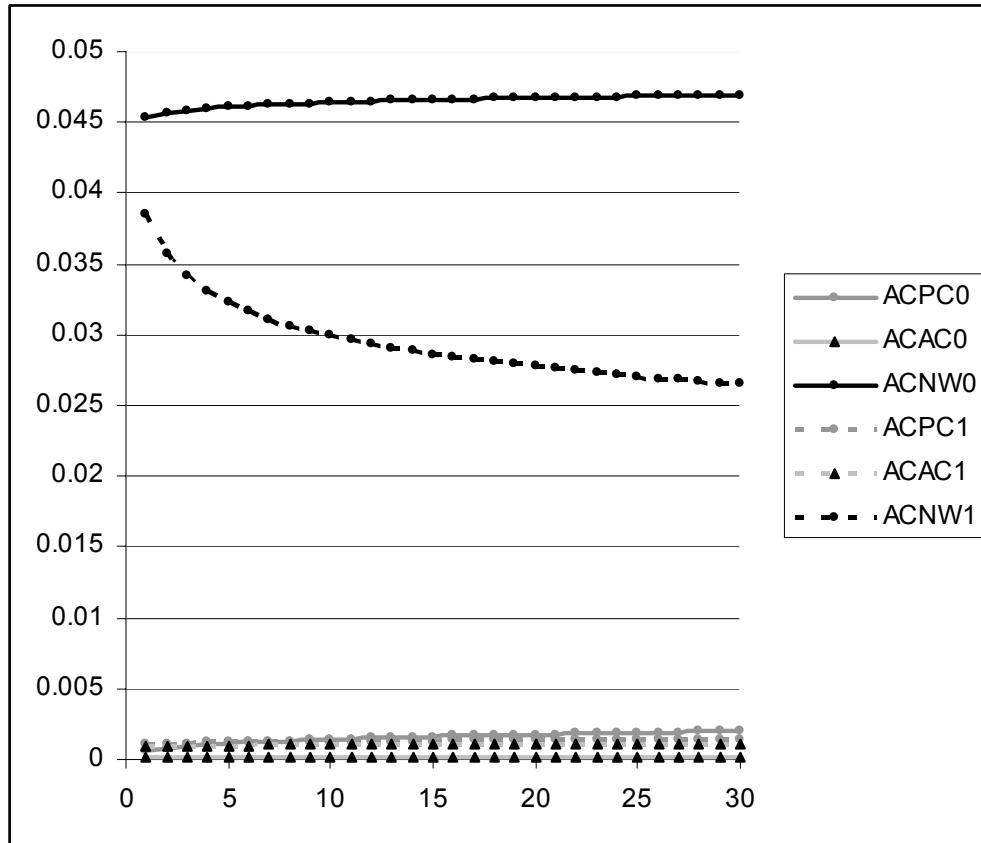


Figure 5. Monthly predicted Hazard rate: leaving an AC (North-West)



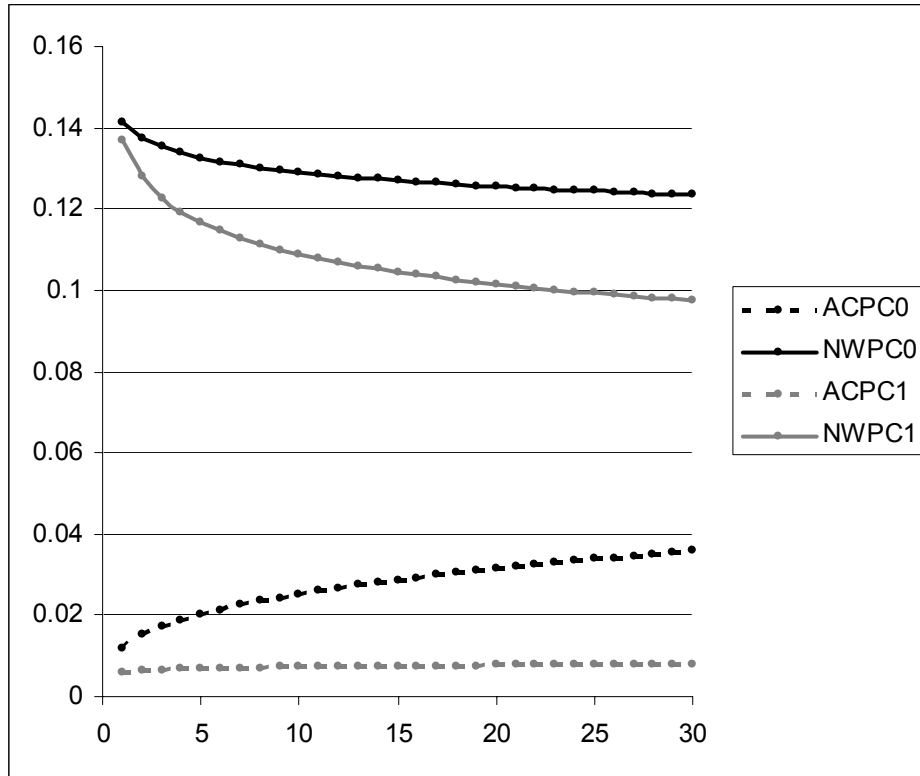
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

Figure 6. Monthly predicted Hazard rate: leaving an AC (South-Islands)



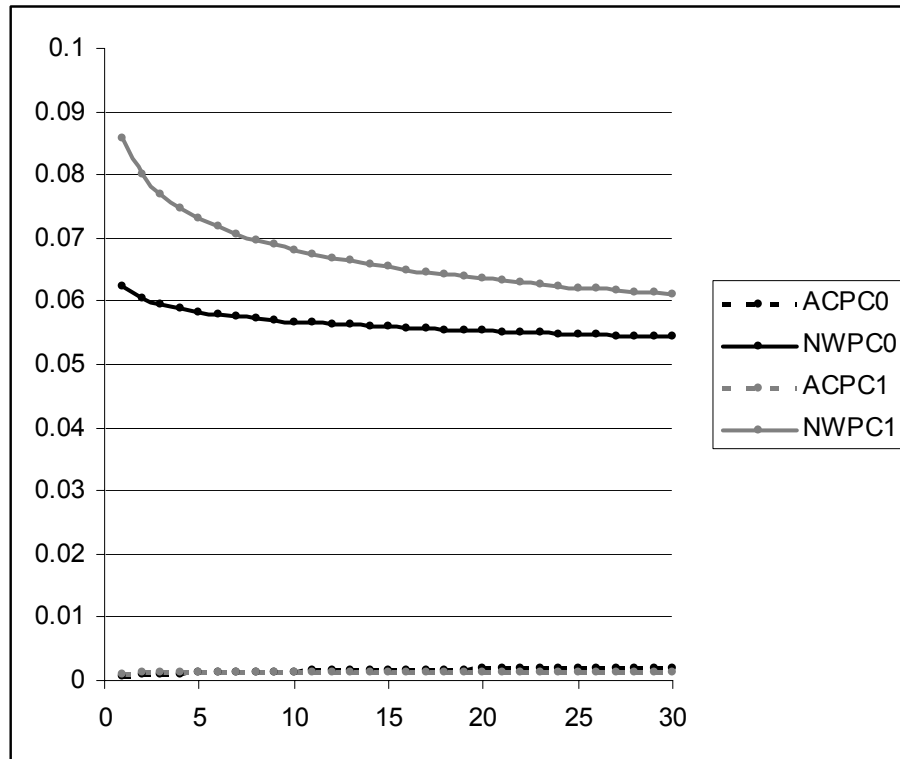
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

Figure 7. Monthly predicted Hazard rate: reaching a PC (North-West)



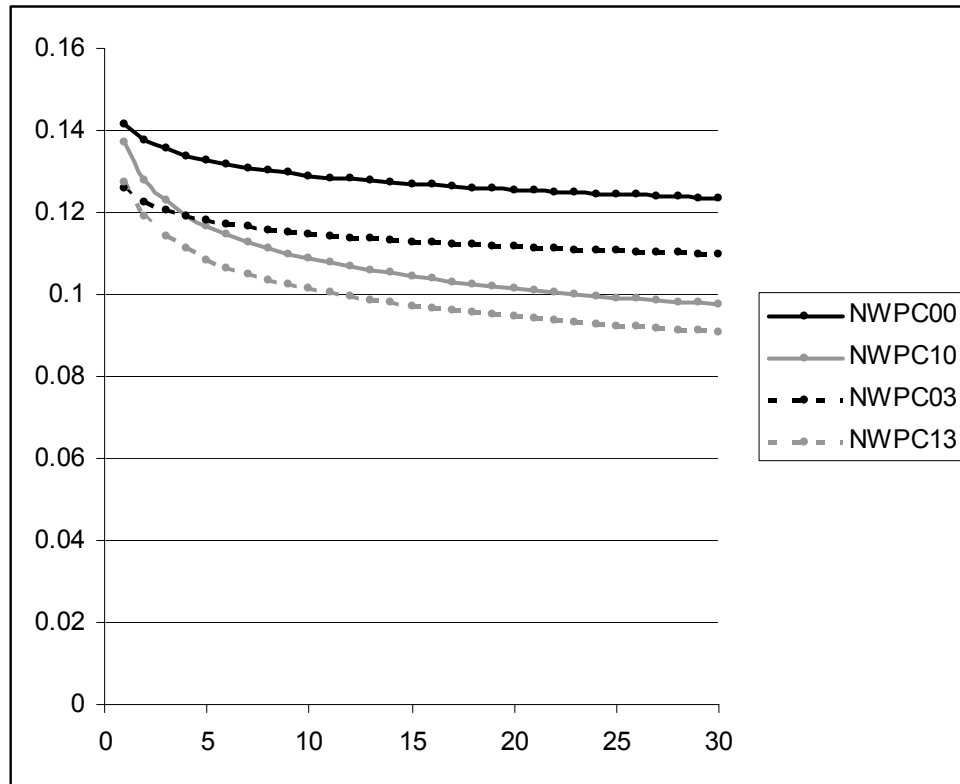
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

Figure 8. Monthly predicted Hazard rate: reaching a PC (South-Islands)



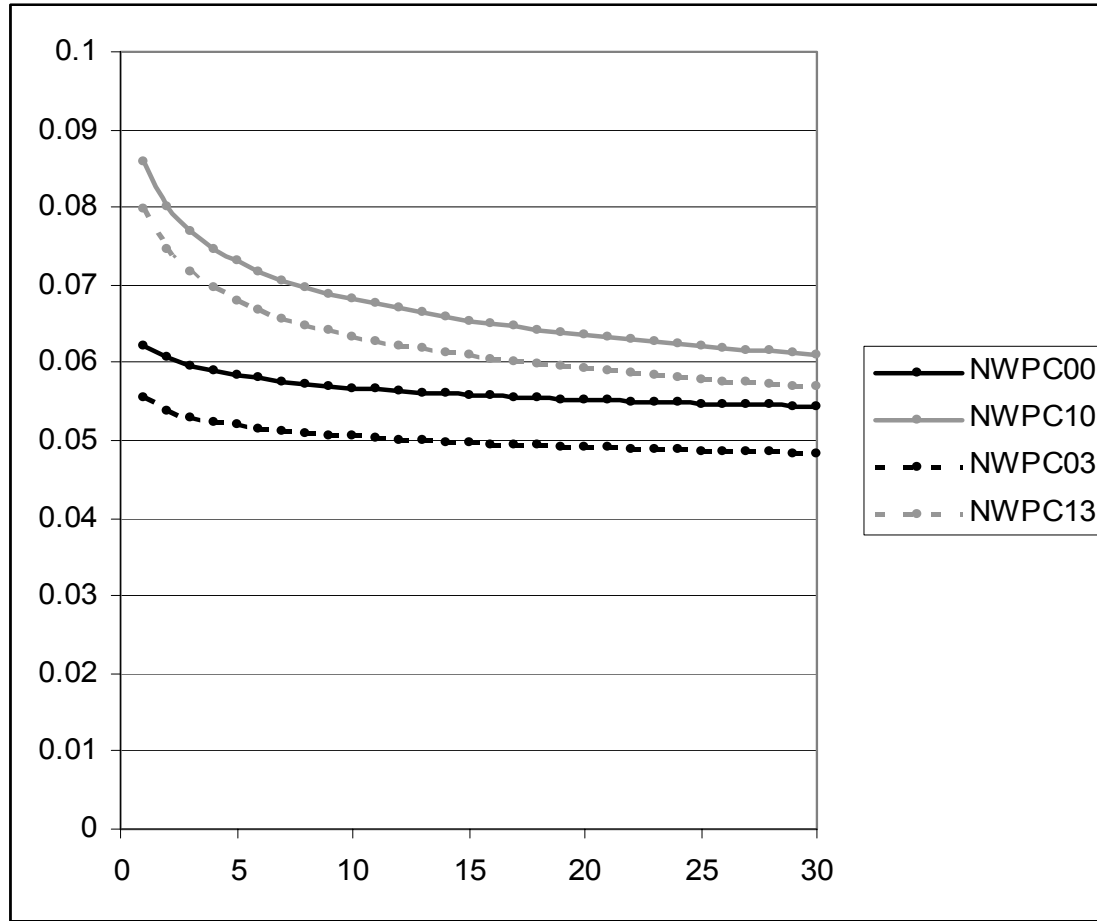
Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, no AC previous experiences, employment growth: 0.6%. 0 = pre-reform period; 1 = post-reform period.

Figure 9. Monthly predicted Hazard rate: NW-PC transitions by number of previous AC experiences (North-West)



Reference category: 25 years old, male, low skill, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, employment growth: 0.2%. first 0 = pre-reform period; 1 = post-reform period. Second 0 = number of AC experiences; 3 = number of AC experiences;

Figure 10. Monthly predicted Hazard rate: NW-PC transitions by number of previous AC experiences (South-Islands)



Reference category: 25 years old, male, low skills, no buildings, no tourism, no part-time, wage: 50 euro per day, tenure: 20 months, employment growth: 0.6%. first 0 = pre-reform period; 1 = post-reform period. Second 0 = number of AC experiences; 3 = number of AC experiences;