The Evolution of Severance Pay over Italian Working Life Careers

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June 25, 2013

Abstract

In this paper we evaluate the expected evolution of the Trattamento di fine rapporto (TFR) over the Italian employees' working life careers. Using amministrative data we disentangle the amount that is expected to be accumulated until retirement, the amount expected not to accrue because of discountinuos working careers and/or paid as an anticipated withdrawal. This is relevant in the light of the recent pension system reforms that strongly encourage the diversion of the TFR to pension funds. Our results evidence that for a coeval of working groups the TFR expected to be accumulated until retirement may be relatively modest, confirming the skeptical view about its universal role as retirement wealth and raise serious concerns on strict prenalizations from using it during working life in case of long term unemployment.

Keywords: Employment, Unemployment, Joblessness, Severance Pay
JEL: J64, J650, J32

*I thank Ainhoa Aparicio Fenoll, Christian Bartolucci, Luigi Benfratello, John.V. Duca, Chirstopher Flinn, Stefan Hochguertel, Costas Meghir, Claudio Michelacci, Raffaele Miniaci, Giovanna Nicodano, Lia Pacelli, Nicola Pavoni and Mathis Wagner for helpful discussions and comments. I thank participants to the "Cognetti's Lunch Seminar", to the Institute for Employment Research (IAB) Workshop and to the ESPE 2011 Annual Congress. Financial support from the Italian Ministry of University and Research (MIUR) is gratefully aknowledged. Usual disclaimers apply.

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1 Introduction

In recent years, the core debate underlying the Italian private pensions reforms was on the opportunity to use the Trattamento di Fine Rapporto (TFR) as the primary source to finance Italian employees' private pension provisions. In particular, the reforms have been questioned as too naively trusting in voluntary TFR diversions to pension funds (see Castellino and Fornero, 2000). The debate is still actual given that the majority of Italian employees seem reluctant to divert the TFR to pension funds (Cozzolino, 2006).

The skepticism about the TFR ability to mount adequate retirement wealth grounds on its dual role as retirement and buffer wealth which seems to be empirically supported given that the observed average TFR across ages is markedly lower than the amount associated with theoretical continuous job careers (Castellino and Fornero, 2000). However, due to lack of data, no previous study attempts to provide a quantitative measure of its ability to mount adequate additional wealth at retirement nor the expected leakages that potentially undermine its accumulation process and thus its potential effectiveness as pension provision. In this paper, we use microdata to evaluate the expected distribution of the TFR over working life careers. In particular, for working groups defined according to demographic and occupational characteristics, we disentangle how much of the TFR can be expected to be accumulated until the end of the working life and thus potentially available for retirement needs ($ETFR_t^{RET}$) from the amount that is expected to outflow from the accumulation process because of job termination ($ETFR_t^{BUF}$) and/or advanced withdrawals ($ETFR_t^{LIQ}$).

The TFR is a lump-sum payment received by employees upon job termination. For each employee, each year of the job relationship the employer accumulates a fraction (6.91%) of the annual salary which is recapitalized at a pre defined interest rate (1.5% +0.75 of the annual inflation). The accumulated TFR fund is then paid when a job separation occurs regardless of its causes or at retirement; the employee working more than eight consecutive years with the same employer can obtain a partial withdrawal on the accumulated TFR to finance home purchase or medicare. Given this legal setup, the TFR plays essentially two mutually exclusive roles. First, in case of continuous job

careers until retirement, it may contribute to build one's pension wealth being a lump sum payment totally available at retirement. Second, it may act as a social shock absorber ("ammortizzatore sociale") to overcome financial burdening from liquidity constraints and/or adverse income shocks[1].

According to pension reforms, employees must decide whether to retain the TFR within the firm ("TFR in firms, henceforth) or to divert it to pension funds ("TFR in pension funds" henceforth)[2]. The reforms will succeed to the extent that workers opt for TFR diversion to pension funds but also as long as they do not use it before retirement because of dismissal and/or binding liquidity constraints, since in these cases they may obtain the accrued positions just as in the case of "TFR in firms". If for a non negligible number of coeval workers the chance of job separation and/or withdrawing behavior is high then the potential outflows from the TFR accumulation may be substantial and the reform fail to meet the goal. Indeed, prior research shows that, vis à vis the lump sum distribution option, the majority of U.S. workers cashes out from pension funds when facing job dismissal (Poterba et al. 1998; Burman et al. 1999), raising concerns about the potential inadequacy of retirement wealth, especially for low income earners[3].

Although they share common liquidability rules during working life, TFR "in firms" and TFR "in pension funds" differ with respect to payouts convenience before retirement. First, the asymmetric fiscal treatment makes it very costly cashing out from pension funds upon dismissal. Unconditional withdrawing upon job separation in case of TFR "in pension funds" is taxed at the progressive rate, while tax rebates are gained on up to the

[1] In case of discontinuous job careers, the TFR received upon contract termination-voluntary or not-represents additional private savings freely disposable to smooth consumption either for precautionary motives, for example to self-insure when the layoff is followed by an unemployment spell or for whatever purpose (Borella et al., 2009; find that TFR recipients increase the amount spent on durables upon voluntary job termination). In addition, during the job contract, the TFR can be used through advanced withdrawals to finance specific needs thus acting as a liquidity buffer to overcome financial constraints or to avoid drawings from other private savings.

[2] More precisely, after the reform, for workers employed in large firms (more than 50 employees) the TFR is accumulated in a public fund managed by the Italian Bureau for Social Security (INPS) rather than by single firms. TFR that accumulates in this public fund follows the same rules as the TFR accumulated in single firms, thus, in this paper we will refer to it as TFR "in firms".

[3] Cashing out patterns tend to display a high degree of heterogeneity across workers being inversely related to age, earnings and entitlements size (Yakoboski, 1997 and Engelhardt, 2002). Hurd and Panis (2006) find that among plans allowing for a lump sum distribution upon job separation, 20% is on average cashed out and that cashing out is more frequent among low income earners who thus are likely to be poor also at old ages.

$50\% - 100\%$ of the TFR stock conditionally to an unemployment status of a minimum of $12 - 48$ months. Conversely, the amount obtained upon job separation on "TFR in firms" is always taxed at the more favorable individual average rate. Thus, pension funds' participants are strongly induced to avoid early withdrawal which could result in heavy penalization if job separations are followed by persistent unemployment. Coherently, our analysis of careers dynamics underlying the TFR accumulation will not be confined to the threatening of job separation but will also account for the chance of re-employment.

Second, the TFR "in firms" is rewarded at a safe but relatively modest interest rate with a partial guarantee on performance[4], while the TFR "in pension funds" is invested in financial markets and thus it is rewarded at a potentially higher but even riskier expected rate, depending both on the performance of financial assets and on the portfolio allocation. Although a diversified portfolio is likely to outperform the rewards from the TFR "in firms" over the medium/long term[5], in the short run yields are likely to be more volatile resulting in lower chance of matching the performance of the TFR "in firms". Greater chance of using the TFR because of job separation and/or advance withdrawal may translates into higher risk of accrued position being unsuitable for smoothing consumption if the potential investment horizon shortening is neglected. The analysis carried out here will detect those working groups who more likely need to cash out the TFR before retirement and for whom more conservative investment strategies are likely to be appropriate.

To derive the expected composition of the TFR we rely on a probabilistic model that tracks the TFR available to full time Italian employees[6] at each age of their working life conditional on being employed[7]. In order to evaluate the probability distributions driving the model we use data from the Work Histories Italian Panel (WHIP) drawn from

[4] As specified above, the legal return rate amounts to one and a half per cent plus the 75 percent of the rate of change in prices.

[5] Assuming valid the property of mean reversion of returns of financial assets.

[6] We focus on full time employees, since the inclusion of part time workers would entail considering separate labor supply functions to account for differences in factors underlying the decision between the two margins, which is beyond the scope of the present study.

[7] Alternatively, we could evaluate the unconditional expected composition of the TFR at each point of the life cycle, i.e. the amount that is expected to accumulate if employed and the amount that could be accumulated but fails to accrue because of the persistence in the unemployment status.

matched employers-employees administrative archives which provide detailed information on individual job spells, earnings and the accumulated TFR. Since these data do not convey information about wealth, consumption or saving behavior we are unable to observe how the TFR withdrawn before retirement is used. Nevertheless, our analysis turns out to be valuable since we are able to evaluate the expected amount that at each age fails to continue to accumulate in the TFR account due to job discontinuity or advanced withdrawing behavior.

Our results evidence that on average the largest amount of the accumulated TFR is expected to be available at retirement, though there's substantial heterogeneity across working groups. The $ETFR_t^{RET}$ tends to be hump shaped with respect to age, reflecting the dynamics of transitions in and out the employment status. The specularily "U" shaped $ETFR_t^{BUF}$ could partially rationalize some evidence on pension funds participants' asset allocation choices. In particular, the distribution of participants to the most conservative (guaranteed and fixed term) investment lines is "U" shaped across ages (COVIP, 2012) which is coherent with the pattern of job dismissal risk but definitely contrasts with theoretical predictions of optimal risk exposure decreasing with age common to standard financial models that abstract from the potential impact of discontinuous careers.

Moreover, the $ETFR_t^{BUF}$ can overcome the $ETFR_t^{RET}$ if the probability of separation is high and the chance of re-employment is low, namely for females, blue collars, workers in southern regions and in the construction industry. For example, for females working in small firms it may account on average for 50% of the total potential TFR. Finally, our results show that, since only a minority of workers cashes out their TFR during the working life, the expected $ETFR_t^{LIQ}$ represents a small portion of the total potentially accumulated reaching the maximum level at middle ages being the chance of withdrawing in advance increasing with the tenure as well as the amount accumulated.

A second strand of critics to pension reforms focusses on the potential burden that TFR diversions pose on firms who would lose a relatively low-cost source of financing. However, firms face up relevant refinancing decisions even upon TFR payments at job separations and/or advanced withdrawals (see e.g. Garibaldi and Pacelli, 2008). Calcagno

et al. (2011) evaluate the impact of pension reforms on small and medium size firms' refinancing costs. Providing a quantitative measure of the expected outgoing amount due to job separations and advanced withdrawals, our analysis leads to resize the costs firms would incur in case of TFR diversion to pension funds.

The paper is organized as follows. Section (2) introduces the probabilistic sequential model for the accumulation of the TFR. The dataset used for the empirical analysis is described in section (3). The econometric approach and results are reported in Section (4) and Section (5) while in section (6) we derive the expected TFR distribution between the $ETFR_t^{RET}$, the $ETFR_t^{BUF}$ and the $ETFR_t^{LIQ}$ as defined above. Section (7) concludes.

2 The model for the accumulation of the TFR

In this section we model the expected evolution of the three components of the TFR over the working life careers.

According to the legal setup, starting from the first year of the job relationship, the employer accumulates on the worker w's behalf a yearly contribution equal to $\left(\frac{1}{13.5}\right)$ of his annual gross wage, y_t The accumulated TFR is rewarded at a partially fixed annual rate (1.5%) linked to the inflation rate τ[8].Thus, the TFR evolves according to the following[9]:

$$TFR_t = TFR_{t-1}(1 + (0.015 + 0.75\tau)) + \frac{y_t}{13.5} \tag{1}$$

where TFR_{t-1} is the stock available at the end of year $t-1$, TFR_t^w is the stock available at the end of t, given the accrued rate of return $(0.015 + 0.75\tau$) and the accumulated fraction $\left(\frac{1}{13.5}\right)$of the annual labor income y_t.

The accumulated TFR is paid to the worker upon job termination, regardless of its reason, or at retirement. Under specific circumstances, the employees working more than

[8]For simplicity, to ease the presentation of the model, we assume a constant inflation rate. The assumption is maintained also in the empirical section across all simulation since no widely accepted stochastic process for inflationary dynamics has been successfully estimated and being their modelling beyond the scope of the analysis carried out here. In particular, in all simulations, τ is set to 2% accounting for a real yielding rate of 1%.

[9]In the following equations, all the variables but the inflation rate are intended indexed at the individual worker level, w. However, to ease the exposition the index w has been suppressed.

eight consecutive years with the same employer can obtain a partial withdrawal on the accumulated TFR[10].

In this paper, we aim at deriving the amount of the TFR that at each period t of the working life career is expected to continue to accumulate ($ETFR_t^{RET}$), the amount that is expected to be paid upon the termination of the job relationship ($ETFR_t^{BUF}$) and the amount that is expected to be withdrawn in advance for specific needs ($ETFR_t^{LIQ}$). To this aim, we consider a probabilistic model for the accumulation of the TFR that enables to evaluate, at each t, the amount of the TFR that is potentially available conditionally on the individual's working life career and decompose it into the three components of interest.

According to our model, at the beginning of t, the individual may be employed with probability p_{t-1}^{ei} or unemployed with probability $p_{t-1}^{u} = 1 - p_{t-1}^{e}$. In each t, the transition between the two labor market states is modelled as a time-nonhomogeneous semi-Markov process[11] driven by the transition matrix Π_t, where

$$\pi_t^{ji} = \Pr ob_t(x_t = i | x_{t-1} = j) \qquad i = e, u, \quad j = e, u \quad \text{and } t = 0, ..., T \tag{2}$$

with initial probability distribution $\pi_0^i = \Pr ob(x_0 = i), \;\; i = e, u.$

At the beginning of t, the individual, employed with probability p_{t-1}^{e}, is entitled to the amount of accumulated TFR, TFR_{t-1}. During t, she remains employed with probability $\pi_t^{ee}$and decides whether to take an advanced withdrawal on TFR_{t-1} or not. She takes an advanced withdrawal with probability λ_t, while with probability $(1 - \lambda_t)$ she does not

[10] According to the Italian law, employees with more than 8 years of service are entitled to early withdrawals from the accrued stock during the same job to buy a primary residence for themselves or their sons or to cover exceptional medical expenses. The amount withdrawn should not be higher than 70% of the account and at firmwide level, only 10% of employees with at least 8 year seniority and up to 4% of total employees are allowed (each year) to take advanced withdrawals.

[11] In particular, the transition process between the two states of interest, employment and non-employment, are allowed to be both time and duration dependent.

take it[12] and the amount that is expected to be withdrawn in advance is[13]

$$TFR_t^{LIQ} = TFR_{t-1}\lambda_t(1 + 0.015 + 0.75\tau) \tag{3}$$

Since she remains employed she receives the annual labor income y_t, thus the fraction $\left(\frac{1}{13.5}\right)$of it is accumulated on her TFR account which grows also by the rate of return $(0.015 + 0.75\tau_t)$ on the portion of the initial stock TFR_{t-1} not withdrawn in advance. Conditionally on the continuity of the job relationship over t, the amount of the TFR that is expected to be available at the end of period t is

$$TFR_t^{RET|e} = TFR_{t-1}(1 - \lambda_t)[1 + (0.015 + 0.75\tau)] + \frac{y_t}{13.5} \tag{4}$$

During period t, the individual employed with probability p_{t-1}^e may experience a job separation with probability π_t^{eu}, upon which she receives the amount[14]

$$TFR_t^{BUF} = TFR_{t-1}(1 + 0.015 + 0.75\tau) \tag{5}$$

During t, the individual unemployed with probability p_{t-1}^u starts a new job relationship with probability π_t^{ue} receiving the annual income y_t, thus the fraction $\frac{y_t}{13.5}$ is accumulated on her TFR account at the end of t

$$TFR_t^{RET|u} = \frac{y_t}{13.5} \tag{6}$$

[12]The restrictions on advanced withdrawals may be overcome upon the employer approval. Indeed in our data we do find evidence that workers with less than 8 years of seniority or employed in small size firms (less than 25 employees) take withdrawals, and that the amount may be higher than the 70% of the existing stock. Thus our analysis of the advanced withdrawing behavior is extended to include all observed withdrawals which satisfy the conditions detailed below. In particular, as specified in section 3, advanced withdrawals are defined as negative changes in TFR evidenced before the last year of service in case of job relationships that last at least 4 years and if they amount at least to 400 euro and if they are at least 20% of the stock accrued. This is taken into account when the Liquidity -TFR is evaluated.

[13]We assume that withdrawals are obtained at the end of t..

[14]We assume that the accrued position is obtained at the end of t.

At each t, the expected amount of the TFR at retirement is

$$\begin{aligned} &ETFR_t^{RET} = p_{t-1}^e TFR_t^{RET|e} + p_{t-1}^u TFR_t^{RET|u} = \\ &= p_{t-1}^e \pi_t^{ee} TFR_{t-1}(1-\lambda_t)[1+(0.015+0.75\tau)] + p_{t-1}^e \pi_t^{ee} \tfrac{y_t}{13.5} + p_{t-1}^u \pi_t^{ue} \tfrac{y_t}{13.5} \end{aligned} \tag{7}$$

while the amount expected to be available as liquidity is[15]

$$ETFR_t^{LIQ} = p_{t-1}^e \pi_t^{ee} TFR_{t-1} \lambda_t (1+0.015+0.75\tau) \tag{8}$$

and the amount expected to be available as buffer is

$$ETFR_t^{BUF} = p_{t-1}^e \pi_t^{eu} TFR_{t-1}(1+0.015+0.75\tau) \tag{9}$$

The three components sum up to the TFR potentially available at the end of each t conditional on the working career till t[16]

$$ETFR_t = p_{t-1}^e TFR_{t-1}[1+(0.015+0.75\tau)] + p_t^e \frac{y_t}{13.5} \tag{10}$$

In this paper, we evaluate $(7)-(9)$ and their relative role with respect to the amount of TFR potentially available at the end of each period t of the working life career conditionally on being employed in t:

$$\alpha_t^{RET} = \frac{ETFR_t^{RET}}{ETFR_t} \tag{11}$$

$$\alpha_t^{LIQ} = \frac{ETFR_t^{LIQ}}{ETFR_t} \tag{12}$$

$$\alpha_t^{BUF} = \frac{ETFR_t^{BUF}}{ETFR_t} \tag{13}$$

To evaluate $(7)-(9)$ at each point of the working careers, given the expected annual

[15] According to the adopted time setting, all the stock variables are evaluated at the end of t and thus are comparable on a "like to like" basis, thus, the $ETFR_t^{LIQ}$,the $ETFR_t^{BUF}$ and $ETFR_t^{RET}$ are capitalized at the fixed interest rate r.

[16] In the appendix $A.1$ we show how we derive the expected TFR at the end of each t. Importantly, it is not a conditional expectation *tout court*, however it may be interpreted as the conditional amount of the TFR available at each t is evaluated taking into account the chance of having used it in the past.

labor income y_t as well as the inflation rate τ, we have to detect the transition probability distributions π_t^{ee}, π_t^{ue} and π_t^{eu} and p_{t-1}^{e}, p_{t-1}^{u}, and the the probability of taking advanced withdrawals λ_t. In particular, to obtain the transition distributions between the two relevant labor market states we develop a reduced-form analysis of the employment and nonemployment duration of Italian employees in the private sector controlling for both observed and unobserved heterogeneity. In section 4.we detail the empirical analysis and report the results.

The proportion that is expected to be taken in advance for specific needs is affected directly by λ_t and indirectly by the chance of not experiencing a job separation. In section 5 we present the empirical approach and results for the advanced withdrawing behavior (λ_t) observed in the data.

In section 6 we report the results on the expected distribution of the TFR implied by the derived probability distributions. In the following section we describe the data that we use to conduct the empirical analysis.

3 The Data

In this paper we use the Work Histories Italian Panel (WHIP) provided by Laboratorio Riccardo Revelli. WHIP is a database of individual work histories, based on INPS (the Italian National Social Security Institute) administrative archives. The panel consists of a random sample $(1:180)$ drawn from the full archive of a dynamic population of about $370,000$ permanently and temporary employed in the private sector or self-employed or retired over the period $1985-2004$. The dataset allows observing the main episodes of each individual's working career. The main drawbacks of the data is that they do not convey information on household composition, education, and other relevant demographic variables.

For this paper purposes, we consider blue and white collar employees working full time[17] in the private sector, aged between 20 and 60 years old. Our sample covers about $62,000$ workers, 72% are men and 28% are women, the median age of men is 36, while the

[17]Part time workers correspond to the 8.9 percent of the sampled population.

median age for women is 33. We observe multiple job spells over the period $1985-2002$[18]. We exclude from the analysis job spells left truncated at January 1985 since for them we cannot distinguish true new hiring, thus we end up with a total of about $145,000$ single job spells[19] .

Table 1 reports the distribution of observed jobs by occupation. Males' job spells, which represent the 65% of the total number of job spells, are more densely concentrated in blue collar occupations than females' job spells (88% against 67%). Manufacturing is the largest industry for both males (38%) and females (37%), the second one for males is construction (27%) which instead accounts only for 1% of total females' jobs. The remaining industries, here called Services[20], cover 60% and 36% of females' and males' jobs respectively. Small and medium size firms (less then 20 employees) provide the majority of jobs (about 56%) for both males and females, while about 7% of job spells are provided by firms with more than $1,000$ employees. The majority of jobs, 52% of the total, are located in northern regions, 17% in the central regions and 30% in south, however, the gender gap is higher in southern regions where males hold the 64% of observed jobs.

In Figure 1 we report, in left and right panel respectively, the (mean) annual earnings profiles by type of occupation for female and male workers. The earnings profile for blue and white collars exhibits upward slope over the life cycle with a reverse "U" shape reaching the maximum at the age of $50th$. Annual labor income for white collars is steadily increasing till age of $40th$ while it is quite flat for blue collars: the average annual growth rate is about 5% and 3% for male and female white collars respectively, while for blue collars, both male and female, it is 1%. The gender gap in annual earnings, measured as the he ratio of female earnings to male earnings is increasing over the life cycle reflecting differences in education, experience, labor supply and possibly discrimination.

In Figure 2 we report the (mean) stock of the accumulated TFR by type of occupation for males and females, respectively. The inverse "U" shaping of the TFR reflects the labor

[18] We use the restricted sample since complete information job spells for years 2003 and 2004 are not yet available.

[19] Left truncated job spells account for 16% of the total job spells.

[20] For this paper purposes, industries included in the macrosector Services are: Utilities, Trade, Transports and others.

income dynamics over the working life careers. Differences in levels and growth rates of annual labor income translates in different TFR-age profiles, thus, the TFR accrued for white collars is sensibly higher than for blue collars, while the stock accumulated for females is lower with respect to males.

In addition to earnings, also job stability affects the amount of the accumulated TFR. As detailed in the previous section, to evaluate the expected distribution of the TFR we rely on the analysis of the discontinuity of job careers. Since the data used in this paper originate from administrative archives we are unable to distinguish voluntary from involuntary job interruption spells. Consequently, we cannot distinguish, among the observed non-employment episodes, true unemployment spells from the out of the labor force spells. In this paper, we treat equally all the observed job interruptions and evaluate the chance of not being employed over the life cycle and its implications for the expected TFR accumulation process. Given this clarification, hereafter, we use indifferently the term unemployment and non-employment state. In Table 2 we report the average duration of employment and unemployment spells[21] by age classes[22]. The mean duration of job spells is hump shaped with respect to age at entry, while the unemployment duration appears to be convex in initial age. In particular, employment tends on average to last longer than unemployment at middle ages suggesting a higher probability of being employed during this phase of the working life with respect to younger and older ages. If this is the case, given the observed hump shaping in labor income profile, then we should observe at middle ages the highest values of the expected Retirement –TFR, i.e. the TFR that is expected to continue to accrue until retirement.

The stock of TFR is affected also by the advanced withdrawing propensity. According to the Italian law, employees with more than 8 years of service are entitled to early withdrawals from the accrued stock during the same job to buy a primary residence for themselves or their sons or to cover exceptional medical expenses. The amount withdrawn

[21] The unemployment spells are defined as starting at the end of a recorded job spells and ending at the re-employment in the private sector (observed in the panel), provided the workers does not retire in the period 1985-2002; if re-employment does not happen before the end of 2002 or the worker does note retire I treat the unemployment spell as censored.

[22] Age is measured at the beginning of the spells.

should not be higher than 70% of the account and at firmwide level, only 10% of employees with at least 8 year seniority and up to 4% of total employees are allowed (each year) to take advanced withdrawals[23]. However, these restrictions may be overcome upon the employer approval. Indeed in our data we do find evidence that workers with less than 8 years of seniority or employed in small size firms (less than 25 employees) take withdrawals, and that the amount may be higher than the 70% of the existing stock. Thus our analysis of the advanced withdrawing behavior is extended to include all observed withdrawals which satisfy the conditions detailed below.

In particular, to study the advanced withdrawing behavior we do create a binary variable WITH indicating whether the worker takes advanced withdrawal from the existing stock of TFR. WITH takes value 1 if there's a negative change in TFR and 0 if not. More precisely, WITH is equal to 1 if a negative change in TFR occurs before the last year of service in case of jobs that last at least 4 years and if it amounts at least to 400 euro and if it is at least 20% of the stock accrued[24]. The sample composition of the spells that last at least 4 years is reported in the last column of Table 1. In this subsample, males are slightly more represented (67%), suggesting that on average males achieve longer tenures than females[25]. The manufacturing sector provides a higher number (58%) of more tenured jobs rather than construction (9%) and the services (33%) sectors. Relatively longer contracts are more frequent in the North -West (36%). Small firms (with less than 20 employees) are under represented in the sample of more tenured job relations, while largest firms (more than 200 employees) are more represented in it.

Table 3 reports the descriptive statistics on advanced withdrawals observed on the subsample of job relationship that last at least 4. The total numbers of observed advanced withdrawals is modest, only the 4.8% of individuals-years pairs is affected by withdrawals which correspond to the 8.4% of the total number of observed job relationships lasting

[23] According to these limits at firmwide level firms with less than 25 employees may not allow them to take advanced withdrawals from the stock of TFR.

[24] The choice of these arbitrary threshold is due to limit the role of the measurement error of the event of interest (Garibaldi and Pacelli, 2008).

[25] Table 1 shows that the median duration of males' employment spells is one years, sligthly less that for females (1.16 years). However, when employment spells which last more than (or equal to) 4 years are considered, the median duration for males is slightly higher (7 years vs 6.8 years).

more than 4 years. Table 3 in first column reports the distribution of advanced withdrawals across individual and occupational characteristics over individual-year observations. The propensity to withdraw measured with respect the individual-year pairs is quite homogeneous across occupational characteristics, while it shows some peculiar differences when measured with respect the number of job relations as reported in the second column of Table 2. According to our data (see Table 3, second column) advanced withdrawals are more frequent in medium and large firms (13% in firms with more than 1000 employees, around to 9.4% in firms with $20-199$ employees, 8.4% in firms with $10-19$ employees and 6.3% in firms with less than 10 employees). The highest percentage of jobs affected by withdrawals is observed in the north-western regions (9%), while the lowest is found in southern regions (8.6%). In the manufacturing sector, the 9.7% of jobs are interested by a withdrawal while the corresponding value for construction sector is 5.7%. White collars show a higher propensity (9.3%) to withdraw then blue collars (8%) while females tend to withdraw less frequently than males (7.3% against 8.7%).

Figure 3 reports the age distribution of the propensity to withdrawal for female and male workers, by cohort and occupation. Females show on average less propensity to withdraw than males at all ages. The propensity to withdraw is hump shaped with respect to age, workers aged between 30 and 40 years old are more likely to take the anticipation option than the youngest ($20-30$ years old) and the elderly ($40-50$ and more than 50). The average proportion of withdrawals is 4.8%, starting from the minimum 3%, at age 24, it increases with age and reaches a peak of about 6% around 35 years old and stabilize at a level of about 3.5% at older ages. This evidence seems to confirm that the anticipated withdrawals, being more frequent at younger and middle ages, are more likely to serve for home purchasing rather than for medical care.

4 Empirical analysis of working life careers

In this section we carry out the analysis on working life careers to derive the empirical counterparts of the process that drives the evolution of the TFR. We rely on non parametric and parametric duration analysis of employment and unemployment spells to

determine the transition distributions among labor market states.

4.1 Non parametric analysis

In Figure 4, we plot the Kaplan-Meier (K-M) empirical hazard rates from the employment and unemployment status respectively against the length of employment/unemployment spells. In the left chart of Figure 4 we plot the hazard function for employment spells. The decreasing shape of the hazard rate is evidence of negative duration dependence for job spells. Thus, the probability of a job separation is an inverse function of the job tenure indicating that job relationships are much more unstable at their start, while they become more stable as the tenure gets longer.

The right chart of Figure 4 plots the K-M hazard function for unemployment spells. The downward-slope of the hazard is evidence of negative duration dependence indicating that the long-term unemployed have less chance of finding a new job than the short-term unemployed. Negative duration dependence is well documented in literature (see e.g. Heckman and Borjas, 1980; Flinn and Heckman, 1982; and Lynch, 1989). It may be due to the fact that long unemployment durations discourage workers to search a new job (Schweitzer and Smith, 1974). Moreover, it may be due to deterioration of skills (see e.g. Pissarides, 1992), or it may be signal of unobserved lower productivity (Vishwanath, 1989), or it may be the result of strong competition for jobs among workers. Moreover, duration dependence in unemployment may arise in a framework were job opportunities are spread through an explicitly network of social contacts (Calvó-Armengol and Jackson, 2004).

In the next subsection we proceed to analyze parametrically the nature of the relationship among the individual and occupational characteristics and the hazards allowing for unobserved heterogeneity.

4.2 Parametric analysis

4.2.1 Econometric specification

We carry out the parametric analysis of employment and unemployment spells estimating two separate continuous time parametric Weibull models to assess the impact of causal variables on the extent of the duration dependence in employment and unemployment status[26]. We privilege continuous time to discrete time techniques as in the first case results are invariant to the time unit used to record the available data (Flinn and Heckman, 1982) and thus enabling to derive the life cycle profile of the probabilities conditional on whatever length of the employment/unemployment spells. Moreover, since the presence of unmeasured variables could give rise to spurious negative duration dependence (see Heckman, 1991), we take into account the impact of unobserved heterogeneity and we allow for a multiplicative shared frailty distributed as a gamma[27].

According to the adopted approach, the instantaneous hazard rates for unemployment (u) and employment (e) spells are modelled as following:

$$h^j(t) = h_0^j(t^j) \exp\left(\beta\prime X^A\right) \theta^j \qquad \text{with} \quad j = u, e \tag{14}$$

where, t_j is the elapsed duration in a given state, $h_0^j(t^j) = (t^j)^\alpha$is the baseline hazard that here takes the Weibull distribution, $\beta\prime X^A$ is a linear combination of observed demographic and occupational characteristics, θ^j is the multiplicative effect that captures unobserved heterogeneity.

Observed heterogeneity is controlled for by a set of covariates X^A that capture individual and job characteristics.

Previous studies evidence that transitions between labor market states are affected by time elapsed in the current state but also by time spent in the previous state. (see for example Heckman and Borjas, 1980; Heckman and Flinn, 1982), thus, we allow for both

[26] We choose this model instead of the widely used semiparametric proportional Cox's model because the latter does not specify a parametric form for the hazard preventing from deriving the transition probabilities of interest. In many cases, the two approaches (parametric vs semiparametric) produce similar results in term the effect of explanatory variables on the hazard rate (see e.g Petrongolo, 2001).

[27] The data that we use convey information on multiple spells per workers, thus allowing for shared frailty entails modelling heterogeneity among workers as a random effect.

duration and lagged duration dependence as well as time dependence. Among covariates we include age, daily salary which capture the time dependence, as well as the length of the previous employment (non-employment) spell which captures the lagged duration dependence. In addition we consider explanatory variables that are fixed over the spell and over the life cycle and are measured at the beginning of the spell[28], they include: cohort, gender, type of occupation, industry, firm size and geographic area.

4.2.2 Results

Table 4 displays the estimated coefficients and the marginal effects for the employment duration model[29]. According to our results all kinds of the allowed dependence are significant. In particular, we find evidence of negative current duration dependence, i.e. the longer the time elapsed in a job spell the more likely the worker will remain employed. We find that there's significant lagged duration dependence, i.e. the longer the previous unemployment spell the higher the risk of exiting the current employment spell. These results support the evidence that unemployment episodes may have a scarring effect on future labor market histories both in terms of subsequent earnings (Arulampalam, 2001) and in terms of subsequent risk of job separation (Arulampalam et al., 2001 and Gregg, 2001). Moreover, according to the human capital theory explanation the unemployment spell induces a deterioration of individual skills but also lower opportunity to accumulate work experience: the longer an unemployment spell the higher the loss of productivity which induces a higher probability of subsequent job termination. Indeed, the probability of being employed depends on the level of wage at the beginning of the spell which seems to act as a proxy of the workers' level of productivity: the higher the wage at the beginning of the job spell the higher the worker's productivity which contributes to lower the probability of job termination.

Our results support the evidence of time dependence, too. In our specification, time

[28] In the duration analysis of unemployment spells, the job related covariates are fixed at the value taken at the end of the previous employment spell.

[29] Negative marginal effects (positive coefficients for the hazard rate) indicate that the covariates reduces the duration, while positive marginal effects (negative coefficients for the hazard rate) indicate that the covariates increases the duration.

dependence is introduced by controlling for the worker's age at the beginning of the job spells. We find that the older the worker at the beginning of the spell the lower the risk of exiting it and the longer the job tenure. This pattern reverses after reaching the middle age, as evidenced by the (significant) second order term of the polynomial in age.

The risk of job separation is less likely for men than for women. Women are thus more likely to encounter discontinuous careers. Job interruptions in the construction industry are more frequent than in the manufacturing and the services industries. North- Western and Central regions are those with longer job relations, while shorter tenures characterize jobs in the South and North-East. Not surprisingly, the probability of separation is monotonically decreasing with the dimension of the firm, shorter tenures are more frequent in small firms and become longer as the average dimension increases. In our data, young cohorts face higher job instability than older cohorts, which is not surprising since young cohorts are more affected by fixed-term contracts with respect to the older cohorts.

Table 5 shows the results for the unemployment duration model. Our estimates document negative current duration dependence for the unemployment status. In addition, we support the evidence for all kinds of duration dependence. In particular, Table 5 shows that the longer the past employment spell the higher the chance of exiting the current unemployment spell becoming employed. This evidence supports the view that the longer the employment spell the greater the productivity enhancement from the working experience which may result in a higher probability of terminating the subsequent unemployment spell. Indeed, the probability of remaining unemployed depends on the level of wage at the beginning of the spell. Here, we are analyzing the unemployment duration, thus the wage measured at the beginning of the spell is the last wage received in the previous employment spell. Our result indicates that the level of wage earned upon termination of the preceding job experience taken as a proxy of the level of the workers' productivity may act as a signal affecting the chance of new job finding.

Time dependence is significant also in determining the nature of the unemployment persistence: the higher the age at entry the higher the chance of terminating the current unemployment spell, although this pattern reverses at old ages as indicated by the second

order term of the polynomial in age.

The chance of exiting the unemployment status is lower for females who are more likely to be involved in non market activities than males (see e.g. Lynch, 1989).

In our specification, we evaluate the influence of last job occupation characteristics on the current unemployment duration. Workers who face job interruptions from medium and large size firms have a lower chance of getting a new job. For workers in the Northern regions, especially Eastern ones, the hazard rate of finding a job is higher than in the rest of Italy. These findings, together with the evidence on the duration of job spells support the importance of local conditions in determining the dualistic nature of the Italian formal labor market.

Finally, younger cohorts are more likely to exit from the unemployment spells with respect to older cohorts. This evidence, coupled with the significant higher instability of job relations for younger cohorts is coherent with the more widespread use of flexible contracts for young workers since middle '90s, as documented in Fugazza (2011), among others.

Importantly, in case of both employment and unemployment durations, our results are robust to the unobserved heterogeneity.

According to our results, both duration and lagged duration dependence turn out to affect significantly the transition process between the two states. Thus we have to rely on simulation techniques to derive the probability distributions of interest, namely, the transition probabilities from employment to unemployment and viceversa (π_t^{ee}, π_t^{eu} and π_t^{ue}) as well as the unconditional probability distribution of being unemployed (p_t^u) over the life cycle. In particular, we simulate the entire working careers for the representative workers of all G working groups who are assumed enter the labor market at the age of 20 and to retire at the age 60. For each representative worker g we simulate, according to the estimated Weibull models, a large number of possible survival times in the initial state, i.e. employment or unemployment. Using the same methodology we simulate the ongoing spells until the age of 60[30]. In Figure 5, we report the life cycle profiles for the transition

[30]In the Appendix we outline the simulation technique followed to derive the probability distributions of interest.

distributions π_t^{ee} and π_t^{eu} implied by the simulated working life careers. Both are hump shaped with respect to age implying an hump shaped probability of being employed and thus a "U" shaped unemployment probability profile over the life cycle.

5 Empirical analysis of advanced withdrawals

5.1 Econometric specification

In this section we carry out the analysis on the advanced withdrawing behavior. The decision of taking an advanced withdrawal is modelled through a latent variable Y^*

$$Y_{it}^* = \nu_i + \gamma' X_{it}^B + u_{it} \tag{15}$$

and

$$\begin{aligned} WITH &= 1 \text{ if } Y^* > 0 \\ WITH &= 0 \text{ otherwise} \end{aligned} \tag{16}$$

X_{it}^B is the vector of observed demographic and occupational characteristics for the individual i time t, ν_i is the individual random effect[31] and $WITH$ is the indicator variable introduced in section 3 denoting whether the worker i at time t takes an advanced withdrawal from the existing stock of TFR . In this work, we favour random against fixed effects since a large number of workers do not display time variation in the withdrawing behavior[32]. Among explanatory variables introduced and discussed in section 3 we include a third order polynomial in age, gender, industry, geographic area, firm size, type of occupation, the birth year cohort, the logarithm of annual earnings received in year t and the logarithm of the accumulated stock of TFR at the end of previous year $(t-1)$.

[31] We assume that individual specific effects are unrelated to observable characteristics restricting the distribution of heterogeneity.

[32] In section 3, we show that the 95% of individual-year pairs is not affected by advanced withdrawals.

5.2 Results

In Table 6 we report the results for the coefficient estimates and their standard errors [33]. The cubic polynomial function captures well the hump-shaped age profile of withdrawals at young ages, when probably the TFR is used to finance the home purchase and when people are more likely to face liquidity constraints. The probability of taking a withdrawal is in fact increasing with age till $35-40$ years old and then slightly decreases (see Figure 7). These results can be reconciled with the empirical evidence on liquidity constraints. In Jappelli (1990), Cannari and Ferri (1997) and Fabbri and Padula (2001) is shown that the age has a negative effect on the probability of being liquidity constrained. Magri (2002) found that age has a positive effect on the demand of debt and that the probability of being subscriber of a mortgage increases until middle ages. Since the $ETFR_t^{LIQ}$ plays the strongest role when individuals are young and are more likely to face binding liquidity constraints, we conjecture that it is used more likely for home purchasing than for medical care expenses.

Women are less likely to take withdrawals than men and on average blue collars are more likely to withdraw than white collars. Workers in Southern of Italy are more likely to take advanced withdrawals. The sector of activity is significantly relevant in order to disentangle which group of workers is more likely to take a withdraw from their TFR while our analysis does not evidence a clear cut relation between firm size and the chance of taking withdrawal. The data show that, with respect to workers employed in the construction industry, those who work in manufacturing and in services are less likely to take a withdrawal. Younger cohorts show a higher probability of taking advanced withdrawals. Finally, the probability is higher the lower the level of annual labor income and the higher the accumulated stock of TFR supporting the view that anticipated withdrawals from the TFR are taken to overcome liquidity constraints when also credit rationing is at playing. Taking the type of occupation as a proxy of the level of education attained we can recon-

[33] The performed Wald test indicates that the coefficients are jointly significant at 10% level. The log-likelihood ratio test confirms that the panel-level variance component is important. supporting the preference for the panel over the pooled estimation.The estimator used relies on Gauss-Hermite quadtrature to evaluate the log likelihood and derivatives. Results are stable under alternative quadrature approximations.

cile our results with the empirical evidence on the impact of personal characteristics on both the debt market participation and on the probability of being liquidity constrained. Magri (2002) finds that less educated people and in general low income earners are more likely to face credit constraints in terms of loan size. Thus, these results seem to confirm that advanced withdrawals are taken more frequently in case of liquidity constraints combined with the higher chance of being credit rationed.

6 Expected evolution of the TFR

In this section we report results for the expected distribution of the TFR over the life cycle ((11) − (13)). For each working group g,we evaluate the potential amount TFR_t available at each age conditional on being employed (10) as well as the three components (11) − (13) using the probability distributions obtained in section 4 (π_t^{ee}, π_t^{eu}, π_t^{ue} and p_t^e, p_t^u) as well as (λ_t) the advanced withdrawal behavior predicted according to the model estimated in section 5[34].

In Tables 7 and 8, we report for male and female workers the expected distribution of the TFR among the tree components (11) − (13).The results are reported by working groups defined according demographic and occupational characteristics: gender, type of occupation, geographic area, industry and firm size, age and birth year cohort. In Tables 7 and 8, we focus on the expected composition of the TFR evaluated for workers belonging to three birth year cohorts (1950 -59, 1960-69, 1970-79), at the age of 25, 40 and 60 years old and working in small and large firm size (with less than 10 and more than 1000 employees, respectively).

According to our results the portion of the TFR that is expected to be accumulated until retirement represents the main component being on average about 67% against an amount of 31% that is expected to be paid upon job separation, while the remaining 2% is on average withdrawn in advance to finance specific needs. In particular, the amount that is expected to be accumulated as $ETFR_t^{RET}$ is positively correlated with the employment

[34]In simulations, the annual labor income y_t is proxied by the average value observed by age, gender and type of occupation. The annual inflation τ_t is set to the value of 2%.

probability which is hump shaped over the life cycle with substantial heterogeneity across working groups. Males workers and white collars display the highest amount of TFR that is expected to be accumulated until retirement. As shown in Tables 7 and 8, at the age of 60, the average expected $ETFR_t^{RET}$ accumulated by male workers is about 71% of the total while the corresponding value for females is about 64%. The gender gap is higher for blue than white collars. For blue collars, who experience higher job instability over the life cycle, the average amount that is expected to be available as Retirement-TFR is about the 65% for males and 57% for females. The average expected $ETFR_t^{RET}$ for males white collars is about 77% while for females is 70%. Differences among females and males are stronger in southern regions. Workers in the North of Italy display more stable working life careers which implies an expected ERetirement –TFR higher of about 8% than workers in south, a gap that is less strong for male workers (7%) than for females (9%).

Differences in job mobility imply also a great dispersion of the expected $ETFR_t^{BUF}$ across workers. The amount potentially available as a buffer displays a "U" shaped profiles over the life cycle reflecting the dynamics of the individual probability of job separation with respect to age. At middle ages (40 years old), the difference in the amount expected to be available for blue and white collars is about 13% while the gap between females and males is about 8%, on average. For workers in southern region the potential buffer component is on average 10% higher than for workers in the North West. The different degree of job stability at industry level leads to an expected $ETFR_t^{BUF}$ for workers in the construction industry on average 12% higher than in the manufactory industry. The average gap in the expected buffer component explained by the firm size is modest. The amount in small firms is on average 8% higher than in large firms. This evidence contrasts sharply with Fugazza and Teppa (2005) who perform a similar empirical analysis and find that the variation of the $ETFR_t^{BUF}$ is almost explained by the average dimension of the firm. However, Fugazza and Teppa (2005) evaluate the proportion of the TFR that is expected to paid during the working life considering job separations only, which are higher for small firms. In this paper, instead, we look at the entire working life, and thus we thus

we take into account the probability of job separation conditional on being employed and the chance re-employment at each stage of the life cycle. Thus, the observed relatively modest gap between small and large firms is due to the composition effect between the probability of job separation - higher for workers in small firms, and the probability of re-employment - lower if workers are dismissed by large firms. These results suggest that there is a potential relevant role for the $ETFR_t^{RET}$, which is stronger for the young, the women and the blue collars who work in small firms operating in the less developed geographic areas. In the present work we estimated the importance of the TFR as a potential buffer for precautionary motives on the basis of administrative data which do not allow to evaluate the actual role played by the TFR withdrawn.

As reported in Tables 7 and 8, the $ETFR_t^{LIQ}$ accounts for a small proportion of the accumulated TFR for all representative workers. The proportion of the accumulated TFR that is expected to be withdrawn in advance is humped shaped over the life cycle when both the accumulated TFR and the probability of being employed are higher relatively to young and old ages. The highest values are found at middle ages for all working groups. Men and white collars exhibit the highest expected amount of withdrawing, on average 1% higher than women and blue collars[35]. Since our analysis is based on administrative data we are not able to distinguish between advanced withdrawals for home purchasing or for health reasons. However, we observe that, ceteris paribus, the $ETFR_t^{LIQ}$ plays the strongest role when workers are relatively younger and/ or likely face binding liquidity constraints we conclude that the amount withdrawn in advance is probably mostly used to buy a house.

7 Conclusions

The TFR has been advocated as panacea to the lack of resources for Italian employees' supplementary pension provisions: pension reforms introduce strong incentives to divert TFR flows to pension funds and heavily penalize withdrawals upon job dismissal. Thus,

[35] According to results in section 5, white collars have a lower propensity to take advanced withdrawals. However, here we evaluate the expected proportion of the amount taken in advance, which is affected also by the probability of being employed.

diversion to pension funds is appropriate for workers facing continuous job careers since it represents a way to accumulate substantial retirement wealth exploiting tax benefits and potentially high rewarding investment opportunities. However, since the TFR may also act as a protection against unemployment or specific needs, the more discontinuous the job careers and the higher the propensity to take advance withdrawals the lower the amount potentially available at retirement and thus less convenient the participation to pension funds.

In this paper, we evaluate the expected distribution of the TFR among the three components implied by the observed mobility across labor market states and the propensity to take withdrawals before job termination. The first two components, $ETFR_t^{RET}$ and $ETFR_t^{BUF}$ are the two sides of the same coin, being related to the employment risk: other things being equal, the expected $ETFR_t^{RET}$ depends on the chance of being employed and of remaining employed, while the expected $ETFR_t^{RET}$ is related to the chance of loosing it. The amount of the expected $ETFR_t^{LIQ}$ is directly linked to the advanced withdrawing propensity.

Our results, evidence that on average the main potential role of the TFR is to finance consumption upon the end of working life, defined here $ETFR_t^{RET}$. However, we find substantial heterogeneity across workers. Several working groups, namely females, blue collars, workers in the construction industry and in southern regions, face relative high job instability due to high probability of job separation as well as lower chance of re-employment, translating in high values of the $ETFR_t^{RET}$ and lower chance of accumulating a substantial amount of TFR at retirement.

The empirical analysis on the determinants of withdrawals points out that only a minority of workers cashes out their TFR during the working life and evidences patterns that are consistent with the demand of mortgages and home ownership. Indeed, since withdrawals from TFR are more frequent at young ages we conclude that it is likely used by individuals to face home purchasing rather than for health.

The main limit of our analysis is the lack of information on consumption and saving decisions or on how the TFR obtained at job separation is spent, preventing from measuring

how much of it really serves for precautionary motives. However, our results are obtained accounting for both the risk of job separation and the chance of re-employment, thus, if we do not provide a precise measure of the role of TFR as precautionary wealth, at least we are able to indicate the expected amount that fails to accumulate until retirement.

Since for a large number of coeval heterogenous workers the TFR expected to outflow is substantial, the skeptical view on its universal role as retirement wealth is supported and serious concerns are raised on strong penalizing cashes out in case of long term unemployment. Moreover, our results point at further investigations on even different data sources with a specific focus on the TFR diverted to pension funds to understand the feasibility of investment strategies suitable to account for the risk of cashing out before retirement.

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8 Appendix

8.1 The conditional evolution of the TFR

In this Appendix we provide the proof for equation (10) in text, i.e. the potential amount of TFR available at the end of t.

$$
\begin{aligned}
&ETFR_t = ETFR_t^{RET} + ETFR_t^{LIQ} + ETFR_t^{BUF} = \\
&= p_{t-1}^e \pi_t^{ee} TFR_{t-1}(1-\lambda_t)[1+(0.015+0.75\tau)] + p_{t-1}^e \pi_t^{ee} \tfrac{y_t}{13.5} + p_{t-1}^u \pi_t^{ue} \tfrac{y_t}{13.5} + p_{t-1}^e \pi_t^{ee} TFR_{t-1}\lambda_t(1+r) + \\
&+ p_{t-1}^e \pi_t^{eu} TFR_{t-1}(1+r) = \\
&= p_{t-1}^e \pi_t^{ee} TFR_{t-1} - \lambda_t p_{t-1}^e \pi_t^{ee} TFR_{t-1} + p_{t-1}^e \pi_t^{ee} TFR_{t-1}(1-\lambda_t)(0.015+0.75\tau) + \\
&+ (p_{t-1}^e \pi_t^{ee} + p_{t-1}^u \pi_t^{ue}) \tfrac{y_t}{13.5} + p_{t-1}^e \pi_t^{ee} TFR_{t-1}\lambda_t + p_{t-1}^e \pi_t^{ee} TFR_{t-1}\lambda_t r + p_{t-1}^e \pi_t^{eu} TFR_{t-1} + p_{t-1}^e \pi_t^{eu} TFR_{t-1} r \\
&= p_{t-1}^e (\pi_t^{ee} + \pi_t^{eu}) TFR_{t-1} + p_{t-1}^e \pi_t^{ee} TFR_{t-1}(0.015+0.75\tau)(1-\lambda_t) + p_{t-1}^e \pi_t^{eu} TFR_{t-1} r + \\
&+ p_{t-1}^e \pi_t^{ee} TFR_{t-1}\lambda_t r + (p_{t-1}^e \pi_t^{ee} + p_{t-1}^u \pi_t^{ue}) \tfrac{y_t}{13.5}
\end{aligned}
\tag{17}
$$

noting that $\pi_t^{ee} + \pi_t^{eu} = 1$ and $p_{t-1}^e \pi_t^{ee} + p_{t-1}^u \pi_t^{ue} = p_t^e$ and given that $r = 0.015 + 0.75\tau$, then

$$
ETFR_t = p_{t-1}^e TFR_{t-1}[1+(0.015+0.75\tau)] + p_t^e \tfrac{y_t}{13.5} \tag{18}
$$

is the amount of TFR that is potentially available at the end of t conditional the working life career before t.

8.2 Simulating the working life careers

In this Appendix, we outline the simulation methodology used to obtain the profiles of the expected life cycle working careers from the estimated transition intensities from employment to unemployment and vicevesa.

According to results reported in section 4, the transition process between the two states of interest (employment and non-employment) is as a non-homogeneous semi Markov chain. Both duration and lagged duration dependence turn out to affect significantly the transition process between the two states. Thus, to derive the transition probability distributions at each point of the working life we have to rely on MonteCarlo simulation

techniques.

In particular, for each representative worker g, we simulate the entire working careers. We assume that working life careers stat at the age of 20 and lasts at the age of 60 years old. At the age of 20, the representative worker may be either employed or unemployed, being the initial probability distribution of the two states is taken from the empirical fraction of employed to non employed at that age. We simulate the survival time T in the initial state employment (unemployment). In particular, we simulate a large number N ($N = 5000$) of lengths for the first employment (unemployment) spell by drawing from the Weibull distribution with shape and scale parameters that depends on the value of the covariates as well as the estimated coefficients (see Table 3 and 4). As the aim is to generate the working histories for the average representative worker of each group g, the parameter governing the individual heterogeneity θ is set to 1. The survival time T is thus function of the individual and job characteristics that remain fixed over the life cycle but also on characteristics that vary over the life cycle: the age and the daily salary at the beginning of the spell and the duration of the previous simulated unemployment (employment) spell[36] Using the same methodology we simulate the ongoing spells. Thus, for each representative worker, we end up with N simulated working histories, i.e. sequences of employment and unemployment spells. From each sequence, we can determine the employment status at each age and by averaging across sequences we can obtain the both the conditional and the unconditional probability of being employed /unemployed at each point of the life cycle.

[36] In simulations, the daily salary at the beginning of the spell is proxied by the average daily salary observed by age, gender and type of occupation.

Tables

Table 1 Summary statistics on the sample composition

Individual and occupational characteristcs		Employement spells		Unemployment Spells[1]	Employment spells length≥4 years
Female		0.35		0.35	0.33
Male		0.65		0.65	0.67
%	Females	Males	All		
Manufacturing	0.38	0.37	0.37	0.42	0.58
Construction	0.01	0.27	0.18	0.18	0.09
Services	0.60	0.36	0.45	0.40	0.33
North West	0.30	0.27	0.28	0.28	0.36
North East	0.32	0.22	0.26	0.23	0.24
Center	0.19	0.16	0.17	0.18	0.19
South	0.19	0.35	0.29	0.31	0.22
Firm size					
1 - 9	0.41	0.40	0.40	0.40	0.28
10 - 19	0.15	0.16	0.16	0.16	0.15
20 - 199	0.27	0.30	0.29	0.29	0.33
200 -999	0.09	0.08	0.08	0.08	0.12
> 1000	0.07	0.06	0.07	0.07	0.13
Blue collar	0.67	0.88	0.80	0.81	0.74
White collar	0.33	0.12	0.20	0.19	0.26
Cohort 1940 - 49	0.12	0.12	0.12	0.16	0.28
Cohort 1950 - 59	0.19	0.20	0.20	0.21	0.24
Cohort 1960 - 69	0.39	0.39	0.39	0.37	0.33
Cohort 1970 - 79	0.30	0.29	0.29	0.27	0.16
Median					
Age at entry	26	28	27	29	28
Daily salary	56.49	66.00	63.09	60.39	64.76
Annual earnings	15,615.08	17,850.98	17149.16		19,772.4
TFR	2,985.00	3,110.93	3,073.95		5,282.615
Duration (in years)	1.16	1.00	1.08	0.69	6.92
Num. spells	50,992	94,905	145,897	100,246	45,571
Num subjects	17,445	44,737	62,182	62,182	28,459

Source: WHIP, Work Histories Italian Panel, years 1985-2002.
Note: In case of unemployment spells, occupational characteristics refer to the last job spells preceding the current unemployment spell.

Table 2

Individual and occupational characteristics (%)	Advanced Withdrawls: Percentage of observations	Advanced Withdrawls: Percentage of employment spells
Female	0.05	0.08
Male	0.05	0.09
Industry		
Manufacturing	0.05	0.097
Construction	0.06	0.057
Services	0.05	0.078
Geographic Area		
North West	0.05	0.09
North East	0.05	0.086
Center	0.05	0.086
South	0.06	0.069
Firm size		
1 – 9	0.05	0.063
10 – 19	0.05	0.084
20 – 199	0.05	0.094
200 -999	0.04	0.096
> 1000	0.05	0.131
Type of occupation		
Blue collar	0.05	0.08
White collar	0.05	0.093
Num. Observations	367,797	45,571

Source: WHIP, Work Histories Italian Panel, years 1985-2002

Table 3
Employment Duration Maximum Likelihood Estimates of the Weibull model with unobserved heterogeneity

Variable	**Coefficients**	**Marginal Effects**
Age	-0.068***	0.091***
	[0.004]	[0.005]
Age^2/10	0.009***	-0.012***
	[0.001]	[0.001]
Gender (ref. Male)		
Female	0.197***	-0.256***
	[0.013]	[0.016]
Industry (ref. Services)		
Manufacturing	-0.457***	0.659***
	[0.011]	[0.018]
Construction	0.119***	-0.152***
	[0.015]	[0.018]
Firm size (ref. 1- 9)		
10-19	-0.125***	0.175***
	[0.012]	[0.017]
20 - 199	-0.247***	0.352***
	[0.011]	[0.016]
200 - 999	-0.475***	0.803***
	[0.017]	[0.036]
> 1000	-0.427***	0.71***
	[0.02]	[0.041]
Geographic area (ref. South)		
North West	-0.437***	0.659***
	[0.015]	[0.025]
North East	-0.201***	0.285***
	[0.015]	[0.023]
Center	-0.306***	0.46***
	[0.016]	[0.027]
Type of occupation (ref. Blue collar)		
White Collar	-0.817***	1.492***
	[0.014]	[0.036]
Length previous unemployment spell	0.155***	-0.208***
	[0.003]	[0.004]
Log daily salary at the beginning of the spell	0.101***	-0.135***
	[0.012]	[0.016]
Cohort (ref. 1979- 79)		
Cohort 1940-49	-0.010	0.015
	[0.028]	[0.038]
Cohort 1950 -59	-0.144***	0.202***
	[0.021]	[0.031]
Cohort 1960-69	-0.185***	0.255***
	[0.015]	[0.021]
Constant	1.129***	
	[0.081]	
α	0.895***	
	[0.003]	
θ	1.036***	
	[0.01]	
Log-likelihood	-58380.53	
N. observations	145,897	

Note: *** p<0.01, ** p<0.05, * p<0.1 ; standard errors are in brackets.
Source: WHIP, Work Histories Italian Panel, years 1985-2002

Table 4
Unemployment Duration Maximum Likelihood Estimates of the Weibull model with unobserved heterogeneity

Variable	**Coefficients**	**Marginal Effects**
Age	0.068***	-0.033 ***
	[0.004]	[0.002]
Age^2/10	-0.007***	0.004***
	[0.000]	[0.000]
Gender (ref. Male)		
Female	-0.914***	0.558***
	[0.015]	[0.011]
Industry (ref. Services)		
Manufacturing	-0.021*	0.002
	[0.011]	[0.005]
Construction	-0.191***	0.087***
	[0.015]	[0.008]
Firm size (ref. 1- 9)		
10-19	0.105***	-0.057***
	[0.011]	[0.005]
20 - 199	0.042***	-0.032***
	[0.01]	[0.005]
200 - 999	-0.080***	0.019**
	[0.017]	[0.008]
> 1000	-0.147***	0.055***
	[0.02]	[0.01]
Geographic area (ref. South)		
North West	0.932***	-0.363***
	[0.015]	[0.006]
North East	1.021***	-0.377***
	[0.016]	[0.006]
Center	0.500***	-0.201***
	[0.017]	[0.006]
Type of occupation (ref. White collar)		
Blue Collar	-0.415***	0.16***
	[0.014]	[0.005]
Length previous employment spell	0.035***	-0.197***
	[0.003]	[0.002]
Log daily salary at the beginning of the spell	0.016***	-0.016***
	[0.005]	[0.002]
Cohort (ref. 1979- 79)		
Cohort 1940-49	-0.331***	0.113***
	[0.029]	[0.014]
Cohort 1950 -59	-0.581***	0.03**
	[0.023]	[0.013
Cohort 1960-69	-0.439***	-0.165***
	[0.017]	[0.012]
Constant	-0.583***	
	[0.065]	
α	0.850***	
	[0.002]	
θ	2.292***	
	[0.014]	
Log-likelihood	-128188.96	
N. observations	100,246	

Note: *** p<0.01, ** p<0.05, * p<0.1 ; standard errors are in brackets.
Source: WHIP, Work Histories Italian Panel, years 1985-2002

Table 5 Advanced withdrawing behaviour –Estimates of the multi-period logit model with random effetcts

Variable	Coefficients	Marginal Effects
Age	0.238***	0.007***
	[0.047]	[0.001]
Age^2/10	-0.050***	-0.002***
	[0.012]	[0.000]
Age^3/100	0.003***	0.000***
	[0.001]	[0.000]
Gender (ref. Male)		
Female	-0.173***	-0.005***
	[0.022]	[0.001]
Type of occupation (ref. Blue Collar)		
White Collar	-0.240***	-0.007***
	[0.023]	[0.001]
Geographic area (ref. Center)		
North West	-0.139***	-0.004***
	[0.026]	[0.001]
North East	-0.124***	-0.004***
	[0.028]	[0.001]
South	0.261***	0.009***
	[0.031]	[0.001]
Firm size (ref. >1,000)		
1 - 9	0.252***	0.008***
	[0.033]	[0.001]
10-19	0.330***	0.011***
	[0.035]	[0.001]
20 – 199	0.288***	0.009***
	[0.03]	[0.001]
200 – 999	-0.032	-0.001
	[0.034]	[0.001]
Industry (ref. Services)		
Manufacturing	-0.145***	-0.005***
	[0.022]	[0.001]
Construction	0.283***	0.010***
	[0.035]	[0.001]
Log earnings $_{t-1}$	-0.406***	-0.013***
	[0.029]	[0.001]
Log TFR $_{t-1}$	0.712***	0.022***
	[0.018]	[0.001]
Tenure (Log years)	0.029	0.009
	[0.029]	[0.001]
Cohort (ref. 1940-49)		
Cohort 1950 -59	0.143***	0.005***
	[0.040]	[0.001]
Cohort 1960-69	0.294***	0.009***
	[0.052]	[0.002]
Cohort 1970 -79	0.406***	0.014***
	[0.060]	[0.002]
Constant	-11.348***	
	[0.580]	
σ_v	0.819	
	[0.042]	
ρ	0.169	
	[0.015]	
Log-Likelihood	-66192.225	
N. observations	367,797	

Note: *** p<0.01, ** p<0.05, * p<0.1. Source: WHIP, Work Histories Italian Panel, years 1985-2002

Table 6 Expected Distribution of TFR – Male workers

A) Cohort 1950-59

		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.66	0.72	0.69	0.71	0.77	0.83	0.80	0.81	0.77	0.82	0.80	0.81	0.86	0.90	0.88	0.89
	40	0.66	0.72	0.69	0.70	0.77	0.83	0.80	0.81	0.78	0.83	0.81	0.81	0.87	0.90	0.89	0.89
	50	0.63	0.71	0.68	0.69	0.77	0.83	0.80	0.81	0.77	0.83	0.81	0.81	0.87	0.91	0.89	0.89
$ETFR^{BUF}$	25	0.33	0.26	0.30	0.28	0.21	0.16	0.19	0.17	0.22	0.16	0.18	0.17	0.12	0.09	0.10	0.10
	40	0.32	0.25	0.28	0.26	0.20	0.14	0.16	0.15	0.20	0.14	0.16	0.15	0.11	0.07	0.09	0.08
	60	0.35	0.27	0.30	0.28	0.21	0.15	0.17	0.16	0.21	0.14	0.17	0.16	0.11	0.07	0.09	0.08
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.02
	40	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.04
	60	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03
									Construction								
$ETFR^{RET}$	25	0.54	0.63	0.59	0.59	0.66	0.73	0.70	0.71	0.66	0.72	0.68	0.70	0.77	0.83	0.80	0.81
	40	0.55	0.61	0.59	0.60	0.66	0.73	0.70	0.71	0.66	0.72	0.69	0.71	0.78	0.83	0.81	0.81
	60	0.52	0.60	0.57	0.57	0.63	0.72	0.69	0.70	0.64	0.72	0.69	0.69	0.77	0.83	0.81	0.81
$ETFR^{BUF}$	25	0.45	0.36	0.40	0.39	0.33	0.25	0.29	0.27	0.33	0.26	0.30	0.28	0.21	0.15	0.18	0.16
	40	0.43	0.36	0.38	0.37	0.31	0.24	0.27	0.25	0.31	0.24	0.27	0.25	0.19	0.13	0.16	0.14
	60	0.47	0.39	0.41	0.40	0.35	0.25	0.29	0.27	0.34	0.25	0.28	0.28	0.21	0.14	0.16	0.15
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	40	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.04	0.04	0.05
	60	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.04
									Services								
$ETFR^{RET}$	25	0.58	0.65	0.62	0.63	0.70	0.77	0.74	0.75	0.70	0.76	0.72	0.74	0.81	0.86	0.83	0.84
	40	0.60	0.64	0.61	0.62	0.71	0.78	0.74	0.75	0.70	0.77	0.74	0.74	0.81	0.86	0.84	0.84
	60	0.56	0.63	0.60	0.61	0.68	0.76	0.73	0.74	0.69	0.76	0.73	0.74	0.81	0.87	0.84	0.85
$ETFR^{BUF}$	25	0.42	0.34	0.36	0.35	0.29	0.22	0.25	0.24	0.29	0.22	0.26	0.24	0.18	0.13	0.15	0.14
	40	0.39	0.33	0.36	0.34	0.27	0.20	0.23	0.21	0.27	0.20	0.23	0.22	0.16	0.11	0.13	0.12
	60	0.43	0.35	0.38	0.37	0.30	0.22	0.25	0.23	0.29	0.21	0.25	0.23	0.17	0.11	0.14	0.12
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.02
	40	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.03	0.03	0.03	0.04
	60	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03

(continued) - Expected Distribution of TFR – Male workers

		Cohort 1960-69															
		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.63	0.71	0.67	0.68	0.72	0.79	0.76	0.77	0.75	0.82	0.78	0.80	0.83	0.88	0.85	0.86
	40	0.64	0.72	0.67	0.70	0.73	0.80	0.76	0.78	0.77	0.83	0.79	0.80	0.84	0.88	0.86	0.86
	60	0.61	0.71	0.66	0.68	0.72	0.80	0.76	0.78	0.75	0.83	0.79	0.81	0.84	0.89	0.87	0.88
$ETFR^{BUF}$	25	0.36	0.28	0.32	0.30	0.27	0.20	0.23	0.21	0.24	0.16	0.20	0.18	0.16	0.11	0.13	0.11
	40	0.33	0.25	0.30	0.26	0.24	0.17	0.20	0.18	0.21	0.14	0.17	0.15	0.14	0.09	0.11	0.10
	60	0.37	0.26	0.32	0.29	0.27	0.18	0.21	0.19	0.23	0.14	0.18	0.16	0.14	0.09	0.11	0.09
$ETFR^{LIQ}$	25	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	40	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.03	0.04
	60	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.02	0.02	0.03
									Construction								
$ETFR^{RET}$	25	0.52	0.61	0.57	0.58	0.61	0.70	0.66	0.67	0.64	0.72	0.66	0.70	0.74	0.81	0.77	0.78
	40	0.55	0.62	0.57	0.59	0.63	0.70	0.66	0.68	0.66	0.73	0.68	0.71	0.75	0.81	0.78	0.79
	60	0.51	0.59	0.56	0.57	0.60	0.70	0.65	0.67	0.64	0.73	0.68	0.71	0.74	0.82	0.78	0.79
$ETFR^{BUF}$	25	0.47	0.38	0.42	0.40	0.38	0.29	0.33	0.30	0.34	0.26	0.31	0.27	0.25	0.17	0.21	0.19
	40	0.43	0.35	0.40	0.37	0.35	0.26	0.30	0.28	0.31	0.22	0.28	0.24	0.22	0.15	0.18	0.16
	60	0.48	0.39	0.42	0.41	0.39	0.28	0.32	0.30	0.34	0.24	0.29	0.25	0.23	0.15	0.19	0.17
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.03
	40	0.02	0.03	0.03	0.04	0.02	0.04	0.03	0.04	0.03	0.04	0.05	0.06	0.03	0.04	0.04	0.05
	60	0.01	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04
									Services								
$ETFR^{RET}$	25	0.55	0.63	0.59	0.61	0.64	0.72	0.67	0.69	0.67	0.74	0.69	0.73	0.76	0.83	0.79	0.81
	40	0.57	0.64	0.59	0.61	0.65	0.73	0.69	0.71	0.69	0.76	0.71	0.74	0.78	0.84	0.81	0.82
	60	0.53	0.62	0.57	0.60	0.63	0.72	0.67	0.69	0.67	0.76	0.71	0.73	0.77	0.84	0.80	0.82
$ETFR^{BUF}$	25	0.45	0.36	0.40	0.37	0.36	0.27	0.32	0.29	0.32	0.24	0.29	0.25	0.23	0.16	0.19	0.17
	40	0.42	0.33	0.39	0.35	0.33	0.24	0.28	0.26	0.29	0.21	0.25	0.22	0.20	0.13	0.16	0.14
	60	0.46	0.36	0.41	0.38	0.36	0.26	0.31	0.28	0.31	0.22	0.26	0.24	0.21	0.13	0.17	0.15
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	40	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.04
	60	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03

(continued) - Expected Distribution of TFR – Male workers

		Cohort 1970-79															
		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.61	0.67	0.62	0.65	0.72	0.78	0.76	0.77	0.72	0.78	0.75	0.76	0.83	0.87	0.85	0.86
	40	0.61	0.66	0.64	0.65	0.73	0.78	0.76	0.77	0.72	0.79	0.75	0.76	0.83	0.87	0.85	0.85
	60	0.58	0.66	0.63	0.64	0.71	0.79	0.75	0.76	0.71	0.78	0.75	0.76	0.83	0.88	0.86	0.86
$ETFR^{BUF}$	25	0.38	0.32	0.36	0.33	0.26	0.20	0.23	0.21	0.26	0.20	0.23	0.21	0.16	0.11	0.13	0.12
	40	0.37	0.31	0.33	0.31	0.25	0.18	0.21	0.19	0.25	0.18	0.21	0.19	0.14	0.10	0.11	0.10
	60	0.40	0.32	0.35	0.34	0.27	0.19	0.22	0.21	0.27	0.19	0.22	0.20	0.15	0.10	0.12	0.11
$ETFR^{LIQ}$	25	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	40	0.02	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.04	0.04
	60	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03
									Construction								
$ETFR^{RET}$	25	0.51	0.55	0.53	0.55	0.61	0.67	0.65	0.65	0.60	0.67	0.61	0.64	0.72	0.78	0.75	0.77
	40	0.52	0.57	0.53	0.54	0.61	0.67	0.64	0.65	0.62	0.67	0.63	0.65	0.73	0.79	0.76	0.76
	60	0.49	0.55	0.54	0.53	0.58	0.66	0.64	0.63	0.60	0.66	0.63	0.64	0.72	0.78	0.76	0.76
$ETFR^{BUF}$	25	0.48	0.44	0.46	0.44	0.38	0.32	0.34	0.33	0.38	0.31	0.37	0.33	0.26	0.20	0.22	0.21
	40	0.47	0.40	0.44	0.43	0.36	0.29	0.32	0.30	0.35	0.29	0.33	0.30	0.23	0.17	0.20	0.18
	60	0.50	0.44	0.45	0.45	0.40	0.31	0.34	0.34	0.39	0.31	0.35	0.33	0.26	0.18	0.21	0.20
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03
	40	0.01	0.03	0.02	0.03	0.02	0.04	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.04	0.04	0.05
	60	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.04
									Services								
$ETFR^{RET}$	25	0.54	0.59	0.56	0.58	0.65	0.71	0.68	0.70	0.64	0.70	0.67	0.69	0.76	0.82	0.79	0.80
	40	0.54	0.59	0.56	0.59	0.65	0.72	0.68	0.70	0.65	0.71	0.67	0.68	0.77	0.83	0.80	0.80
	60	0.52	0.57	0.56	0.56	0.63	0.71	0.67	0.68	0.64	0.71	0.67	0.69	0.76	0.83	0.80	0.80
$ETFR^{BUF}$	25	0.46	0.40	0.43	0.41	0.34	0.28	0.31	0.28	0.34	0.28	0.31	0.29	0.22	0.16	0.19	0.18
	40	0.44	0.38	0.42	0.38	0.32	0.25	0.29	0.27	0.32	0.25	0.29	0.27	0.20	0.14	0.17	0.15
	60	0.47	0.41	0.43	0.42	0.36	0.27	0.31	0.29	0.35	0.27	0.30	0.28	0.22	0.15	0.18	0.16
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	40	0.01	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.05	0.03	0.03	0.04	0.04
	60	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03

Table 7 Expected Distribution of TFR - Female workers

		Cohort 1950-59															
		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.49	0.59	0.56	0.57	0.55	0.65	0.61	0.63	0.61	0.71	0.65	0.70	0.68	0.77	0.71	0.75
	40	0.53	0.65	0.59	0.62	0.59	0.70	0.64	0.68	0.67	0.76	0.71	0.75	0.73	0.81	0.77	0.79
	60	0.53	0.63	0.58	0.62	0.59	0.69	0.62	0.67	0.67	0.77	0.70	0.74	0.73	0.82	0.77	0.80
$ETFR^{BUF}$	25	0.51	0.40	0.44	0.42	0.45	0.34	0.39	0.36	0.38	0.28	0.34	0.29	0.32	0.22	0.28	0.24
	40	0.46	0.34	0.39	0.36	0.40	0.29	0.34	0.30	0.31	0.21	0.26	0.23	0.25	0.17	0.21	0.19
	60	0.46	0.36	0.41	0.37	0.40	0.30	0.37	0.32	0.32	0.22	0.28	0.24	0.26	0.17	0.22	0.18
$ETFR^{LIQ}$	25	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	40	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.01	0.02	0.02	0.02
	60	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.01	0.02	0.02
									Construction								
$ETFR^{RET}$	25	0.44	0.55	0.51	0.52	0.48	0.60	0.55	0.58	0.55	0.66	0.61	0.64	0.62	0.71	0.66	0.70
	40	0.46	0.58	0.54	0.56	0.52	0.65	0.59	0.62	0.61	0.71	0.66	0.68	0.67	0.76	0.71	0.74
	60	0.48	0.57	0.52	0.56	0.54	0.63	0.58	0.62	0.61	0.70	0.63	0.68	0.67	0.76	0.70	0.74
$ETFR^{BUF}$	25	0.56	0.44	0.48	0.47	0.52	0.40	0.44	0.42	0.44	0.33	0.38	0.35	0.38	0.28	0.33	0.29
	40	0.53	0.40	0.44	0.41	0.47	0.33	0.39	0.36	0.38	0.26	0.31	0.28	0.31	0.22	0.27	0.23
	60	0.52	0.41	0.47	0.42	0.45	0.36	0.41	0.37	0.38	0.28	0.35	0.29	0.32	0.22	0.28	0.24
$ETFR^{LIQ}$	25	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	40	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03
	60	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01	0.02	0.02	0.03
									Services								
$ETFR^{RET}$	25	0.43	0.52	0.50	0.51	0.47	0.57	0.53	0.55	0.53	0.62	0.59	0.61	0.58	0.67	0.61	0.66
	40	0.45	0.55	0.52	0.54	0.51	0.60	0.57	0.59	0.57	0.67	0.63	0.66	0.64	0.73	0.67	0.71
	60	0.47	0.54	0.50	0.52	0.50	0.57	0.54	0.58	0.57	0.66	0.60	0.63	0.62	0.72	0.65	0.70
$ETFR^{BUF}$	25	0.56	0.48	0.50	0.49	0.53	0.43	0.47	0.45	0.47	0.37	0.41	0.38	0.41	0.32	0.38	0.33
	40	0.54	0.44	0.48	0.45	0.49	0.38	0.42	0.39	0.42	0.31	0.35	0.32	0.35	0.25	0.31	0.27
	60	0.53	0.45	0.49	0.47	0.49	0.42	0.45	0.41	0.42	0.33	0.39	0.35	0.37	0.27	0.33	0.28
$ETFR^{LIQ}$	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01
	40	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
	60	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02

(continued) - Expected Distribution of TFR – Female workers

		Cohort 1960-69															
		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.54	0.64	0.61	0.62	0.64	0.74	0.70	0.72	0.69	0.77	0.73	0.75	0.78	0.85	0.81	0.83
	40	0.57	0.66	0.62	0.64	0.67	0.75	0.71	0.73	0.71	0.79	0.75	0.76	0.80	0.86	0.83	0.84
	60	0.53	0.65	0.60	0.61	0.64	0.75	0.70	0.72	0.69	0.79	0.74	0.76	0.79	0.86	0.83	0.84
$ETFR^{BUF}$	25	0.45	0.35	0.38	0.36	0.35	0.25	0.29	0.27	0.30	0.21	0.26	0.23	0.21	0.14	0.18	0.15
	40	0.41	0.32	0.36	0.33	0.32	0.22	0.27	0.24	0.27	0.18	0.23	0.20	0.18	0.12	0.15	0.13
	60	0.46	0.34	0.39	0.37	0.35	0.24	0.29	0.26	0.30	0.20	0.24	0.22	0.20	0.12	0.15	0.14
$ETFR^{LIQ}$	25	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
	40	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03
	60	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
									Construction								
$ETFR^{RET}$	25	0.46	0.55	0.51	0.53	0.53	0.64	0.60	0.61	0.57	0.67	0.62	0.64	0.67	0.76	0.72	0.74
	40	0.48	0.57	0.54	0.54	0.55	0.65	0.61	0.62	0.60	0.68	0.64	0.66	0.70	0.77	0.74	0.75
	60	0.45	0.54	0.51	0.51	0.52	0.63	0.58	0.59	0.57	0.67	0.63	0.65	0.67	0.77	0.73	0.74
$ETFR^{BUF}$	25	0.54	0.44	0.48	0.47	0.47	0.35	0.39	0.38	0.42	0.32	0.37	0.34	0.32	0.23	0.27	0.24
	40	0.51	0.42	0.45	0.44	0.43	0.33	0.37	0.35	0.38	0.29	0.33	0.30	0.28	0.20	0.23	0.21
	60	0.55	0.45	0.48	0.48	0.48	0.36	0.41	0.39	0.42	0.31	0.35	0.33	0.31	0.21	0.25	0.23
$ETFR^{LIQ}$	25	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02
	40	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.03	0.02	0.03	0.03	0.04	0.02	0.03	0.03	0.04
	60	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03
									Services								
$ETFR^{RET}$	25	0.48	0.57	0.53	0.54	0.56	0.66	0.62	0.64	0.60	0.69	0.64	0.67	0.70	0.78	0.74	0.76
	40	0.50	0.59	0.54	0.57	0.58	0.68	0.63	0.65	0.62	0.71	0.66	0.69	0.72	0.80	0.76	0.78
	60	0.47	0.56	0.52	0.53	0.55	0.66	0.60	0.63	0.60	0.70	0.65	0.67	0.70	0.79	0.75	0.77
$ETFR^{BUF}$	25	0.52	0.42	0.46	0.45	0.44	0.34	0.37	0.35	0.39	0.30	0.35	0.31	0.30	0.20	0.25	0.22
	40	0.49	0.39	0.44	0.41	0.41	0.30	0.35	0.32	0.36	0.27	0.31	0.28	0.26	0.18	0.22	0.19
	60	0.52	0.43	0.47	0.46	0.45	0.33	0.38	0.36	0.39	0.29	0.33	0.31	0.29	0.19	0.23	0.21
$ETFR^{LIQ}$	25	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	40	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03
	60	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02

(continued) - Expected Distribution of TFR – Female workers

		Cohort 1970-79															
		Blue Collars								White Collars							
		Small firms: 1-19				Large firms: >1000				Small firms: 1-19				Large firms: >1000			
	Age	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center	South	NorthWest	North East	Center
									Manufacturing								
$ETFR^{RET}$	25	0.54	0.62	0.58	0.59	0.62	0.72	0.66	0.70	0.66	0.74	0.69	0.72	0.75	0.82	0.78	0.80
	40	0.56	0.64	0.58	0.61	0.64	0.73	0.68	0.70	0.68	0.75	0.71	0.73	0.77	0.84	0.81	0.81
	60	0.52	0.61	0.57	0.59	0.61	0.71	0.66	0.68	0.66	0.75	0.70	0.73	0.76	0.84	0.80	0.82
$ETFR^{BUF}$	25	0.46	0.37	0.41	0.40	0.37	0.27	0.33	0.29	0.33	0.24	0.29	0.26	0.24	0.17	0.20	0.18
	40	0.43	0.34	0.40	0.36	0.34	0.25	0.30	0.27	0.30	0.22	0.26	0.23	0.21	0.14	0.17	0.15
	60	0.47	0.37	0.42	0.39	0.38	0.27	0.32	0.30	0.33	0.23	0.28	0.25	0.23	0.15	0.18	0.16
$ETFR^{LIQ}$	25	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02
	40	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.03	0.03
	60	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
									Construction								
$ETFR^{RET}$	25	0.46	0.53	0.51	0.51	0.52	0.60	0.58	0.59	0.56	0.62	0.58	0.61	0.65	0.73	0.69	0.71
	40	0.47	0.54	0.51	0.53	0.54	0.62	0.58	0.60	0.57	0.65	0.60	0.63	0.67	0.74	0.71	0.72
	60	0.45	0.52	0.50	0.50	0.51	0.60	0.56	0.57	0.54	0.64	0.60	0.61	0.64	0.74	0.69	0.71
$ETFR^{BUF}$	25	0.53	0.46	0.48	0.48	0.47	0.39	0.41	0.40	0.43	0.36	0.41	0.37	0.34	0.25	0.30	0.28
	40	0.53	0.44	0.48	0.46	0.45	0.36	0.40	0.38	0.41	0.32	0.37	0.34	0.31	0.23	0.26	0.24
	60	0.54	0.47	0.50	0.49	0.49	0.38	0.43	0.41	0.45	0.34	0.39	0.37	0.34	0.24	0.29	0.26
$ETFR^{LIQ}$	25	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02
	40	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.03	0.03	0.04
	60	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.03
									Services								
$ETFR^{RET}$	25	0.48	0.55	0.52	0.54	0.54	0.62	0.58	0.61	0.58	0.66	0.62	0.63	0.66	0.75	0.71	0.73
	40	0.50	0.57	0.52	0.54	0.57	0.64	0.59	0.62	0.61	0.67	0.62	0.66	0.69	0.77	0.72	0.75
	58	0.47	0.54	0.50	0.52	0.53	0.62	0.59	0.60	0.57	0.66	0.62	0.64	0.67	0.76	0.72	0.74
$ETFR^{BUF}$	25	0.52	0.44	0.47	0.46	0.46	0.37	0.41	0.38	0.41	0.33	0.37	0.35	0.33	0.24	0.28	0.25
	40	0.50	0.42	0.47	0.44	0.42	0.34	0.39	0.36	0.38	0.30	0.36	0.31	0.29	0.21	0.25	0.22
	60	0.53	0.46	0.49	0.47	0.47	0.37	0.40	0.38	0.42	0.32	0.36	0.34	0.31	0.22	0.26	0.24
$ETFR^{LIQ}$	25	0.00	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	40	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.03	0.02	0.02	0.02	0.03
	60	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02	0.02

Figures

Figure 1 Mean Annual Earnings

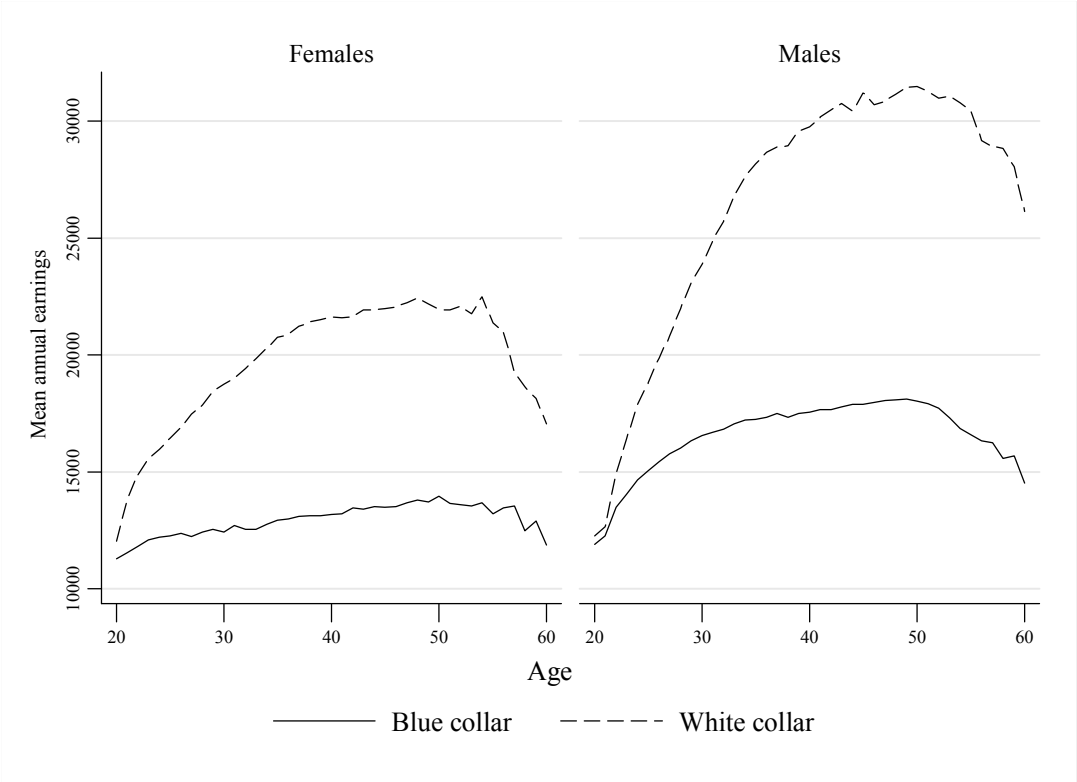


Figure 2 Mean TFR stock

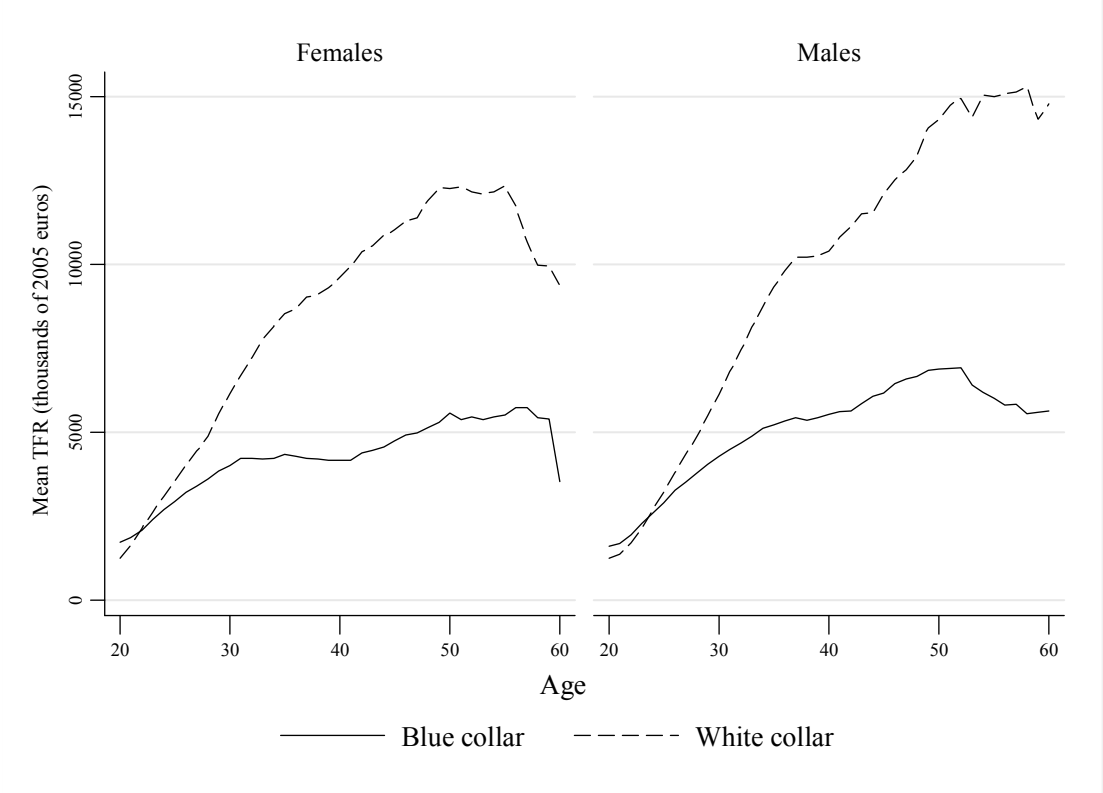


Figure 3 Average spell duration

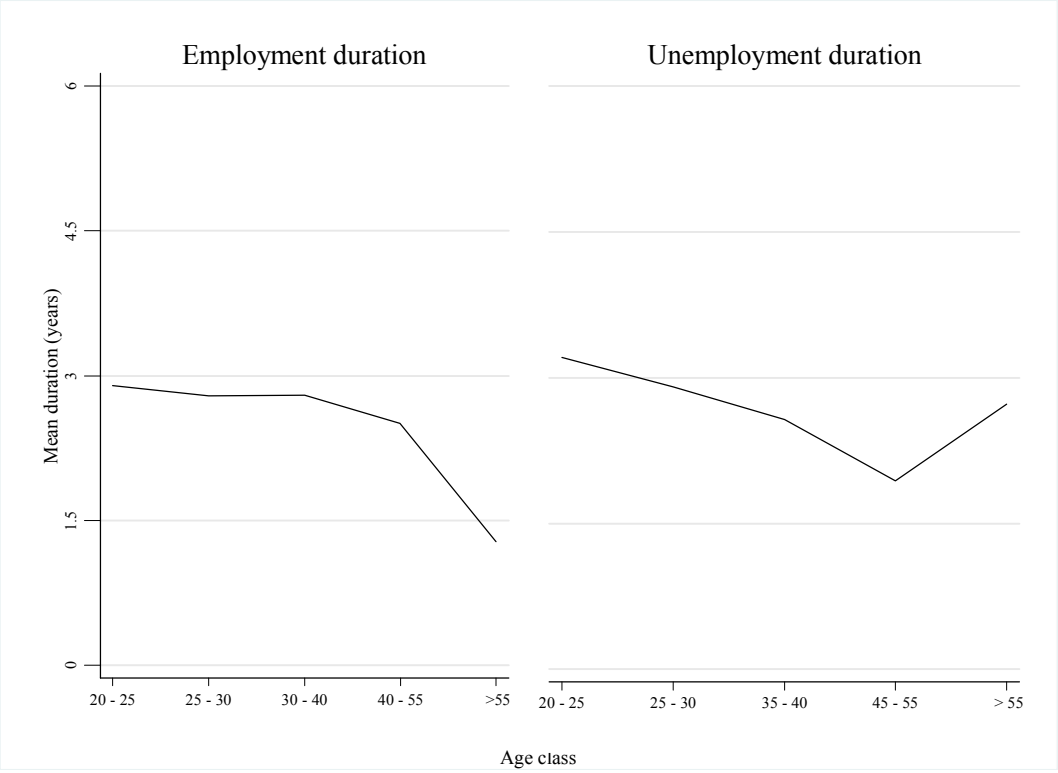
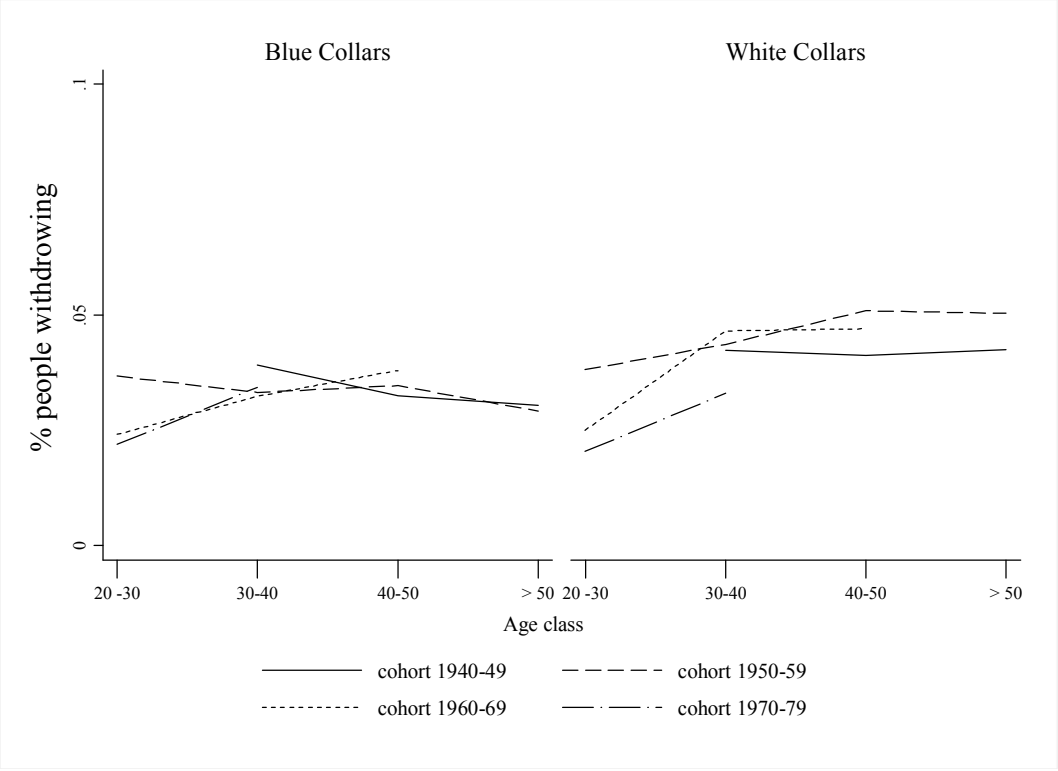


Figure 4 Advanced withdrawal behaviour

4a) Females



4b) Males

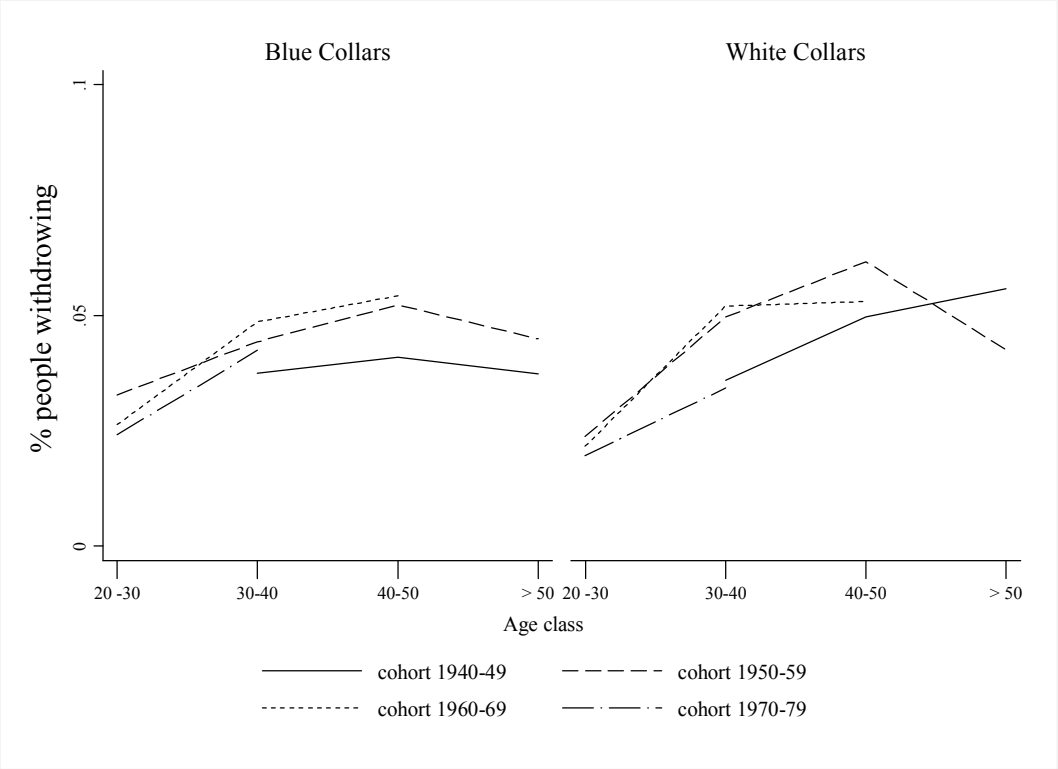


Figure 5 Smoothed hazard estimates

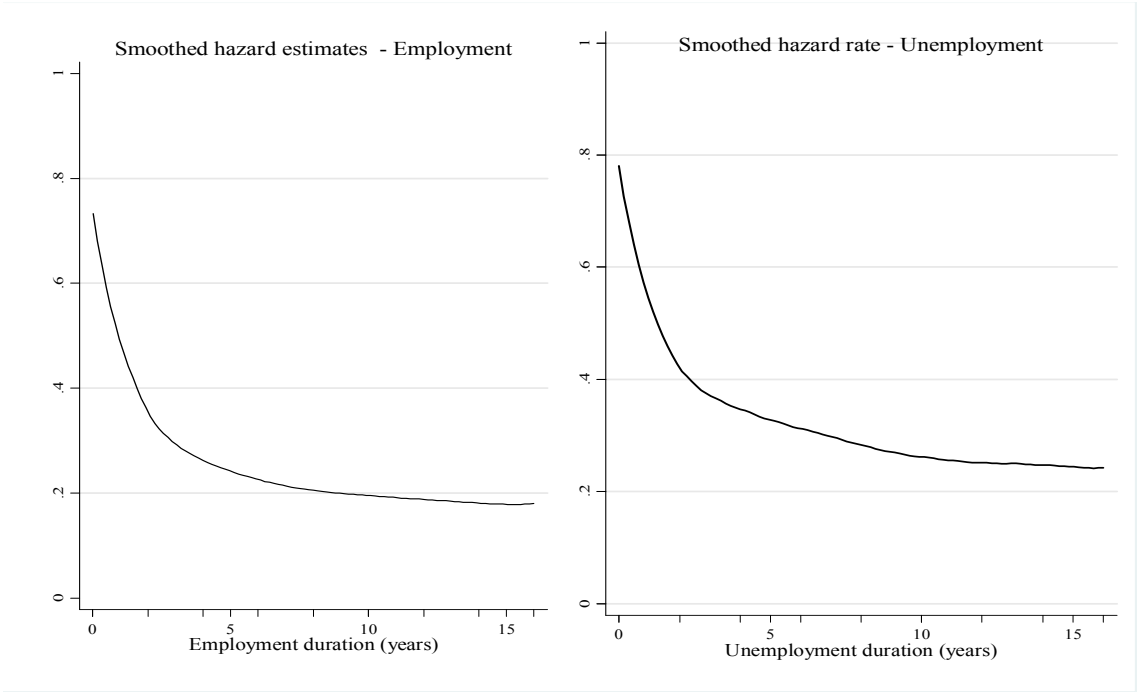


Figure 6 Transition probability distributions

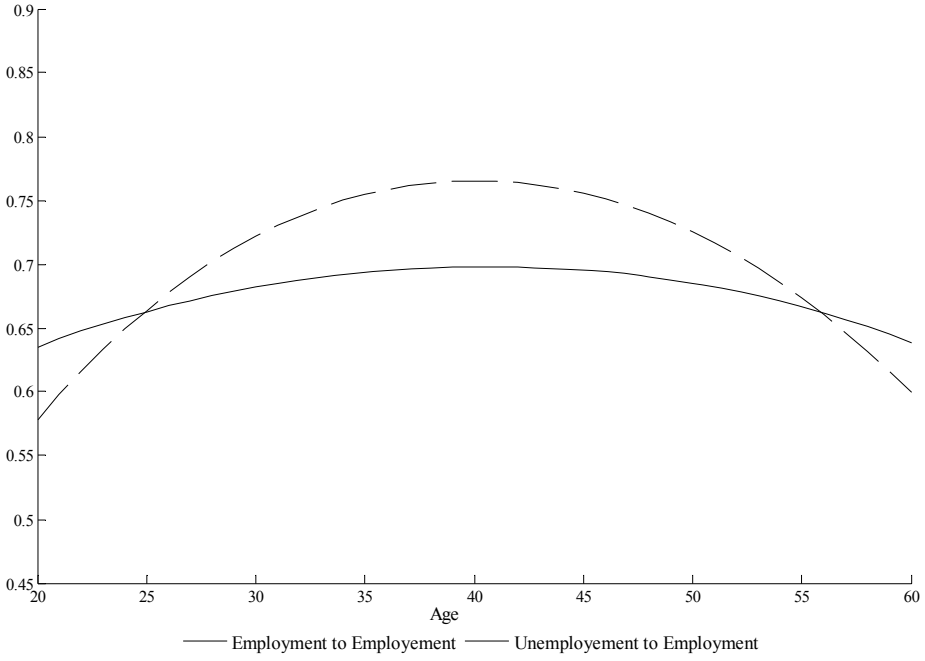
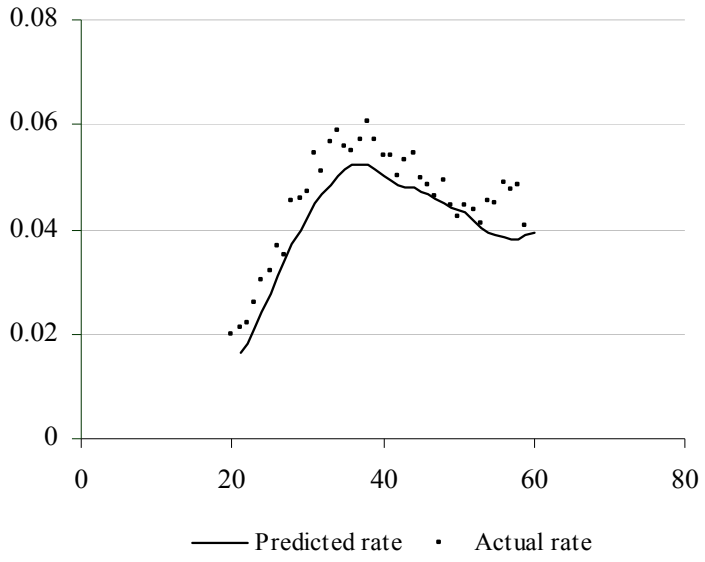


Figure 7 Withdrawal rate by age



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