Employment Protection, Job-Tenure and Short Term Mobility Wage Gains An Application to the Italian Case*

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Abstract

The main goal of this paper is to analyze theoretical and empirical links between job-tenure and short-term mobility wage gains. Standard theoretical approaches examining this subject (search theory, job-matching and on-the-job training models) predict a negative correlation between these variables. Furthermore, this result has been confirmed in different applied researches for US. However, European labour market institutions appear to be quite different from US ones, especially for employment protection and turnover costs. Taking this feature into account we develop a simplified model, evaluated through analytical and simulation procedures, where optimal switching condition determines a positive correlation between job-tenure and short-term mobility wage gains. The main proposition derived from our model is confirmed for the Italian case. Using a panel database and different econometric specifications we find out that short-term mobility wage gains are non linear and positively correlated with job-tenure.

JEL codes: J3, J58, J6 and C2

Keywords: Job-tenure, employment protection, mobility wage gains, panel data estimation.

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1 Introduction

Job mobility effects on wage dynamics are analyzed through different approaches, which could be classified in two main groups: "static models" without on-the-job wage dynamics and "dynamic models" allowing both between and within-job wage variations.

Search theory belongs to the first group because wage dynamics is entirely explained by discrete jumps (short-term mobility wage gains) at the switching time.

Dynamic approaches are often described as job-matching or human capital models where wage growth increases after every job change while short-term mobility wage gains (MWG) will be rather negatives except for some specific cases explained in section 2.2.

As it will be shown in our theoretical survey, all these theories predict a negative correlation between short-term MWG and job-tenure.

In Search Theory models, shorter job-tenures and higher MWG are strongly correlated for younger workers while the opposite effect appears for more experienced employees.

As far as dynamic specifications are concerned, similar results can be obtained because both on-the-job training and job-matching models entail a negative correlation between job-tenure and short-term MWG. Such a result is mainly derived from the idiosyncratic feature of specific human capital (SHC) and "matching" information.

This theoretical relationship appears to be confirmed by recent empirical evidence where short-term MWG are decreasing functions in previous job tenure or within-firm worker experience.

However, both theoretical and applied research have been developed to explain the US labor market behavior[1], where employment protection is the lowest among OECD countries[2]. Results cannot be generalized for European countries where employment protection legislation and labor market institutions play a more important role entailing a relevant trade-off between mobility wage gains and job-uncertainty. Indeed, these institutional differences appear could be useful to explain large disparities between US and Italy concerning job-tenure effects on retention rates[3] (the probability to remain in the same job).

For this reason, our main theoretical objective is to develop an analytical framework allowing for "risk effects" involving a positive correlation between job-tenure and short-term MWG. We will use a model where turnover costs are positively correlated with job tenure while job uncertainty decreases with these costs. A key feature of this model is the asymmetric uncertainty between job positions due to differences in job-tenure. Indeed, as turnover costs increase with job-tenure, current job uncertainty will be always lower than that of outside

[1] As it will be presented in following sections, almost all studies analysing job-tenure effects on MWG have used US panel data. See Carroll and Powell (2002), Gottschalk (2001) or Buchinsky *et al.* (2001).

[2] See for instance the OECD (1999) ranking concerning Employment Protection Legislation.

[3] See figure (10).

alternatives (where job-tenure will be zero when a job change takes place). When this difference increase (because of job-tenure in current employment) short-term MWG must also increase to fulfil the optimal switching rule (while long-term MWG becomes progressively unimportant to switching decisions). We prove the main model proposition by means of three different cases entailing both analytical and asymptotic (simulation) approaches.

We will test this hypothesis using the administrative database of the Italian Social Security System[4]. The whole database contains more than 2.000.000 observations for more than 300.000 different workers, for the period from 1985 to 1998.

In order to have a treatable data sub-sample we will select just those workers who are in the database at least four years out of seven. We will carry out a panel estimation with more than 330.000 observations for 61,991 male workers from 1992 to 1998. Since we are interested in dealing with both individual effects and endogeneity bias (due to the potential feedback between individual effects and job-tenure) we have decided to carry out six different specifications for an extended log-wage equation (OLS, fixed effects, first differences, IV fixed effects, IV first differences and General 2SLS).

The structure of the paper is the following. In section 2 we summarize the standard economic theories concerning MWG. In section 3 an empirical survey concerning the issues of this paper is presented. In section 4 we develop an analytical model (also calibrated through bootstrapping simulation) showing that under specific assumptions it is possible to obtain a positive correlation between short-term MWG and previous job-tenure. In section 5 we present the empirical application to the Italian case using the INPS panel data set. Concluding remarks are reported in section 6.

2 Theoretical survey

2.1 Static approaches to MWG

Search Theory[5] central hypothesis supposes that wage gains, which are derived from working mobility, are the result of discrete jumps in the wage level when the worker moves between job positions (assuming that after this jump the wage level is constant up to the next job-switch).

These models suppose that worker productivity is constant along his/her working experience. Nevertheless, his/her wage can vary among different firms. Each of them can get distinct worker productivity levels. Using this framework, Burdett (1978) examines the dynamic of the voluntary working mobility. In his model, workers search 'on-the-job' considering a stable distribution of potential wages, with imperfect (and costly) information regarding the location of higher wage jobs.

[4] We work on a panel version of this database, elaborated by ISFOL.

[5] Search Theory seminal paper is Phelps *et al* (1970). Some lately developments are Mortensen and Pissarides (1999) or Pissarides (2000), among others.

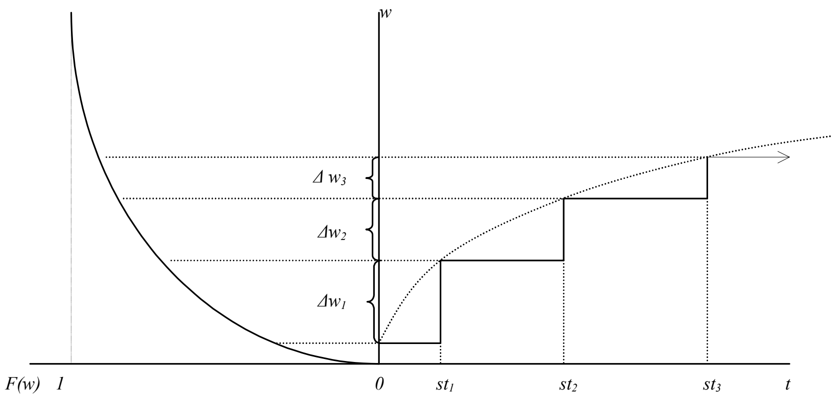

Figure 1: Job-switching and wage dynamics under the search theory approach

Imperfect information and turnover costs determine a positive effect from mobility on wage growth. Furthermore, supposing the stability of the (between-jobs) wage distribution function determinates an additional corollary: MWG grow at decreasing rates with job switching intensity. Indeed, when workers "move" voluntarily, they go up inside the wage distribution function $F(w)$. Therefore, if $F(w)$ is continuous and strictly increasing in w, the "marginal probability" of getting a better paid job (as well as the size of expected MWG) decreases with the number of job changes.

We can see from figure 1 that MWG (Δw) is a decreasing function both in the wage level and in the "switching intensity", while job tenure (that is, the segment between st_i *and* $st_j, \forall\ i \neq j$) appears to be an increasing function in these variables. Hence, search theory wage dynamics could be formally presented as:

$$\dot{w} = \partial w/\partial t = \psi(SWI, w_0, X_0, \dot{X}) \tag{1}$$

Where t is time, SWI is the switching intensity, w_0 is the initial wage level and X represents the vector of variables affecting SWI, reservation wage or wage distribution function (with $\psi_1' \geqslant 0$, $\psi_1'' < 0$ and $\psi_2' < 0$ while the sign of remaining partial derivatives is indeterminate).

To resume, the Search Theory allows inferring an increasing relationship (but at decreasing rates) between wages and job mobility thoroughly explained by discrete jumps at the switching time.

2.2 Dynamic approaches to MWG

According to dynamic models benefits from mobility are not always characterized by discrete changes in the wage distribution (short term gains when the job change takes place). On the contrary, they are established regarding the expected wage evolution in the new job (in long term bases).

Jovanovic (1979) develops a job-matching model, which assumes as given the new job value while current job value evolves stochastically according to the information about the actual worker productivity.

The starting wage depends on the expected worker productivity. In competitive markets, when new information is revealed the wage level evolves according with productivity variations. A job change takes place when the value of the outside option is higher than the current job expected value (the latter is modified along with the gathered information on the expected productivity of the firm-worker matching).

In spite of these propositions, we have not found a general pattern for the wage dynamics and its relationship with job mobility. In order to do so we shall assume some complementary hypotheses. First of all, we shall specify the main characteristics of information dynamics about the expected worker productivity. Traditional solution (see Mortensen, 1988) involves the hypothesis that information is accumulated at decreasing rates (according to the worker tenure) and it is not transferable among enterprises.[6] It must be also assumed that there exists a selection bias, which entails that those workers with a negative wage dynamics (due to a starting wage higher than actual productivity) are under-represented in all samples observing long-term dynamics (because it is expected that these workers would quit their jobs faster). Using these hypothesis it is possible to claim that:

1. on-the-job wage will increase at decreasing rates;

2. any job-change entails a greater wage growth (regarding the last wage growth in the previous job);

3. short-term MWG (the difference between the last wage in the old job and the first wage in the new one) could be negative if switching conditions are guaranteed.

Figure 2 shows the most usual cases for the hypothesis already exposed, through which we can analyze the relationship between working mobility (job changes occur in ta) and the wage dynamics according to the job-matching theory. In panel (b) we assume a homogeneous information dynamics among firms, whereas in panel (a) we suppose that information about worker productivity grows faster in the new job. When required conditions for a job change are fulfilled, the starting wage of the new job (w_{ta}^{B}) in panel (b) must be necessary higher than the starting wage of the current job (w_{o}^{A}). In panel (a), existing asymmetry (amongst different job positions) about information dynamics removes this "inequality constraint" in starting wages.

[6] This hypothesis is not shared by all authors (Eriksson, 1989). Therefore, the theoretical impact of working mobility on wage dynamic in job-matching models is considerably modified.

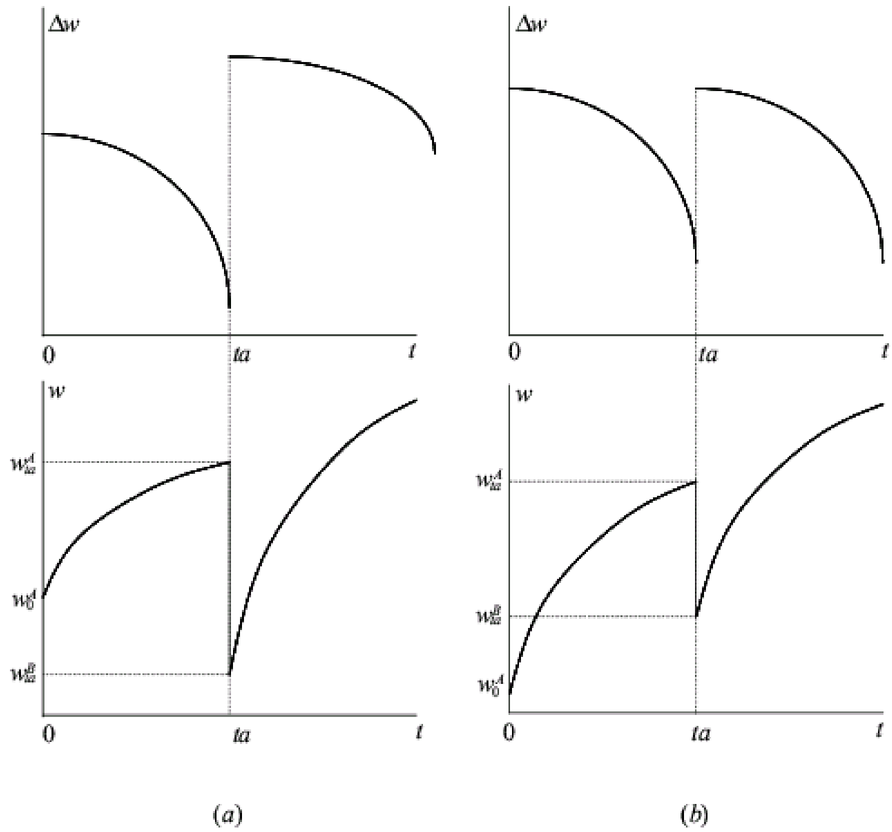

Figure 2: Job-Matching approach to job-switching and wage dynamics (idiosyncratic firm-worker information)

In both panels there is a short-term wage fall determined by the assumption of non-transmissible information about worker productivity. If this assumption is relaxed, results change completely and MWG will be mainly explained by an initial jump in the wage level followed by a weaker wage growth path.[7]

Two general propositions are useful to resume existing relationships between job-change and wage gains in a job-matching analytical framework:

1. Job mobility can incorporate a short-term earnings drop if it is compensated by a higher wage growth in the new job;
2. Dynamic characteristics of information process entail a concave wage evolution (even without job mobility) with indeterminate and discrete jumps depending on information properties:

$$\dot{w} = \partial w/\partial t = \xi(F_i(I), Tn_i, Z) \tag{2}$$

where $F_i(I)$ is the cumulated distribution function of information about worker productivity (for the i^{th} firm), Tn_i is the worker job tenure in the i^{th} firm and Z represents the vector of control variables affecting wage dynamics (with $\xi_2' > 0$, $\xi_2'' < 0$ and ξ increasing with the left-skewness of $F_i(I)$[8]).

Alternative versions for dynamic models of MWG are those based on the Human Capital approach (Becker, 1962, or Mincer, 1974). Amongst them on-the-job training models[9] highlight the fact that the relative value of current employment (along with productivity and wages) increase with job tenure because of specific human capital (SHC) accumulation[10]. However, since SHC accumulation rate is a job-tenure decreasing function (a standard hypothesis in Human Capital models *a la* Becker), wage growth will decline alongside the worker experience within a particular job.

If SHC is not transferable between firms (as claimed by Mortensen[11]), SHC accumulation rate (and wage growth) will accelerate after each job change, while short-term MWG are more ambiguous.

When between firms worker productivity is identical (for the same job-tenure) or differences are not significative, short-term MWG will be strongly negative (but afterward compensated by a higher wage growth) because of the

[7] See Campbell (2001).

[8] Because this entails a faster accumulation rate of information and therefore a higher wage growth at the beginning of job in firm i.

[9] For detailed information about on-the-job training and job-mobility relationship see Mincer (1988), Lynch (1991) or Krueger and Rouse (1998).

[10] We recall that this productivity, as well as within job wage level, is assumed to be constant in Search Theory models. For job-matching models productivity is also constant but wages increase in tenure because of information dynamics and imperfection assumptions.

[11] See Mortensen (1988)

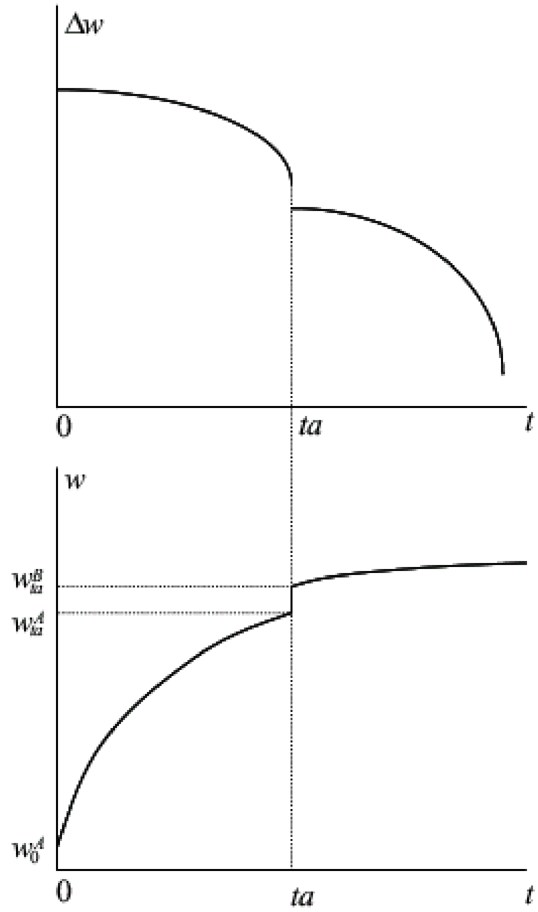

Figure 3: Job-Matching approach to job-switching and wage dynamics (non-idiosyncratic information about worker productivity)

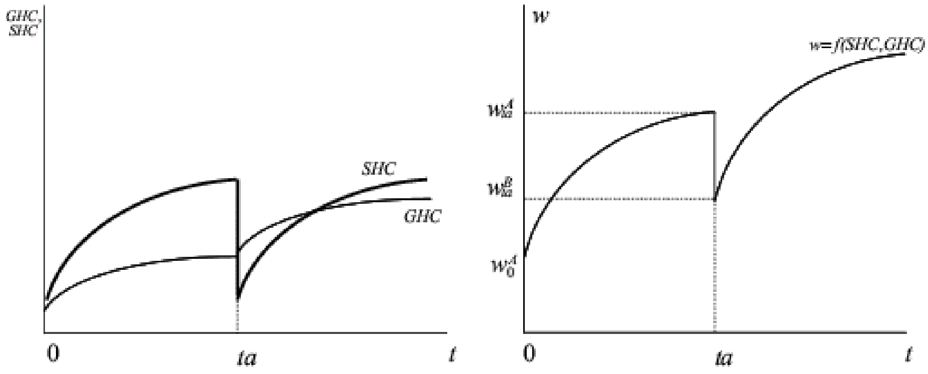

Figure 4: MWG with SHC and GHC (on-the-job) accumulation

loss of (non transferable) SHC. If the new job wage dynamics replicates that observed in the previous job, new initial wages must be forcefully higher than those observed in the previous work (but not necessarily greater than the last wage observed before the job-change). These alternatives could be graphically presented as in figure 2, panels (a) and (b) respectively.

Short-term MWG can be positives if the Mortensen's hypothesis of SHC non-transferability is removed. This is the case for a within-sector job change where the optimal switching rule could be satisfied by initial gains in the wage level. Another way to (theoretically) reduce the impact of losses in SHC on short-term MWG is to assume that within-job human capital accumulation could be decomposed between specifics and general (transferable) components[12] (when general components do not affect within-job wage growth but become non trivial in the bargaining process about the new job initial wage)[13].

When workers are able to accumulate general human capital (GHC), the short-term MWG will be negative but the wage loss will be weaker than those without GHC accumulation. The initial wage in the new job (w^B_{ta}) will be between the first and the last wage in previous employment (w^A_0 and w^A_{ta}).

Therefore, wage dynamics in on-the-job training models could be described as:

$$\dot{w} = \partial w / \partial t = \Phi(SHC, GHC) \tag{3}$$

where $SHC = h(Tn_i, W)$, $GHC = j(\sum_{i=1}^{n} Tn_i, V)$ and where V and W represent the vector of variables affecting GHC and SHC accumulation processes (with $\Phi'_1 > 0$, $\Phi'_2 > 0$ and $\Phi''_1 < 0$, $\Phi''_2 < 0$).

[12]See Antel (1985, 1986).

[13]Because it is assumed that GHC does not affect worker productivity in current (maybe not qualified) employment but could be useful for other job-positions.

Summarizing, job-matching and human capital approaches allow a dynamic analysis of MWG, including short and long-term changes in wage evolution. As a general result, wage growth will increases after every job change while short-term MWG will be rather negatives except for above described specific cases (between-firm transmissible information and GHC accumulation)[14].

2.3 Firm-worker attributes affecting MWG

In this section we make a brief survey of existing literature, which extend previous analysis to take into account some firm, worker and job position attributes affecting job changes and MWG.

Jun and Munasinghe (2002) develop a between firm mobility model with stochastic wages and irreversible turnover costs. In this model (an adaptation from price theory of financial derivatives to labor market analysis), the optimal switching rule for MWG is an increasing function in turnover costs and wage volatility. Disregarding obvious consideration for turnover cost, the key result of this paper focus on the role of wage uncertainty. The value of delaying job changes increases with time dispersion of wage differential (between firms)[15], because of rising "waiting" gains[16]. Therefore authors state that MWG must increase progressively with wage uncertainty[17].

To explain existing MWG differences between young, adult and aged workers it is usual to quote the seminal paper of Bartel and Borjas (1978). From a traditional SHC model with infinite lived agents, the authors derives that MWG are higher at the beginning of work experience[18].

More intense mobility (when voluntary) and lower initial wage for young workers can entail greater MWG. On contrary, job-changes for qualified (with SHC accumulation) high wage elderly workers are least profitable because of a lack of better wages offers and potential short-term drop in earnings (due to SHC loss) not compensated in the future (because elderly workers are not far from retirement).

[14] For Human Capital models it is useful to recall some worries about general results. Polachek (1975) states that SHC accumulation is a decreasing function of labor market experience when individuals are not infinite lived agents. Furthermore, Borjas (1978) highlights that mobile workers have lower incentives to invest in SHC because of shorter expected tenure. Therefore, even when SHC accumulation will be higher after a job change, it would be lower than that observed for non-mobile workers.

[15] We find a similar result in the Search Theory where optimal search period is an increasing function of wage dispersion.

[16] It is true that volatility also increase potential loses. However, it must be recalled that worker can always avoid this possibility just delaying the job-change decision.

[17] It is important to remark that this result is not based on risk aversion. In Jun and Munasinghe (2002), volatility increase potential 'waiting' gains. In most models with risk-averse workers, MWG do not depend explicitly on relative wage volatility. Indeed, MWG increase with the outside wage volatility but decrease with the current employment wage volatility. Therefore, effects of relative wage volatility on MWG for risk aversion models are often indeterminate.

[18] This relationship has been theoretical and empirically validated by many recent studies such as Perticara (2002).

Bartel and Borjas (1978) also found that quits and wage growth are negatively correlated[19]. Based on this relationship, Munasinghe (2002) use a "human capital–job search model" with (between jobs) heterogeneous SHC accumulation and disreputable contracting to explain a feedback between wage growth and turnover (quits). Higher SHC accumulation jobs (hence higher productivity growth jobs) allow firms to increase wages in order to retain productive workers entailing a fall in turnover rates (assuming a stable distribution function for outside wage offers). As a corollary, MWG must be higher for these workers because current employment value is greater than those estimated for individuals working in constant wage jobs.

MWG also varies with gender. Loprest (1992) or Kahn and Griesinger (1989) claims that MWG are higher for men because non-monetary job features are more appreciated by women. Following Brousse (2000), higher weight of non-monetary job features in women utility functions is strongly related to the unequal within-family distribution of main household responsibilities. Indeed, women valorization of flexible time and part-time jobs over "full-time high wage" jobs would be entirely determined by household discrimination and cultural constraints.

Besides, Contini and Villosio (2000) state that MWG are affected by other variable such as firm size, worker education and required job qualification.

Small firm to big firm job switching will imply a higher MWG because average big firm wages are usually greater (due to some profit-share mechanism[20]). Furthermore, big firms use "internal labor markets[21]", to encourage productivity (and reduce quits) entailing an increasing wage function depending on job-tenure. Therefore, short and long term MWG would be positively correlated with the "firm size gap" between current and new job positions.

In order to explain the role of education and required job qualification we will use previously presented models.

Education increases wage dispersion (expanding the range of job opportunities) faced by the worker. From search theory, it is possible to infer that optimal search period increase with wage dispersion entailing sporadic job-changes but high MWG.

Finally, required job qualification affects MWG through human capital accumulation. On-the-job training (and therefore human capital accumulation) is greater in high-skill job positions. Therefore, turnover (quits and layoffs) decreases with job qualification because specific human capital will be lost with job changes. Therefore, increasing the value of current employment, job qualification also raises the expected MWG.

[19] A result that is also supported by other authors such as Jovanovic (1979), Topel and Ward (1992) or Munasinghe (2000).

[20] For a survey of this literature see Richard (2001).

[21] See Doeringer et Piore (1971).

3 Empirical survey

Applied research on MWG has widely increased since the seminal contribution of Bartel and Borjas (1978).

In most of these papers[22], short term MWG are always around 10-20%, and they seems to be slightly correlate with individual and firm characteristics. However, other studies (with different improvements in econometric procedures) do not fully confirm these results.

Using the National Longitudinal Survey of Youth (NLSY) data (from 1979 to 1998), Perticara (2002) finds out that short term MWG of voluntary job changes are close to 7%. Following Antel's (1985) methodology to decomposes actual wages into general-human capital and specific-matching components (through fixed effect and Instrumental Variables-Generalized Least Squares methods), Perticara obtains MWG as the difference between specific matching values for two consecutive job positions. From the same survey, but using only those observations for which MWG and wage volatility information are available, Jun and Munasinghe (2002) and Munasinghe (2002) estimate an average MWG of 14.5% (conditional on a voluntary change). In addition, authors carry out OLS estimations to show that short term MWG are increasing in within-job wage volatility of both current and new jobs (especially for men and nonwhite women).

Moreover, Simonnet (1998) compares MWG for US and Germany using NLSY (1979-1993) and German Socio Economic Panel (1984-1993) data. Through a "within" panel estimation, Simonnet derives specific-matching effect for different job positions in order to find out (as main result) that voluntary MWG are significative just for US workers.

For Britain data (the British Household Panel data Survey) between 1991 and 1994, Campbell (2001) identifies short and long term MWG using both OLS and 2SLS econometric estimations. The main results of this paper are that overall MWG is about 9,6% and that short term MWG account for no more than four-tenths of overall MWG.

Unfortunately, none of these papers are useful for our comparison purposes because job-tenure effects on short term MWG are not controlled for. For this reason, we report the main results of three recent studies (for US panel data) where the composite effect of voluntary job-changes and previous job-tenure is explicitly analyzed.

Covering the period going from 1979 to 1994, and using parametric and non-parametric estimations, Carroll and Powell (2002) find out that voluntary job-switching entails a short-term MWG of 8,7% when previous job-tenure is lower than 2 years. After that, short-term MWG decrease systematically with job-tenure, becoming non-significantly different from 0 when previous work experience is higher than 6 years. Moreover, OLS coefficient for previous job-tenure (in a "between job wage change" equation) indicates that short-term MWG decrease 1,5% for each additional year in previous position.

[22] Such as Keith and McWilliams (1999), Topel and Ward (1992), Loprest (1992) or Antel (1986).

Gottschalk (2001) uses the 1986-1993 panel of the Survey of Income and Program Participation (SIPP) to perform OLS multivariate estimations of between job wage growth equations. As in Carrol and Powell (op. cit), MWG are negatively correlated with previous job-tenure: each additional month in previous position involve a wage loss of 0,3% (e.g. 3,6% per year) as a jump when workers move voluntarily between jobs.

Finally, Buchinsky et al (2001) apply a Bayesian approach (and Markov Chain Monte Carlo methods) to estimate simultaneously a participation equation, a wage equation and an between-firm mobility equation using the US Panel Study of Income Dynamics (PSID, 1975-1992). Even if results appears to be slightly different across population sub-groups (classified by education level), there is a common feature related to the fact that short-term MWG is always decreasing in job-tenure, and clearly negative for workers with more than 10 years of experience in previous job (for whom wage losses could be higher than 30% after a job-change).

4 The model: Job tenure and Short-term MWG

Theoretical relationship between job tenure and "short-term" MWG appears to be almost always negative[23].

Search theory predicts short tenures with high MWG at the beginning of labor market experience. On contrary, long tenures and weak MWG would be typical for experienced workers (because of decreasing probability of getting a better paid job, see figure 1).[24]

Moreover, on-the-job training models define a positive correlation between SHC and job-tenure, which entails a negative relationship between this variable and short-term MWG. Job-tenure increases the wage loss (at ta) because current SHC (paid at its marginal productivity) will not be appreciated in the new job.

Finally, job-matching models present a similar result. Workers with longer tenure (and higher wages) will face a higher short-term wage loss because cumulated information about worker-firm match productivity (and therefore wages) increases with job-tenure but this information is not transmissible between firms.

Generally speaking, most theoretical approaches have disregarded the case for positive correlation between job-tenure and short-term MWG[25].

However, some empirical evidence does not support previous theoretical approaches. As we will see in the following sections, short-term MWG (estimated

[23] It is useful to remind here that short-term MWG is just the difference between the first wage after job-switching and the last wage in the previous job position.

[24] Nevertheless, it is also possible to find a positive correlation between job tenure and short term MWG in Search Theory models. Conditional on wages, the longer the tenure, the higher the expected short term MWG (because job tenure is assumed to be positively correlated with on-the-job search activities). But this is true just for a given wage rate. When we allow wages to change, previous results (with a negative correlation between job-tenure and short-term MWG) still apply.

[25] Except for some particular situations, as those described in section 2 (such as transmissible information and non-idiosyncratic accumulation of SHC), and the case of optimal search decisions conditional on a given wage rate.

using Italian administrative data) appears to be positively correlated with job-tenure.

In order to overcome this problem we will present a simplified analytical framework, which derives a positive correlation between those two variables.

Let V_B and V_A be the new job (B) and the current job (A) actual values, defined as:

$$V_B = b + \int_{ta+dt}^{T} \left[b + \frac{d}{e^{1/(t-ta)}} \right] e^{-r_B(t-ta)} dt \tag{4}$$

$$V_A = a + \int_{ta+dt}^{T} \left[a + \frac{c}{e^{1/(t-ta)}} \right] e^{-r_A(t-ta)} dt \tag{5}$$

where b is the initial wage in B, ta identifies the job-switching time, $\frac{d}{e^{1/(t-ta)}}$ is the expected (non-linear) wage growth in B after ta, T is the expected termination date, a is the wage in A at ta, $\frac{c}{e^{1/(t-ta)}}$ is the expected wage growth in A after ta, t^* identifies the beginning of job A, while r_A and r_B are time discount rates for future wage flows. For simplicity we make the following assumptions $a > 0$, $b > 0$, $c > 0$ and $d > 0$.

Using previous definitions, optimal switching rule entails that,

$$b + Vg_B > a + Vg_A \tag{6}$$

where $Vg_B = \int_{ta+dt}^{T} \left[b + \frac{d}{e^{1/(t-ta)}} \right] e^{-r_B(t-ta)} dt$ is the actual value for future wages in the new job, while $Vg_A = \int_{ta+dt}^{T} \left[a + \frac{c}{e^{1/(t-ta)}} \right] e^{-r_A(t-ta)} dt$ is the actual value for future wages in the current position. Therefore, equation (6) can be posed as

$$b - a > Vg_A - Vg_B = \Phi(ta - t^*, c - d, T) \tag{7}$$

where $b - a$ is the short term MWG, with $\Phi_1' > 0$, $\Phi_2' > 0$, and $\Phi_3' > 0$ if $c > d$ and < 0 otherwise.

Therefore, we can derive our main proposition:

Proposition 1 *When wage flows are stochastic (because of job-uncertainty) and firing costs are increasing in job-tenure, short-term MWG are also increasing in both job-tenure and worker risk aversion.*

Proof. Let Fc be the firing cost function depending on job-tenure $(t - t^i)$[26], with

$$Fc^i = \tau(t - t^i), \text{ where } \tau \in R^+ \text{ and } i = [*, a] \tag{8}$$

[26] A suitable assumption for European countries.

In turn we assume firing probabilities to be inversely correlated with firing costs,

$$\begin{aligned} FP^i &= \varphi\left(Fc^i\right), \quad \text{with} \quad \varphi' < 0 & (9) \\ &= \lambda\left(t - t^i\right), \quad \text{with} \quad \lambda' < 0 & (10) \end{aligned}$$

entailing that LIFO rules (last-in-first-out) will be applied in order to adjust employment levels (all other thinks equal).

In this framework (and assuming a simple two-parameters exponential form for $\lambda(.)$[27]) it is possible to achieve a general expression for risk-adjusted firing probabilities ($RAFP$, the worker appraisal about firing probabilities when risk-aversion is taken into account):

$$\begin{aligned} RAFP_t^i &= \Omega(FP^i) \\ &= \begin{cases} 0, & \forall t = ta \\ \frac{\alpha\chi}{1+e^{\beta[\tau(t-t^i)]}}, & \forall t > ta \end{cases} \end{aligned} \qquad (11)$$

where $\chi \in [0, 2/\alpha]$ is a risk aversion coefficient , $\alpha \in (0, 2)$ represents the FP^i intercept while $\beta > 0$ is the convexity parameter.[28]

We can see that job-tenure reduces firing probabilities but non-linearly. At the beginning of any job an increase in job-tenure strongly affects hazard rates. However, as long as job-tenure goes up, and "within job experience (and then firing costs)" is higher enough to isolate workers from "employment risk", a further increase in job-tenure becomes irrelevant to modify firing probabilities (see figure 5).

$$\frac{\partial RAFP_t^i}{\partial t} = \frac{-\alpha\chi}{\left(1 + e^{\beta[\tau(t-t^i)]}\right)^2}\beta\tau e^{\beta\left[\tau\left(t-t^i\right)\right]} < 0 \qquad (12)$$

Furthermore, it is assumed that $RAFP_t^i$ is an increasing function of the risk aversion coefficient (see figure 6), entailing that,

$$\frac{\partial RAFP_t^i}{\partial \chi} = \frac{\alpha}{1 + e^{\beta[\tau(t-t^i)]}} > 0 \qquad (13)$$

Additional features of $RAFP_t^i$ involve that $\underset{(t-t^i)\to\infty}{Lim} RAFP_t^i = 0$, $\underset{(t-t^i)\to 0}{Lim} RAFP_t^i = \frac{\alpha\chi}{2}$, $\underset{\chi\to 2/\alpha,(t-t^i)\to 0}{Lim} RAFP_t^i = 1$ and $\underset{\chi\to 0}{Lim} RAFP_t^i = 0$.

Using previous statements, we can prove our main proposition by means of three different cases involving both analytic and asymptotic-like explanations.

[27] This assumption was derived from empirical observation about Italian retention rates for different levels of job-tenure (see figure 10).

[28] At $t = ta$, $RAFP_t^i$ is zero by assumption. This just entails that movers cannot be fired up to receive their first wage in the new job and stayers cannot be fired up to take their final wage in job A. Therefore, workers can be fired since $ta + dt$ (with $dt > 0$) and thereafter.

Figure 5: RAFP response to Job-tenure evolution.

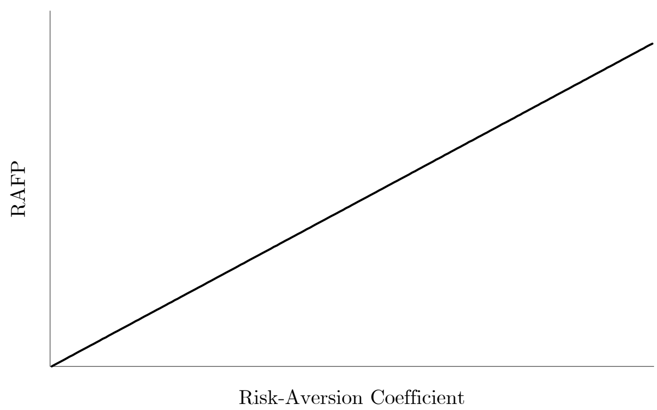

Figure 6: RAFP response the the Risk-Aversion Coefficient.

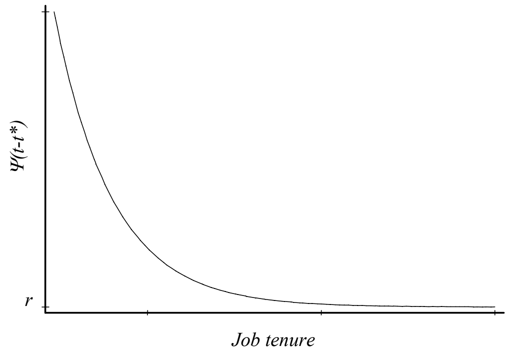

Figure 7: Impact of job tenure on the intertemporal discount factor.

Case 1 *Heterogeneous (quasi-hyperbolic) time discount rates* $(r_A \neq r_b)$

Job uncertainty depends on job-tenure (in turn affecting firing probabilities). The simplest alternative to model how this kind of risk modifies wage flow actual values is to use heterogeneous time discount rates in the following way:

$$\begin{aligned} \Psi_{(ta-t^i)} &= \frac{r}{1-RAFP_{ta+dt-t^i}} \\ &= \frac{r}{1-\frac{\alpha\chi}{1+e^{\beta\left[\tau\left(ta+dt-t^i\right)\right]}}} \end{aligned} \tag{14}$$

where $\Psi_{(ta-t^i)}$ is the job i "time-invariant" discount factor and $ta+dt-t^i$ is job i job-tenure evaluated at $ta+dt$ (with $dt>0$).

In order to avoid confusions about the properties of this specification it is useful to highlight that equation (14) does not entails an hyperbolic discount factor[29] because $\Psi_{(.)}$ does not changes with time. It changes with job-tenure (evaluated at ta) to keep constant thereafter[30].

From previous equation it is derived that job tenure reduces the time discount rate as is described below:

$$\frac{\partial\Psi_{(ta-t^i)}}{\partial t^i} = -\frac{\Psi_{(ta-t^i)}\ RAFP_{ta+dt-t^i}\ \beta\tau e^{\beta\left[\tau\left(ta+dt-t^i\right)\right]}}{\left(1-RAFP_{ta+dt-t^i}\right)\left(1+e^{\beta\left[\tau\left(ta+dt-t^i\right)\right]}\right)} < 0 \tag{15}$$

In a similar fashion, we can derive a particular expression describing time-discount rate responses to different risk aversion degrees.

[29] Originally applied by Phelps and Pollak (1968) and popularized by Laibson (1997) and Harris and Laibson (1999).

[30] However; it must be reconigsed that $\Psi_{(ta-t^i)}$ could be interpreted as an inverse-hyperbolic-like function in job-tenure (not in time). Nevertheless, this does not changes that wages flows will be homogeneously discounted amogst different time periods.

$$\frac{\partial \Psi_{(ta-t^i)}}{\partial \chi} = \frac{\alpha\ \Psi_{(ta-t^i)}}{(1-RAFP_{ta+dt-t^i})\left(1+e^{\beta[\tau(ta+dt-t^i)]}\right)} > 0 \tag{16}$$

The intuition behind equation (16) is quite simple. The higher the risk aversion, the lower the value assigned to the wage flows in the long run (because of the higher -perceived- probability to be fired). When workers are "extreme risk lovers", perceived firing probabilities are close to 0 (because of $\chi = 0$) for both job alternatives. Therefore r_A (equal to $\Psi_{(ta-t^*)}$) and r_B (roughly equal to $\Psi_{(ta-ta)}$=$\Psi_{(0)}$) will be identical to the time preference rate r. However, when risk aversion coefficient (χ) increases r_A and r_B will be no longer equal, except for the case when there is no previous job tenure in job A ($ta - t^* = 0$). Elsewhere, r_A will be always lower than r_B and the difference will be increasing in both previous job tenure and worker risk aversion.

In order to clarify previous statements we will present a particular case with risk neutral workers ($\chi = 1$) and $dt \to 0$ through which it is possible to obtain the following equations:

$$\begin{aligned} r_B &= \Psi_{(ta-ta)} \simeq \Psi_{(0)} \\ &= \frac{r}{1-\frac{\alpha}{2}} \end{aligned} \tag{17}$$

$$\begin{aligned} r_A &= \Psi_{(ta-t^*)} \\ &= \frac{r}{1-\frac{\alpha}{1+e^{\beta[\tau(ta-t^*)]}}} < r_B \end{aligned} \tag{18}$$

Under these hypotheses, we have that,

$$V_{gB} = \int_{ta+dt}^{T} \left[b + \frac{d}{e^{1/(t-ta)}}\right] e^{-r_B} dt \tag{19}$$

and

$$V_{gA} = \int_{ta+dt}^{T} \left[a + \frac{c}{e^{1/(t-ta)}}\right] e^{-r_A} dt \tag{20}$$

If the optimal switching condition entails that

$$b - a > Vg_A - Vg_B \tag{21}$$

short-term MWG must increase with actual employment job-tenure because of the progressive reduction in long-term mobility wage gains ($Vg_B - Vg_A$[31]).

[31] Because d is considered as an exogenous parameter. Under this assumption V_{gA} will increase with job-tenure, while V_{gB} remain unchanged.

Case 2 *Cumulative probabilities with exogenous and symmetric time discount rates*

The main results of our model can (also) be obtained without using heterogenous time-discount rates. In order to avoid discussions around the "quasi-hyperbolic" features of equation (14)[32] we can use cumulative probabilities achieving the same outcomes.

Let us rewrite actual values in a discrete time representation modelling job-uncertainty as cumulative firing probabilities:

$$V_B = b\Pi_{ta} + \sum_{t=ta+1}^{T} \frac{\left[b + \frac{d}{e^{1/(t-ta)}}\right]\Pi_t^a}{(1+\overline{r})^{(t-ta)}} \tag{22}$$

$$V_A = a\Pi_{ta} + \sum_{t=ta+1}^{T} \frac{\left[a + \frac{c}{e^{1/(t-ta)}}\right]\Pi_t^*}{(1+\overline{r})^{(t-ta)}} \tag{23}$$

where $\overline{r}$ is the same "exogenous, time and job-tenure-invariant" discount rate used to evaluate wage flows in both alternatives,

$$\begin{aligned} \Pi_t^a &= (1 - RAFP_t^a)\left(1 - RAFP_{t-1}^a\right)... \\ &\quad ...\left(1 - RAFP_{ta+1}^a\right) \geq 0 \end{aligned} \tag{24}$$

is the (cumulative) probability to remain in the new job up to time t,

$$\begin{aligned} \Pi_t^* &= (1 - RAFP_t^*)\left(1 - RAFP_{t-1}^*\right)... \\ &\quad ...\left(1 - RAFP_{ta+1}^*\right) > \Pi_t^a \geq 0 \end{aligned} \tag{25}$$

represents the (cumulative) probability to remain in the actual job up to time t, and

$$\begin{aligned} \Pi_{ta} &= \Pi_{ta}^a = \Pi_{ta}^* = 1 - RAFP_{ta}^i \\ &= 1^{33} \end{aligned} \tag{26}$$

is the probability to rest in job i from ta to ta.

Then, assuming "risk neutrality" by simplicity ($\chi = 1$),

$$\Pi_t^a = \frac{\alpha}{1+e^{\beta\tau}}\frac{\alpha}{1+e^{2\beta\tau}}...\frac{\alpha}{1+e^{t\beta\tau}} \tag{27}$$

and

[32] Most cricisisms focus on time consistency of this kind of discounting -as it was noted by Strotz (1995), Rubistein (1998 and 2000), Azfar (2002) and Fernández-Villaverde and Mukherji (2002).

$$\Pi_t^a < \Pi_t^* = \frac{\alpha}{1+e^{\beta\tau(ta+1-t^*)}}\frac{\alpha}{1+e^{\beta\tau(ta+2-t^*)}}\cdots\frac{\alpha}{1+e^{\beta\tau(ta+t-t^*)}} \tag{28}$$

As we found in the previous case, the higher the actual employment job-tenure, the higher the new-job "relative uncertainty" and the higher the short-term MWG required to fulfill optimal switching condition[34].

However, the exogeneity assumption concerning future employment wage growth does not seems to be a suitable hypotheses.

Indeed, it is always possible (at least theoretically) to find a wage offer fulfilling optimal switching condition without any short-term MWG. Even a negative short-term MWG could be completely offsetting when the long-term MWG is higher enough to induce worker mobility.

Therefore, allowing long-term MWG to be endogenously determined entails that further assumptions must be made in order to achieve a more general result about the relationship between previous job-tenure and short-term MWG.

Case 3 *Model calibration using experimental data and bootstrapping replications*

When both short and long term MWG are affected by current employment job-tenure, the analytical solution of the proposition entailing a positive relationship between job-tenure and short-term MWG becomes extremely complicated (depending on many specific assumptions about underlying wage-offer distributions). To avoid such a complication, we will perform a traditional calibration using an asymptotic-like methodology based on experimental data and bootstrapping replications.

Using previous model specification involving cumulative firing probabilities, discrete-time and homogeneous discounting (case 2) we built multiple artificial databases[35] (including information about actual and future employment wage flows, previous job-tenure, risk-aversion and wage flow composition for more than 5000 "virtual workers"). With this information[36] we calibrate equations (22) and (23) in order to analyze switching decisions as well as related short term and long term MWG[37]. Finally, we perform 2000 bootstrapping replications (with a random re-sampling window of 1000 observations) for each database obtaining a matrix with MWG mean values we use to analyze the relationship between risk aversion, previous job-tenure, and both short-term and long-term mobility wage gains. These results are presented in the following tables and figures.

[34] Assuming again that c and d are exogenously given.

[35] Derived from 20 different combinations between job-tenure and worker risk-aversion.

[36] Assuming for simplicity that: 1) a and b follow a similiar uniform distribution $\sim U(150, 800)$ and 2) $c = a(1+e_1)$ and $d = b(1+e_2)$, where the random variables e_1 and e_2 follow the same uniform distribution $\sim U(0.5, 0.085)$.

[37] We define here short-term MWG as $(b-a)/a$ while long-term MWG will be proxied by $(d-b)/b$.

Short-Term MWG: (1)	Previous Job-Tenure				
Risk Aversion	2	4	6	8	10
1.2	100.0	129.8	130.4	131.1	131.6
1.4	100.4	150.6	152.5	153.5	154.3
1.6	101.2	184.2	187.4	189.0	191.0
1.8	103.8	232.3	238.6	245.9	247.1

Table 1: Short-Term MWG responses to Previous Job-tenure and Worker Risk-Aversion. Bootstrapping results from experimental data (Benchmark case equal to 100: Risk-Aversion = 1.2 and Previous Job-Tenure = 2)

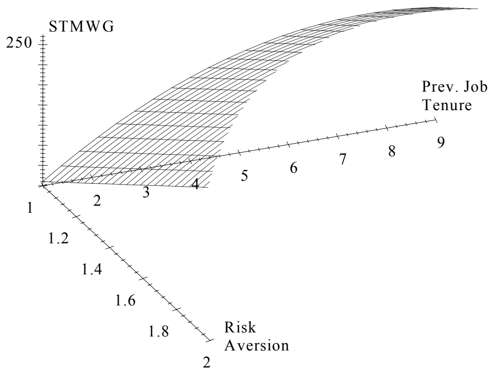

Figure 8: Short-term MWG surface responce function.

Long-Term MWG: (2)	Previous Job-Tenure				
Risk-aversion	2	4	6	8	10
1.2	100.0	113.8	114.2	114.5	114.6
1.4	100.3	122.4	123.3	123.8	124.8
1.6	100.8	136.6	137.3	137.8	138.2
1.8	101.4	155.0	157.1	161.7	162.2

Table 2: Long-Term MWG responses to Previous Job-tenure and Worker Risk-Aversion. Bootstrapping results from experimental data (Benchmark case equal to 100: Risk-Aversion = 1.2 and Previous Job-Tenure = 2)

ST / LT Ratio: (1) / (2)	Previous Job-Tenure				
Risk-aversion	2	4	6	8	10
1.2	100.0	114.0	114.2	114.5	114.8
1.4	100.1	123.0	123.7	124.0	123.7
1.6	100.4	134.9	136.4	137.2	138.2
1.8	102.4	149.9	151.9	152.0	152.4

Table 3: Short-term / Long-Term MWG responses to Previous Job-tenure and Worker Risk-Aversion. Bootstrapping results from experimental data (Benchmark case equal to 100: Risk-Aversion = 1.2 and Previous Job-Tenure = 2).

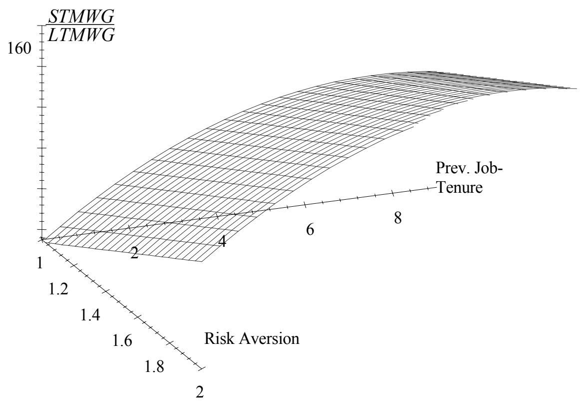

Figure 9: Relative Short-term MWG response surface function.

As we can see from tables 1 to 3 and figures 8 and 9, short-term and relative short-term MWG (the ratio between short-term MWG and long-term MWG) are monotonically increasing in both previous job-tenure and worker risk-aversion even allowing for endogeneity in long-term MWG. In other words, model calibration and bootstrapping replications allow us to induce the proof of our main proposition even when there are upward changes in d. Moreover, we prove that previous job-tenure increase not only required wage flows from alternative job position but also its time composition. The higher the job-tenure in current employment, the higher the weight of short-term MWG (entailing that long-term MWG becomes progressively less important to determine switching decisions -see table 3 and figure 9). ■

With this model we have develop a simplified analytical framework in order to evaluate how risk effect may drive job switching decisions. This contribution must be jointly evaluated with specific human capital and matching information (traditional) hypotheses to achieve the overall effect of job tenure on short term MWG.

5 An application to the Italian case

According to OECD (1999), tenure is one of the main important variables affecting turnover costs and employment protection legislation, leading to very different patterns for European and US labor markets.

	Severance Payment after			Notice Period After		
Country	9 months	4 years	20 years	9 months	4 years	20 years
Italy	0.7	3.5	18.0	0.3	1.1	2.2
US	0.0	0.0	0.0	0.0	0.0	0.0

Table 4: Examples of differences in turnover costs according to changes in job tenure (OECD, 1999 -in months)

It is clear that in Italy job-tenure represents for the workers an important way to acquire stability and bargaining power. In the US this phenomenon is almost negligible. Moreover, in this framework firms could follow the LIFO rule when they need to layoff. The idea is that to layoff the last-in worker is much less expensive than laying off workers with longer job-tenure. These kind of workers will appreciate to remain in their firms, in order not to loose the acquired advantages. A job-change would imply no rights to claim and a higher uncertainty in the new job.

Turnover costs differences (between Italy and US) are at the origin of our theoretical motivations. Moreover, there is also a significative difference regarding the relationship between hazard rates (one minus retention rate -the probability to remain in the same job[38]) and job-tenure, in turn related to the above mentioned turnover cost discrepancy. In the figure (10) we show that Italian retention rates are monotonically decreasing in job-tenure while the US ones present a "U shaped" relationship. As job-tenure increases, US relative hazard rates (the ratio between the US hazard rates and Italian ones) becomes larger, especially for "experienced workers" for whom higher Italian turnover-cost appears to be particularly protective.

It is important to highlight that re-employment opportunities are also quite different between these countries, entailing that Italian unemployment outflow rate is just a fourth of US one (e.g. 9.5% and 37.4%, respectively in 1993). Therefore, differences in both hazard rate-job tenure relationship and unemployment outflow could explain why "risk effect" hypotheses appears to be particularly relevant for Italian labor market. Workers with higher job-tenure are protected against displacement but in the case of laid-off, it will be more difficult for them to find a new job. This is a typical feature of "segmented labor markets" in which risk-aversion and limited job-mobility are closely correlated.

[38]See Diebold *et al.* (1997).

Figure 10: Hazard rates by job-tenure. A comparison between US and Italy. (Source: Panel-INPS and Diebold *et al.*, 1997)

The model we use is based on the assumption that job-tenure and job uncertainty are strongly related and then, traditional theories focusing on human capital, idiosyncratic information and search decisions must be improved (or complemented) to better explain Italian labor dynamics.

In order to test our main theoretical hypothesis we will use the administrative database of the Italian Social security system, which is roughly described in the next sub-section.

5.1 Database and data description

This database is organized by INPS (the Italian social security institute). We work on a panel version of this database, elaborated by ISFOL. The sample units are salaried full-time workers[39] in the private sectors but of agriculture. The panel is constructed merging INPS employee information dataset (O1M) with the employer information dataset (DM10) and covers 14 years from 1985 to 1998. This means that it is an employer-employee database. The sample scheme has been set up to follow individuals born on the 10^{th} of March, June, September and December, and therefore the proportion of our sample on the Italian employees population is approximately of 1/90[40].

As far as workers information is concerned, the database contains many

[39] Apprenticeships and part time workers are excluded from our dataset; this should not alter mobility rate estimates, as during '80s and early '90s respective shares of Italian employment were under 5%.

[40] This means that if a sampled worker quitted (or was fired), he/she would disappear from the panel and could be found again only if he/she started a new salaried job. Obviously if a worker that met sampling criteria found a job between 1985 and 1998 a new "record" would be created in the dataset.

individual information like age, gender, qualification, place and date of birth, region where the job takes place, date of beginning and end of the current worker contract, the social security contribution paid each year by the worker, the cumulated social security contributions paid by the workers, if the worker is either part time or full time, the yearly wage (which does not take into account the number of worked days) and the daily wage.

For the firms our database contains the following information: headquarter region, production region, the average number of employee (or firm size), the sector and the date of start up and shut down (if the firm has shut down in the panel period) of the firm.

Using this database it is possible to properly manage with mobility issues, because for each worker we have the monthly information about mobility. In other words we can compute not only the mobility that takes place among two different years but also what happens during each year.

In the database, each observation includes both an identifier for the employee and another one for the firm. The whole database contains more than 2.000.000 observations for about 300.000 different workers, for the period from 1985-1998. In order to have a treatable database we have selected all the workers who are in the database at least three years in the period 1992-1998. Moreover, as usual in this kind of analysis we have considered only male workers. At the end we use an unbalanced database of 61.991 male workers and more than 330.000 observations.

In order to test our theoretical hypothesis we have generated some additional variables.

- Job change: it concerns the identification of workers who change at least one job between time $t-1$ and t (a dummies variable *change*).

- Job tenure. For each observation we are interested in two kinds of job tenure. If the worker does not change job in the current year we compute the standard job tenure adding the job tenure at time $t-1$ to the one in time t (*Job Tenure*). On the other hand, if the worker changes job in the current year we are interested in both the job tenure before the job change (*Prev. Job Tenure*) and the job tenure after the job change (again *Job Tenure*).For each worker in 1985 we have a truncated information about job tenure, in the sense that all the labor contracts in 1985 that had began before 1985 do not contain the information about the beginning of the job match, hence they all formally begin in January 1985 even if in fact we do not know the real beginning date. For these reason job tenure is always left truncated. In order to manage with this problem we have decide to carry out our estimation in the period 1992-1998. In other words, we will use the period 85-89 to derive the job tenure for almost all workers. However, this means that for those workers that have a tenure starting before 1985 and that are in the same workplace in 1992 we still have truncated values. For this reason we do not consider these workers, in this way the length of job tenure cannot be higher than 13 years. It is worth noting that from a quantitative point of view we do not loose too many workers (nearly 15%).

- Voluntary job change. In order to evaluate some theoretical hypothesis presented in the first part of this paper, basically linked to Human Capital and search theory, we have to identify all job changes that workers undertake in a voluntary way. Unfortunately, we do not have this information in our database. However, a standard hypothesis in order to approximate this variable is to assume that each job changes that takes place without any unemployment spell (i.e. in our database it means that less than 30 days occur between the two labor contracts -the same hypothesis is assumed by Abowd, Kramarz, and Margolis, 1999). Hence, we have generate the variable *Change* (equal to 1 if the worker change jobs in the current year and 0 otherwise), the variable *Unemp.Spells* (the length of the unemployment spell) and the variable *Volont* (equal to 1 if there are less than 30 days between two consecutive labor contracts). Moreover, using the variable *Volont* we can also compute the variable "*Vol.* Prev. Job Ten.*", which represents the job tenure before a voluntary job change. It will be our main variable of interest, since we are interested in computing the return of previous job tenure on wage gains after a voluntary job change.

- Yearly job changes. There are some workers who change of job more than once in the same year. In order to carry out a panel estimation we need one observation per year per worker. For this reason we have considered, for these workers that change more than one job per year, only the last observation. We have kept just the information of how many job changes each worker has in that specific year the last wage earned (since we are interested in the mobility effects we have kept the last wage and not the average wage) and the information concerning the unemployment spells among the different contracts. From our own calculations we note that this decision to keep only the last observation allow us to keep more than 99% of the whole information[41].

5.2 Descriptive analysis

Let us start from analyzing the general statistics derived from our database. First of all, we can notice that 48.4% of the workers never change job in the whole period (Table 2). In other words, 48.4% of the workers have just one labor contract during the period they are in the labour market. Moreover, if we consider the workers with $0, 1$ and 2 yearly job changes[42] we already cover

[41] The 91% of the observations (not of the workers) are characterized by no job change. Moreover, putting together the observations without any change and the ones with just one change we cover already 99.19% of the sample, meaning that the incidence of the workers who change more than one job in the same year is negligible (less than 1%).

[42] By yearly job change we mean all the cases in which a job at time t is different from the job the same worker had at time $t-1$. We are not interested in how many times this worker

around 93% of the sample.

	0	1	2	3 to 7	Tot.Obs.
All workers	48.4%	31.0%	13.3%	7.2%	61991
By Region					
North-West	51.5%	30.2%	12.4%	5.9%	20078
Nord-East	46.2%	31.0%	14.6%	8.1%	14629
Centre	48.6%	32.1%	12.7%	6.6%	11642
South	46.4%	31.3%	13.8%	8.5%	15628
By Qualification					
Blue Collar	46.9%	30.0%	14.4%	8.7%	43629
White Collar	51.9%	33.6%	10.8%	3.7%	18029
Managers	67.6%	24.6%	6.6%	1.2%	333

Table 5: Number and % of 'yearly' job changes at the workers level in the period 1992-98 and for any population group

It is also interesting to analyze the differences in nominal yearly wage growth, computed on observation and not on workers. First of all, from Table 3 we can notice that workers who change of job show a higher wage growth, in average, than the worker who do not change job (8.64% and 6.23% respectively). Moreover, it comes out that wage growth for workers who change workplace voluntarily is, in average, higher than the "stayers" one (9.86% *vs.* 7.38%). Finally, yearly wage growth for involuntary job change is a little bit higher than the one of stayers[43].

	No change		With change		Involuntary		Voluntary	
	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.
All workers	6.23%	262402	8.64%	50874	7.38%	25073	9.86%	25801
By Region								
North-West	6.43%	89504	9.92%	15142	7.78%	6131	11.37%	9011
Nord-East	6.40%	61795	8.82%	13105	6.88%	5971	10.44%	7134
Centre	6.19%	50205	8.23%	9235	7.81%	4519	8.63%	4716
South	5.81%	60555	7.27%	13163	7.17%	8245	7.42%	4918
By Qualification								
Blue Collar	5.69%	173849	8.04%	38109	7.04%	21267	9.30%	16842
White Collar	7.23%	83556	10.21%	12240	9.02%	3718	10.74%	8522
Managers	8.31%	4997	15.34%	525	17.88%	88	14.16%	437

Table 6: Nominal Yearly wage growth for movers and stayers and for voluntarily and involuntarily changes in the period 1993-98

has changed job in t.

[43]The time period is restricted to 1993-1998 because when computing the wage growth we cannot derive the 1992 lagged value.

Regional differences do not seem to be remarkable, except for voluntary job changes. Wage gains differences with respect to job qualifications are quite standard. Managers display the highest gains and, finally, it is possible to see that white collar yearly wage growth is slightly higher than the blue collar one.

5.3 Econometric Methodology

To test our main hypothesis concerning job-tenure effects on short term MWG we use a standard wage equation for panel data, *i.e.* regressing the logarithm of the wage on the covariates in level. It is important to note that using this specification allow us to evaluate the impact of a change in one of the covariates on the wage growth. In other words, in case of job change at time t the wage growth ($\Delta \log w$) actually represents the short term mobility wage gains ($(b-a)/a$) defined in the theoretical section of the paper[44].

The wage equation is the following:

$$\log w_{i,t} = \sum_{k=1}^{K} b_k x_{k,i,t} + u_i + \omega_{i,t} \ , \ \ n = 1, ..., N \ ; \text{ and } t = 1, ..., T \tag{29}$$

where $\log w_{i,t}$ is the dependent variable, $x_{k,i,t}$ are K explanatory variables, u_i is the individual effect for each worker, and $\omega_{i,t} \backsim IID(0, \sigma^2_\omega)$ are random disturbances.

In our model, $\log w_{it}$ is the log of annual labor earnings divided by the number of worked days, whereas the vector of K covariates is composed by the following variables:

$$\begin{aligned} X'_{k,i,t} \ = \ & [\text{Age}_{i,t}, \text{Age}^2_{i,t}, \text{Job Tenure}_{i,t}, \text{Job Tenure}^2_{i,t}, \\ & , (\text{Volont}_{i,t} * \text{Prev. Job Tenure}_{i,t-1}), \\ & (\text{Volont}_{i,t} * \text{Prev.Job Tenure}_{i,t-1})^2, \text{Unemp.Spells}_{i,t}, \\ & \log \text{Firmsize}_{i,t}, \text{Blue Collar}_{i,t}, \text{White Collar}_{i,t}, \\ & \text{North West}_{i,t}, \text{North East}_{i,t}, \text{South}_{i,t}, \text{Sec0}_{i,t}, \\ & \text{Sec1}_{i,t}, \text{Sec2}_{i,t}, \text{Sec3}_{i,t}, \text{Sec4}_{i,t}, \text{Sec5}_{i,t}, \text{Sec6}_{i,t}, \\ & \text{Sec7}_{i,t}, \text{Sec8}_{i,t}, \text{D1990, D1991, D1992, D1993,} \\ & \text{D1994, D1995, D1996}] \end{aligned} \tag{30}$$

Most of these variables have been already explained in section 4. In addition we have included different dummy variables to control for job-qualification (Blue Collar and White Collar, which entails that Managers -not included dummy- is

[44] It is worth noting that we cannot observe, by construction of the database, the last wage in the previous job and the first wage in the new job. We approximate these wages using the average wage in the last year in the previous job ($t-1$) and the average wage in the new job (t), even if the job change took place in period t.

the benchmark qualification), firm region (North West, North East and South -Center is the reference region) as well as sectoral and cyclical dummies.

We carry out panel data estimation in order to take into account the impact and the bias that individual effects determine on the other coefficients. For this reason we use fixed effect and first difference estimations and not a random effect estimation that is usually implemented to investigate variance decomposition[45].

Fixed effect model assumes where unobservable individual specific components are time invariant parameters having a non-trivial correlation with all regressors (Mundlak, 1978).

$$\log w_{i,t} = a_i + \sum_{k=1}^{K} b_k x_{k,i,t} + \omega_{i,t} \tag{31}$$

with

$$\sum_{n=1}^{N} a_i = 0 \tag{32}$$

The second alternative is to estimate the log wage equation in *first differences*:

$$\Delta \log w_{i,t} = \sum_{k=1}^{K} b_k \Delta x_{k,i,t} + \epsilon_{nt} \tag{33}$$

with

$$\epsilon_{i,t} = \Delta\varepsilon_{i,t} = \Delta\omega_{i,t} + \Delta u_i = \Delta\omega_{i,t},\ IID \backsim N(0, \sigma_{\epsilon}^2) \tag{34}$$

It is clear that first difference estimates can cope with individual specific effect because $\Delta u_i = 0$.

Unfortunately, standard identification problems arise. There is a quite important and well known literature (for example Altonji and Shakotko, 1987; Topel 1991; Topel and Ward, 1992) concerning endogeneity problems in the wage equation due to the correlation between tenure and individual effects. The basic idea is that there is a positive correlation between job-tenure and the individual fixed effects because high productivity workers receiving higher wages are less likely to experience layoffs and quits, ending up with longer job-tenure. In this framework tenure coefficients would be biased. In order to manage with this problem we implement a standard identification strategy using instrumental variables for tenure. The choice of the instruments is not of course an easy

[45] By the way, implementing the Hausman test we have checked that individual effects and regressors are not uncorrelated. For investigate these issues see for example Baltagi (2001), Arellano (2003).

task. We have followed the Altonji and Shakotko (1987) methodology, using as instruments the deviations of the tenure variables around their means on a given match (index j represents the firm). More specifically:

$$\tilde{T}_{i,j,t} = T_{i,j,t} - \bar{T} \text{ and } (\tilde{T}^2_{i,j,t}) = T^2_{i,j,t} - (\bar{T})^2$$

These instruments are by construction uncorrelated with the individual effects and in this way they should be able to cope with problems linked to the correlation between tenure and individual effects. Moreover, we have a similar endogeneity problem for our variable of interest, previous job tenure, which is a composite variable derived by the multiplication between a dummy variable identifying voluntary job changes and the job-tenure in previous work position. Therefore, we use the same kind of instruments we have used for tenure, *i.e.* deviation from the means of previous job tenure (PJT) at the match level:

$$\widetilde{PJT}_{i,j,t} = PJT_{i,j,t} - \overline{PJT} \text{ and } (\widetilde{PJT}^2_{i,j,t}) = PJT^2_{i,j,t} - (\overline{PJT})^2$$

As before, they are uncorrelated by construction with the individual effect. Moreover, they should manage with the endogeneity behind the choice of the worker that moves because she/he will gain more in the new match. In other words, since moving decisions are not exogenous, deviation from the mean at the match level should represent a proper instrument to manage with the endogeneity problem.

Hence we implement different kind of estimations, simple OLS, fixed effects and first differences (also using IV estimators) and, in order to manage with heteroschedasticity problems probably present in the data, a G2SLS random effects.

5.4 Estimation results

The main goal of the paper is to estimate the impact of previous job tenure on wage gains due to a voluntary job change. In other words, are short term mobility wage gains higher the longer the job tenure in the previous job is? Standard economic theory, such as human capital, job-training and search theories, suggest that the higher the job tenure the smaller the short term MWG required by the worker in order to move voluntary to another job. We have shown in our theoretical model that it could not be the case in countries characterized by turnover cost positively related to job tenure. We have pointed out that in this framework it is possible to end up with a positive correlation between short-term MWG and job tenure.

To empirically test the theoretical model we develop panel estimates for the period 1992-1998, with around 330.000 observations for 61.991 male Italian workers According to previous discussion we have carried out our estimations using six different econometric specifications: OLS, fixed effect (within estimation), first differences, IV using fixed effects, IV using first differences and

G2SLS using random effects[46]. In table 4 we present the main results. We have only reported the coefficients concerning our variables of interest. By the way, first of all we comments the others covariate coefficients, not reported in the table, which are quite stable across the different estimations carried out[47].

For the labor market experience[48] (*age*), we observe a positive coefficient for the linear coefficient and a negative one for the quadratic coefficient. This clearly means that the labor market experience displays a concave function behavior: the higher the labor market experience, the higher the return deriving from it but a decreasing rate. To analyze the coefficients related to job qualification it must be highlighted that we have omitted the manager dummy, hence the coefficients for blue collar and white collar have to be compared to the manager one. For this reason these two coefficients are negative, and the one related to blue collar is smaller than the one related to white collar. For the regional differences we have omitted the dummy for the center of the country. Hence, it is quite obvious that the coefficient of the north comes out to be positive (the north is supposed to be the richest region of the country).

	OLS	*FE*	*FD*	*IV* FE	*IV* FD	*G2SLS*
Age	0.0273 *	0.0175 *	-	0.0177 *	0.0211 *	0.0306 *
Age^2	-0.0003 *	-0.0003 *	-0.00022 *	-0.0003 *	-0.0002 *	-0.0003 *
jobtenu	0.0133 *	0.0062 *	0.00528 *	0.0052 *	-0.0011 *	0.0055 *
jobtenu^2	-0.0004 *	-0.0002 *	-0.00033 *	-0.0001 *	-	-0.0001 **
prev JT	0.0208 *	0.0064 *	0.00894 *	0.0050 *	0.0072 *	0.0055 *
prev JT^2	-0.0011 *	-	-0.00057 *	-0.0003	-0.0007 *	-0.0003 *
*Coeff. sig. at 1%, **Coeff. sig. at 5%						
R^2	0.50	0.15	0.02	0.15	0.14	0.46
R^2 Within	-	0.40		0.40	0.16	0.38

Table 7. OLS, fixed effects, first differences and IV estimates fe/fd for the period 1992-1998

As far as our variables of interest are concerned it is worth noticing that coefficients concerning age, job tenure and previous job tenure are almost always significative. Of course, as in Altonji and Shakotko (1987) OLS coefficients concerning Job tenure are much higher than the ones in the other estimations. This is due to endogeneity problems. Moreover, linear previous job tenure coefficients are always significative and positive, while the square coefficient is negative when significative. This means that the impact of PJT on STMWG

[46] The endogenous variables are job tenure, job tenure^2, prev.job tenure, prev.job tenure^2, while the instruments are those already defined.

[47] At first, we have implemented the Breusch-Pagan (1980) test, after the FE estimates, showing (not actually in the table) that the variance of individual effects is significatively different from zero. Therefore, individual effects must be included in the estimation process.

[48] As accepted in literature, we will use age as a proxy of labor market experience.

is either linearly positive or concave. These results are strongly consistent with the hypotheses of this paper.

The higher the job tenure before a job change, the higher the switching risk (as already explained in our theoretical model) and the higher the potential loss of SHC (or idiosyncratic information about worker-firm matching productivity). The first effect, captured by previous job tenure coefficients, entails a positive correlation between previous job tenure and short term MWG to compensate increasing job uncertainty. The second one, the loss in SHC captured by job tenure coefficients, concerns the traditional assumption of human capital theory involving a negative impact of job tenure on short term MWG. Hence the overall result will depend on the relative size of each effect.

In figure 11 we can see that for all the identification strategies PJT trend is positive: it behaves as a concave functions in all estimations but in FE . If we consider the first differences estimates (FD), for example, we observe that in the Italian case the risk effect is non linear involving that up to 8 years of previous job tenure the overall effect is always positive. After that SHC effect dominates the risk one and the overall marginal impact of job tenure on short-term MWG becomes negative[49].

As shown in our empirical survey, this result is not consistent with those found for the US labor market (*i.e.*- Buchinsky *et al.*, 2001, Gottschalk, 2001). Indeed, positive correlation between previous job-tenure and short-term MWG has never been documented for that country and cannot be explained by standard theoretical frameworks. Nevertheless, our theoretical model can be used to explain this puzzle. Italian labor market is characterized by a strict level of employment protection legislation (EPL) and by firing costs higher than those in the US. This means that the labour market is more segmented between insiders and outsiders in Italy. For these reasons it is not surprising that the risk effect initially dominates for Italian workers while SHC effect is more significative in the US. In fact, if firing costs are proportional to job-tenure, the higher the job-tenure the lower the uncertainty on actual job wage flows and the higher the risk to job switching (because movers will loose their job insurance -linked to firing costs-). Because of lower firing costs, job uncertainty (firing probability) for US workers is not strongly related with job tenure and then risk effect can be negligible. Moreover, in the US even for displaced workers it is easier to look for a job because outflows from unemployment is higher. On the contrary, job uncertainty for Italian workers is a decreasing function in job-tenure because of binding firing costs, and the probability to find a job once displaced is lower in Italy than in the US. For these workers, job-switching risks (in terms of increasing probability of being fired) will be higher and increasing in job-tenure. This

[49] Overall effect is computed using coefficients in table 4 for the following equation: (Volont+a(Volont*Prev.JobTen.)+b (Volont*Prev.JobTen.)^2)-(c Job Tenure + d Job Tenure^2). The first argument is the risk aversion effect and the second one is the SHC-"matching" effect.

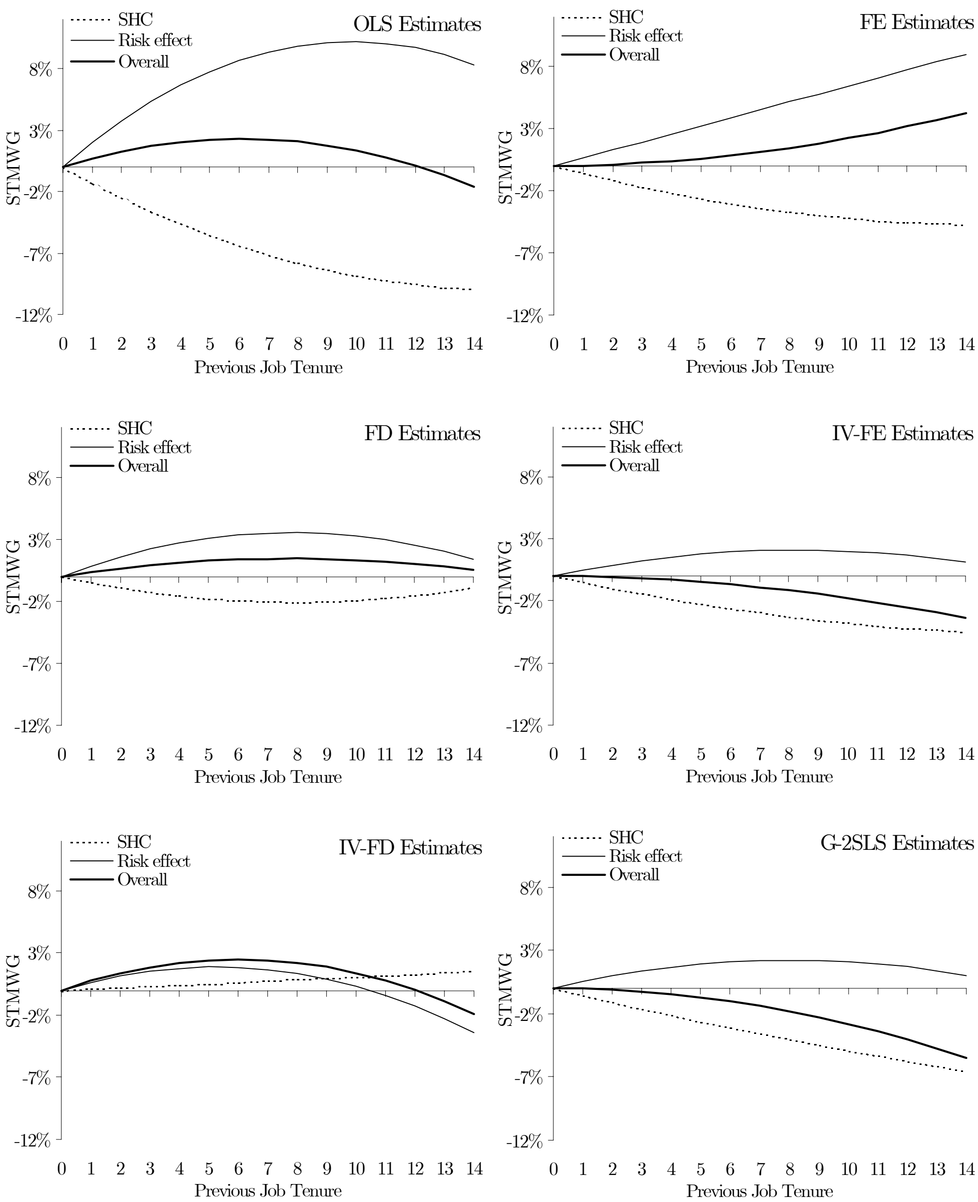

Figure 11: Previous Job Tenure and STMWG in the different estimations

means that they will demand higher short-term MWG in order to compensate the increasing uncertainty.

In the econometric estimations we do not take into account the trade off between STMWG and LTMWG. In the simulation of the theoretical section we have pointed out that in presence of strict employment protection legislation workers who decide to change job will ask for higher returns in the short run and relatively lower in the long run, since LTMWG will be less appreciate because of the higher uncertainty in the new job. In future versions of the paper we will deepen this issue also from an econometric point of view.

6 Conclusions

From traditional theoretical approaches (search theory, job-matching and human capital models) the relationship bewteen job-tenure and short-term MWG is typically negative. This results is also achieved in empirical applications for US labor market (see Buchinsky *et al.*, 2001 and Gottschalk, 2001).

Our main contribution in this paper is to present a new theoretical approach to support an alternative positive correlation. This result is derived from labor market institutions and worker risk aversion. Using a model with endogenous discount rates (or cumulative probabilities to remain in the job), which depends on job tenure (because discount rates and firing probabilities are increasing functions in job uncertainty, in turn negatively correlated with turnover costs) we find out that when wage flows are stochastic (because of job-uncertainty) and firing costs are increasing in job-tenure, both absolute and relative short-term MWG (the ratio between short-term and long-term MWG) are also increasing in job tenure and risk aversion. This result is obtained by means of both analytical and simulation procedures involving different assumptions about current and alternative wage offer distributions.

In order to test our main hypothesis, we use an unbalanced sub-sample of INPS (Italian Social Security Institute) panel data set to estimate a log-wage extended model, using more than 330,000 observations for 61,991 male Italian workers.

After controlling for individual observable and non-observable effects, firm attributes and endogeneity bias using six different econometric specifications (OLS, individual fixed effects, first differences, IV individual fixed effects, IV first differences and General 2SLS -using individual random effects). Disregarding the econometric specification, estimation results support our theoretical propositions: The impact of previous job-tenure on short-term MWG is always positive (and concave). Moreover, this "risk effect" is generally greater than the "SHC loss", involving a positive overall impact.

This result is not in line with previous research on the same subject focusing on US databases. However it is not surprising because firing costs in Italian labor market are higher than the US ones, and they increase in job tenure (entailing a positive relationship between job-tenure and retention rates). Therefore, the higher the job tenure the higher the rise in job uncertainty for movers and, in turn, the higher the short-term MWG that satisfies optimal switching conditions. This effect is not significative for US workers because job tenure does not strongly affect firing cost and then it is negligible for job uncertainty.

Our findings could be used to analyze macroeconomic determinants of job-turnover and wage dynamics.

When risk-aversion drives job-switching decisions expected short-MWG (and then voluntary job-turnover[50]) will be extremely sensitive to different structural features relaying on production and distribution processes. Amongst them, output volatility, growth and income inequality appears to be the main forces explaining aggregate and idiosyncratic differences about risk appraisal. Indeed, the higher the size of macroeconomic fluctuations the lower the retention rate at any job-tenure (but particularly at the lowest ones). In other words, job-uncertainty asymmetries (between current and alternative jobs) increase with output volatility entailing a lower (voluntary) job-mobility rate at both aggregate and individual levels (and mainly for experienced and risk averse workers).

In turn, when utility functions are concave in wealth income polarization or income inequality leads to a higher aggregate risk-aversion coefficient. This result will increase "perceived" job-uncertainty asymmetries enlarging short-term MWG and reducing job-mobility (specially for experienced and poor workers –because poverty increase risk aversion when utility function is concave).

Finally, both job-uncertanty asymetries and risk aversion coefficients will be negatively correlated with economic growth because of higher retention rates and lower risk-aversion coefficients prevailing in growing economies.

Therefore, output volatility, income inequality and macroeconomic stagnation could reinforce each other to amplify the "risk-effect" we present in this work. These macroeconomic features increase short-term MWG, reducing voluntary job-mobility, particularly for older insiders and poor workers. As a byproduct of this result it appears reasonable to think that poor people living in volatile, unequal and stagnated economies will be less likely to voluntary move between jobs. In this way they lose many outside alternatives to move-up within the wage distribution remaining long-time in a "poverty trap".

Further improvements on this subject will be addressed to test these hypotheses using administrative and household survey data for different European and Latin American countries.

[50] Because short-term MWG is inversely correlated with job-switching probabilities (assuming that alternative wage offers follow an exogenously given distribution).

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