

# Wage losses after displacement in Spain. The role of specific human capital\*

Preliminary and incomplete. Please do not circulate or cite.

Paula Garda<sup>†</sup>

February 2012

## Abstract

Spain has a segmented labor market with two thirds of employees retaining a permanent contract (PC) and the rest working under fixed term contracts (FTC). First, this paper develops a search a matching theory a la Mortensen and Pissarides (1994) with two type of contracts and endogenous accumulation of specific human capital. The model shows that firms offer FTC always they can choose, hence firms create PCs when are legally constrain to do so. According to the model the accumulation of specific capital depends on two policy parameters: firings costs of PCs, and the expiration rate of FTCs. Calibrated to Spain, PC workers are expected to accumulate a relatively higher share of firm specific human capital with respect to workers employed with FTCs. Then, the paper exploits empirically this duality to explore the sources of earning losses after displacement. I estimate the impact of mass-layoffs on subsequent wages, differentiating between workers holding permanent and fixed term contracts at the time of displacement, and decompose these wage losses into different sources. The results obtained show that workers under permanent contracts suffer larger and more persistent wage losses after displacement, than their fixed term counterparts. Although changing industry and the duration of unemployment has negative impact on subsequent wages for the two type of contracts, the losses for permanent contracts stem mainly from the loss of pre-displacement firm tenure, not being important for fixed term workers. This is taken as evidence of the difference in the accumulation of job specific human capital between the two type of contracts, supporting the prediction of the model.

JEL classification: J31, J41, J63, J65

Keywords: Displacement, mass-layoffs, wage losses, fixed term employment.

---

\*I am especially grateful to Thijs van Rens for his guidance, advice and encouragement. I would also like to thank Albrecht Glicht for his valuable time, comments and suggestions. To Libertad Gonzalez, Sergi Jimenez, Jordi Gali, as well as all the participants of the UPF Labor, Public and Development Lunch Seminar and the CREI Macroeconomics Breakfast, who contributed with helpful comments and suggestions at various stages of the project. Financial support from Agaur is gratefully acknowledged (FI-DGR). I thank the Ministry of Labour and Social Security of Spain, and specially to Almudena Duran for proving me with the MCVL, and help with the data. All remaining errors are mine.

<sup>†</sup>Universidad Pompeu Fabra. E-mail:paula.garda@upf.edu

## 1 Introduction

The main reason why we should be concerned about job losses is that they may involve not only lost earnings during unemployment but also declines in earnings at subsequent jobs. After the displacement and the consequent job search, the worker may need to restart her career from scratch in a new job, since she needs to acquire new skills, establish a new network inside the firm, i.e. acquire the new specific skills that are required in that job, with the subsequent lower productivity and large wages losses.

The sources of these wages losses are still on debate in the academy. The acquisition of specific skills through, for example, learning-by-doing on the job and investments in specific training as in Becker (1964) can yield substantial earnings losses at job loss. Topel (1990) and Neal (1995), among others, argue that specific forms of human capital play a central role in determining the magnitude of earnings losses associated with job displacement.

The main objective of this research is to investigate the impact of displacement on subsequent wages in Spain. Spain has a segmented labor market with two thirds of employees retaining a permanent status and the rest working under fixed term contracts. The aim is to exploit this duality to further explore the sources of earning losses after unemployment. In order to understand theoretically the subject, the paper develops a search and matching model a la Mortensen and Pissarides (1994) with two type of contracts and endogenous accumulation of specific human capital. Firms choose which type of contract offer to workers, while workers after knowing the type of contract decide if invest in human capital at a cost, and become more productive or not. The model shows that the decision of acquiring human capital will depend on two parameters that determine the duality of the economy: higher firing costs for permanent contracts, and the expiration rate of fixed term contracts. In economies with higher duality (larger firing costs gap between contract arrangements, and conversion rates from permanent to fixed term contracts) permanent contract (PC) workers are expected to accumulate a relatively higher share of firm specific human capital with respect to workers employed with fixed term contracts (FTC).

According to this theory, under fixed term contracts there is little incentive, either for employers or workers, to invest in specific human capital, since turnover rates of these jobs are considerably higher than for FTC workers, and there is not enough time to reap the benefits of the investment. The empirical literature has shown that temporary workers are less subject to on the job training with respect to similar permanent contract peers (Arulampalam (2001) for UK, Dolado, García-Serrano, and Jimeno (2001) and Albert, Garcia Serrano, and Hernanz (2005) for Spain, Guetto and Cutuli (2011) for Italy, and Sauermann (2006) for Germany).

This paper tries to contribute to this literature, investigating the sources of wages losses, and testing the importance of the accumulation of job or industry specific human capital under the to

two type of contract arrangement. The wage losses after an unemployment spell have been very used in the literature to study the transferability of human capital. Following the human capital theory we can expect that FTC workers loss less wages than the permanent contract peers, since the the accumulation of firm specific human capital is lower. This generates a *wage loss gap* between PC and FTC workers.

There are other theories that predict wages losses after unemployment, such as signaling theories. An unemployment spell might also be a signal of an employee's low productivity. Lacking information about workers' productivity, employers seek signals which may convey information about the employee. Since the productivity of an individual is expensive to evaluate, employers refer to signals and hire employees without unemployment gaps or at least pay low wages at the beginning of the employment contract. These wage penalties upon re-employment should not be permanent. This theory would predict a wage loss gap after displacement, if being displaced from PC carries a worst signal of productivity, than losing the job after a fixed term contract. At the same time, some period of unemployment after displacement causes depreciation of general human capital which also causes wages losses upon re-employment.

Finally, other sources of wage losses has been pointed out by Stevens (1997), who showed that long-term earnings effects may be related to multiple job losses, and Hall (1995) suggested that the persistence may be explained by high turnover in subsequent short-tenured jobs. Finally, to the extent that firm's or sector characteristics also play a role in wage determination, a displaced worker may lose wage premiums related to the firm's or sector characteristics, that can be associated to union premiums or insider rents. The latter predicts that FTCs are less likely to be receiving wage premiums on the their old jobs, because they are less covered by collective agreements, unions, etc. and hence would suffer lower wage losses, predicting also a positive wage loss gap.

The analysis of the wage losses upon re-employment and its decompositions in its different sources for the two type of workers is a very important issue in the Spanish context. Understanding who bears the costs and the source of these costs is key to understand the costs and benefits of the dual structure of the labor market. For example, if FTCs wage losses are lower due to under-investment in job or sector specific human capital, this predicts a negative impact on overall labour productivity. The declining productivity growth of Spain, and the low conversion rate from FTC to PC highlights the importance of this point. I am also contributing to a non-explored literature of accumulation and transferability of human capital for fixed term workers. This paper explores if workers accumulate human capital trough experience and its transferability between firms or industries under different contract arrangements.

The separation costs have been the focus of a number of recent studies. Evidence from the US studies suggests that the average earnings losses of displaced workers are large and persistent, being around 10-25 percent even several years after the job loss (see Ruhm (1991), Farber (1997) Stevens

(1997), Couch and Placzek (2010) and Jacobson, LaLonde, and Sullivan. (1993)). Perhaps the most cited work is the latter. It introduced the use of program evaluation techniques into the job displacement literature. In this study, the authors use administrative data on Pennsylvanian workers to compare pre and post-displacement earnings of high-tenure (more than six years) displaced workers relative to a control group of non-displaced workers. The Pennsylvania data span the years 1974 to 1986. By focusing on workers that remained attached to the labor market after massive lay-offs, they find that high tenure workers suffer substantial earning losses when they leave their jobs. The authors provide the largest estimates of lost earnings in the literature, 45 percent the year of displacement. The paper has been criticized for focusing only in very high tenured workers, possibly biasing upwards the average earning losses. Davis and Wachter (2011) present evidence of wage losses after displacement for more than three years tenured workers, obtaining very similar results to Couch and Placzek (2010) and Jacobson, LaLonde, and Sullivan. (1993).

The empirical evidence for Europe is relatively sparse. Studies by Borland et al. (2002) for the UK, Lefranc (2003) for France, Carneiro and Portugal (2006) for Portugal, Eliason and Storrie (2006) for Sweden find the long-term losses to be large and concordant with the earlier studies for the US. Other results for Germany, confirm these findings. Burda and Mertens (2001) and Schmieder, Wachter, and Bender (2010) found wage losses to be around 4 and 14%, respectively. For the British economy, Arulampalam (2001) reaches similar conclusions. The author also stress the importance of the source of unemployment and report significant scarring not only after dismissals and layoffs, but also after non renewal of temporary contracts and among workers from declining industries. More recently Garcia Perez and Rebollo Sanz (2005) and Arranz, Serrano, and Davia (2010) using the European Community Household Panel (ECHP) data analyze the effects of job mobility on wages, and particularly the effects of a spell of unemployment and inactivity on reemployment wages. The results found confirm that workers experience important changes in their real wages as a consequence of involuntary job mobility. According to Garcia Perez and Rebollo Sanz (2005) German workers tend to experience larger wage losses compared to the rest of countries (Spain, France and Portugal). When compared to stayers, German workers have much larger wage penalties, around 22%, followed by French, Spanish and Portuguese workers, who suffer wage losses of 10%, 9% and 8% with respect to stayers, respectively. At the same time Arranz, Serrano, and Davia (2010) found that spells of both, unemployment and inactivity, scar future wages. These scars are deeper in France if individuals move between jobs due to inactivity. Unemployment (but not inactivity) also brings about wage losses in Germany, Italy, Spain and Portugal.

The first goal of the paper is to develop a detailed picture of the displacement event in Spain, providing evidence on earnings losses after displacement distinguishing between displaced from fixed term contracts (FTC) and permanent contracts (PC). For this purpose, the paper makes use of a novel data set that traces the labor market experiences of a large number of workers, and data from their firms, in Spain during 52 quarters, from 1996 to 2008. The resulting data set contains quarterly earnings histories for a large number of displaced and non-displaced workers, and the type of contract

they hold, used to contract control and treatment groups.

The methodology focuses on mass-layoffs so we can isolate the group of workers who would have not moved under normal business conditions, approximating for an exogenous displacement. By doing this the selection bias problem, due to low quality workers being laid off, is reduced. The methodology used is a difference in difference approach assuming that if selection into mass-layoffs is done based on observable pre-displacement characteristics and fixed effects, results will show the causal effect of a mass-layoff on wages. A second specification includes individual specific time trends. The control group is defined by worker not suffering mass-offs in the entire period.

The second contribution of the paper is to obtain a detailed decomposition of the wage losses into firm or sector specific human capital, joblessness, and premiums due to the type of contract or sector specificities. I analyze the wage losses in case of change industry, different unemployment duration and pre-displacement tenure. A decomposition into these three sources is performed in order to analyse the heterogeneity of wages losses among different contract arrangements.

The results obtained show that workers under permanent contracts have larger and more persistent wage losses after suffering a mass-layoff, than their fixed term counterparts. In the first quarter of re-employment displaced workers from permanent workers suffer a sharp drop in wages. The estimates of wage reductions of the fixed-effects estimator the first quarter they find a job are between 15-20% with respect to the control group. While the estimated wage losses for workers holding fixed term contracts at the time of displacement the first quarter they find a job are 4-8%. In the fourth year following re-employment, substantial recovery occurs and the estimated impacts average 7 and less than 1 percent, respectively.

In a second step a decomposition of these wage losses into its sources is done. Results indicate that changing industry has a negative impact on post-displacement wages for both type of workers, being the impact for both. On the other side, unemployment duration is important to explain wage losses, and seems to be more important for PC workers. Meanwhile, pre-displacement tenure is the most important source of the wage losses for PC, not being important for FTC workers. This is taken as evidence of lower accumulation of firm specific human capital under fixed term contracts. Results also show that among workers with less than three years tenure, workers displaced from permanent contract suffer larger losses than similar fixed term contract peers. This result further confirms the hypothesis of lower job specific investment in human capital. This finding is important for two reasons. First, the proportion of fixed term workers that obtain an open-ended contract is very low. Second, labour productivity growth has decline in Spain since 1995 and human capital accumulation is one of the factors that might help recover the path of productivity growth.

The paper is organized as follows. Next section describes briefly the institutional framework and the Spanish labour market. Section 3 develops the model and calibrates it for Spain. Next

we focus on the empirical part describing the data used, definition of displacement and descriptive statistics, while section 5 describes the econometric methodology. Section 6 presents the empirical results. Finally, section 7 confronts the empirical finding with the simulated data from the model, and extracts conclusions. At the end conclusions are drawn.

## 2 Spanish labour market and Institutional context

The low rate of employment creation in the mid-70's spread the opinion among policy makers that labor markets across the whole Europe were very rigid, and that more flexibility was needed. Spain, had at that moment, one of the most slack labor markets in Europe, and its unemployment rate was more than 20%. This led Spanish policy makers to implement flexibility measures. The most important one being to allow to hire workers on fixed term basis with very low or no firing costs for types of job that were not fixed term in nature. The introduction of this measure changed completely the distribution of contracts in Spain since 1984. In late 1983 the proportion of fixed term contracts was 15%, going to a stable 30% in the 1990's. In the late 1980's policy makers started to worry about the risk of segmentation with good jobs (permanent contracts with a high degree of employment protection) and bad jobs (fixed term contracts). Three labour market reforms (in 1994 and in 1997, and 2001) aimed at undoing the liberalisation of 1984 and reducing the proportion of temporary employment. The 1994 reform relaxed the conditions for "fair" dismissals of workers under permanent contracts and restricted conditions for the use of fixed-term contracts, aiming them primarily at unemployed workers. The ineffectiveness of the 1994 reform led to a new reform in 1997, which was eventually extended in 2001. The 1997 reform has implemented subsidies to firms that signed new permanent contracts from certain population groups under permanent contracts. This policy was decided at a regional level, and eligibility conditions vary across regions, age and sex of the workers, although only the unemployed were eligible for these new contracts. The 2001 reform essentially extended the 1997 reform by applying lower subsidies to more groups than the previous reform.

These fixed term or temporary contracts can be signed for a period between a minimum of six months and a maximum of three years, also extensible to 12 more months, depending of the type of contract it is being signed. After the maximum legal limit, the contract cannot be renewed, and the worker must be either fired or offered a permanent contract by his/her current employer (in the former case, the employer cannot hire any other worker for that job)<sup>1</sup>.

The introduction of the reform of the late 1980's had many consequences for the Spanish labor market. For an extensive analysis refer to Dolado, García-Serrano, and Jimeno (2001). On one hand, FTCs account for the largest portion of the hiring rates (Güell and Petrongolo (2007)), while transition of FTCs into permanent ones have been very low (Güell and Petrongolo (2007); García-Pérez and Muñoz-Bullón (2011)). Güell and Petrongolo (2007) study the duration pattern of FTCs

---

<sup>1</sup>In appendix A can be found a detailed description of these contracts, and the differences in firing costs and advance notification with the permanent contracts.

and the determinants of their conversion rate into permanent ones, which went down from 18% in 1987 to about 5% in 1996. According to Amuedo-Dorantes and Malo (2007) establishments rely on fixed-term contracts as a buffer to meet expected short-run changes in employment needs, and to a lesser extent as a screening device.

Another clear consequence of this segmentation was the gap of wages that raised between fixed term and permanent contracts. Jimeno and Toharia (1993), de la Rica and Felgueroso (2000) examine whether temporary contracts involve lower wages than permanent ones, after controlling for observed and unobserved heterogeneity in personal and job-related characteristics. The results of the papers quoted above agree in estimating a wage gap in favor of permanent male workers of around 10% to 15%. Instead, Davia and Hernanz (2004) find that wage differentials between temporary and permanent workers are explained by the differences in the characteristics of jobs and workers. Although the law requires equal pay for temporary and permanent workers, temporary workers earn less (controlling for observed skills and the employer characteristics), reflecting differences in unobserved skills (de la Rica (2004)).

Finally, Dolado, García-Serrano, and Jimeno (2001) argue, that if the turnover rate of temporary jobs is very high, there is little incentive either for employers or workers to invest in specific human capital. Although, there is no direct empirical evidence about such an issue in Spain, Dolado et al. (1999) estimate that the probability of receiving free or subsidized on-the-job training is 22% lower for workers under FTCs. Another paper by Albert, Garcia Serrano, and Hernanz (2005) also find evidence of lower probability of on the job training for workers holding fixed term contracts. The fact that under-investment in specific human capital has strong implications on overall labour productivity is clearly illustrated by the expansion of the late 1980s, where employment growth was based on the massive use of FTCs and labour productivity hardly reached an annual average growth rate of 1% during the 1986-1990 boom. Moreover, Dolado and Stucchi (2010) find that firms with larger proportions of FTC show lower productivity. The authors interpret this result as evidence of less investment in firm specific human capital in fixed term contracts.

### 3 Data

#### 3.1 Muestra Continua de Vidas Laborales - *Continuous Sample of Job Histories*

The data used is a unique administrative dataset with Social Security records called Continuous Sample of Job Histories (Muestra Continua de Vidas Laborales, MCVL) for the year 2008, which contains information on individual job histories from social security records and basic individual information from the census. Thus, we can work with detailed information of all job spells in a worker's history.

The MCVL consist of a random sample of 4% of all affiliated workers, working or not, and

pensioners from the Social Security archives. The MCVL is very rich and detailed as regards job histories, which include labour market status and type of contract for each and every job spell. It includes information on age, gender, qualification level, reason for termination of the spell (voluntary/involuntary or retirement), province of residence of the worker, an identifier of whether each employment spell is accomplished through a temporary help agency (THA) or not, and firm size.

The MCVL contains information about the amount for which employees have to contribute to the Social Security System, which is a good approximation of the wage for the majority of workers. The problem is that wages are computed from covered wages, hence are censored from below and above. The fact that are censored from below is not that important, because there are very few cases and also because the minimum wage is binding. With respect to the censoring from above, there is no reason why the presence of the top-code should affect displaced workers more than non-displaced workers, in fact, I find it is vice versa, leading to understate the earning losses at job displacement. This problem affects mainly permanent contract workers. Hence, what I am going to find is a lower bound of wage losses for PC workers<sup>2</sup>.

### 3.2 Sample selection

First, the sample period is from 1996 to 2008, because the type of contract is not reliable for the previous period. We focus on men born between 1948 and 1966, that is between 25 and 48 years old in 1971. This is because it is better to avoid the behavior of wages when starting the job career, that could be different from older ages workers. Second, we only use job spells posterior to 1996, since prior to that year, information on type of contract is not reliable. Third, we consider workers who are in the “Regimen General” which includes 90 per cent of all workers; i.e. we exclude the self-employed, workers in Agriculture, Fishing and other minor special cases. Fourth, the unit of observation is a quarter. Because of this, we have to add more restrictions. We disregard simultaneous employment spells and, instead, use the information corresponding to the full time job or longer-lasting of these. We unify any two registers that present overlapping contracts, i.e., when one of the contracts begins before the previous one has ended. Finally, we drop incomplete or incorrect registers (for example, negative spells durations). The sample is also restricted to full-employment workers at the time of displacement.

This database stores the entire labor history for each worker, for whom it provides information relating to the worker’s age, gender, qualification of the job, and the exact duration of each unemployment/employment spell. Moreover, for periods of unemployment, the MCVL database allows us

---

<sup>2</sup>In any case, to check the robustness of the estimation when correcting by the top coding in the data, I use the algorithm described in Boldrin et al. (2004) to recover actual wages. The estimation of actual wages relies on the assumption that the true distribution of the logarithm of earnings is a normal distribution where the mean is a linear function of observed individual and job characteristics (age, nationality, sector, type of contract, region and time dummies). The censored values are replaced by the estimated conditional mean of wages. Results are robust to this estimation, confirming that not using this correction, I am finding a lower bound of wage losses. See appendix C for results.



to distinguish between those that covered by unemployment benefits and those that are not. The latter can represent either periods of unemployment without benefits or periods of inactivity. Nevertheless, we use the term unemployment to denote all periods of inactivity with respect to work. All contracts have been re-codified to the new contracts, and codified as permanent, fixed term or unknown (See Appendix A for a detailed explanation of the types of contracts available).

Moreover, we restrict to people that was employed during the two year period 1996-1998. The control group is defined by people that do not suffer mass-layoff in the entire period, from 1996 to 2008. Could be that these people make direct job transitions, or convert contracts within the same firm. I think this is a better choice than that of using only workers that additionally maintain their initial jobs for all the period, because the comparison group is aimed to be representative of the counterfactual situation of displacement. Therefore, the control group is aimed to represent the hypothetical (and not observed) outcomes of the same displaced workers if they simply did not experience the involuntary job loss, without additionally (and arbitrarily) ruling out that they would experience a job change (or non-employment). It is also important to point out that the control group described above does not include individuals laid off on an individual basis. The final control group used in the analysis is a 50% random sample of the initial control group.

The treatment group is the sample of displaced workers that is formed by employees that have been employed during 1996-1998, but were involuntary separated during a mass-layoff in some year between 1999 and 2004. I estimate the impact of only the first observed job displacement for each individual during the relevant period. I do not separately include additional displacements for these workers because, as common in the literature, I consider future displacements as a cost of the initial displacement.

### 3.3 Definition of displacement

Different with most administrative datasets, the MCVL records whether a change of employer or a movement from employment to non-employment is the result of an employer-initiated separation (i.e. a displacement) or a voluntary movement by the employee (i.e. a quit). In order to define a displacement I use the cause of separation registered in the MCVL. The causes of separation included in the MCVL are: voluntary separations by the worker, involuntary separations (including unfair dismissal and termination of contracts), temporal incapacity, ERE (Record of employment regulation), family or kids care leave, and plant closing. These separations are reported by the employer to the Social Security, and most of time even if the separation is due to an ERE or a plant closing, they declare an involuntary separation<sup>3</sup>. In the database, most of the cases are quits or involuntary separations.

We define displaced workers as those that have lost the job because of an ERE, or an involuntary

---

<sup>3</sup>This is the reason why besides considering EREs in the sample, we will include firms that suffer a reduction in the workforce defined as a mass-layoff

termination of the spell, if they switch employer. That is, we only consider a separation if the employee change firms, in order to avoid recalls. This way we also avoid the use of repeated fixed term contracts within a firm, separated by some periods of inactivity. Firms, in order to reduce costs, renew fixed term contracts several times, in some cases in between some periods of inactivity.

The record of employment regulation, abbreviated with their initials, ERE, is a procedure under the Spanish law by which a company in crisis seeks for authorization to suspend or layoff workers within a framework which guarantees certain rights of workers. This administrative procedure can be processed for the following reasons: collective dismissal based on economic, technical, organizational or productive reasons (the most usual reason); suspension or termination of the employment contract in case of superior force (like a natural disaster); termination of employment because of firm closure.

In order to define a sample of exogenous displaced workers, we define a mass-layoff sample as those that have lost the job because of an ERE or a large employment adjustment, above 30% of the workforce in a given year. The large employment adjustment is defined in sample. That is, since we do not have information on the size of firms for all years in the sample, we define the size of the firm with the number of employees in the sample by year. We disregard information on firms with less than 5 workers<sup>4</sup>.

The primary purpose of looking at workers from firms where employment has declined by at least 30 percent is to reduce the likelihood that workers fired for cause are included in the sample, and hence reducing selection bias. In this sense, the mass-layoff measure reduces the selection bias for the two type of workers since is measuring the probability of getting displaced or not having the contract renewed because of exogenous reasons to the characteristics of the workers, and more related to the business conditions of the firms. This way we can substantially lessen the importance of the selectivity bias by restricting the analysis to workers who separate from firms that reduce a large part of their workforce. Such workers are unlikely to have left their jobs as a result of their own poor performance.

### 3.4 A glance at the data

Tables 1 to 3 present sample characteristics of displaced workers during mass-layoffs. These tables show that there are important differences between displaced and non displaced, and under the two types of contracts. Table 1 shows differences in workers characteristics in 1997 (the beginning of the sample). First, displaced workers under PC tend to be younger, while for FTC workers the difference is not significant. On the other hand, no matter the type of contract tend to have shorter firm tenure. Displaced from fixed term contracts tend show lower wages, but for the PC this is not significant. These differences are also present between the two type of contract the worker holds. That is, fixed

---

<sup>4</sup>We present here the results for the this definition of mass-layoff sample, but other cutoffs have been tried. The 40% and the 15% show very similar results. Also, using only plant-closing in the sample show very similar results. All this results are showed in Appendix D of the paper.

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

term workers are younger, lowered tenured and earn lower wages, than their open-ended contracts counterparts.

As table 2 shows, displaced workers tend to be lowly educated and occupy positions that require lower qualification (second panel of the panel). These differences are also present comparing PC and FTC workers. Fixed term workers tend to be lowly educated, and occupy lower qualification positions. Finally, as the third panel of that table shows, PC workers suffer mass-layoff mainly from manufacturing and service sectors, while for FTC workers, the construction sector is also very important. These pre-separation differences highlight the importance of controlling for observable and unobservable characteristics of the displaced workers when comparing them to a control group, something that is going to be address in the regression analysis.

	Permanent			Fixed term		
	Displaced	Non disp	Diff	Displaced	Non disp	Diff
Age	36.9	38.1	-1.2 [0.228]**	34.5	34.3	0.2 [0.217]
Firm tenure	8.4	8.9	-0.5 [0.239]**	2.3	2.7	-0.6 [0.093]***
Real daily wages	93.59	93.1	0.5 [1.207]	61.04	65.7	-4.6 [0.954]***
N obs	1,161	28,997		1,943	13,720	

Table 1: Sample Characteristics in 1997.

Notes: Displaced are defined as those suffering mass-layoffs in the period 1999-2004. Non disp, are non-displaced, i.e. the control group of workers not suffering mass-layoffs in the entire period. Source: Own calculations with MCVL2008

	Displaced		Not displaced	
	Permanent	Fixed term	Permanent	Fixed term
	Qualification of the position (%)			
Medium high	0.14	0.05	0.17	0.06
Medium	0.16	0.10	0.19	0.12
Medium low	0.33	0.39	0.33	0.41
Low	0.24	0.40	0.18	0.30
	Education (%)			
Incomplete Primary education	0.19	0.31	0.20	0.23
Primary education	0.35	0.39	0.33	0.37
Secondary and Technical Education	0.40	0.27	0.42	0.34
University	0.06	0.03	0.05	0.06
	Sector (%)			
Manufacturing	0.51	0.27	0.35	0.23
Construction	0.05	0.27	0.06	0.25
Services	0.44	0.46	0.60	0.52

Table 2: Sample characteristics of displaced and non-displaced..

Notes: Displaced are defined as those suffering mass-layoffs in the period 1999-2004. Non disp, are non-displaced, i.e. the control group of workers not suffering mass-layoffs in the entire period. Source: Own calculations with MCVL2008

Finally, table 3 shows differences in the displacement event between temporary and permanent

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

workers. First, firm tenure at displacement is much shorter for fixed term workers<sup>5</sup>. Second, workers displaced from permanent contracts tend to experience longer unemployment spells. One reason for this could be that unemployment benefits depend on the period that have been employed in the last 6 years, while the amount of the unemployment benefits depends on the previous wage. Third, more than 60% of workers holding indefinite contracts at displacement are re-employed with fixed term contracts<sup>6</sup>. This figure is larger for workers holding fixed term contracts at displacement (almost 90%). Hence, displaced workers enter a mobile market with high incidence of temporary contracts. After two years of being re-employed, PCs workers tend to have more probability of re-gaining a PC while most FTCs still maintain the temporary status. Finally, almost half of these workers change industry after displacement. The industries are measured at two digit level. The figures are similar between the two type of workers, showing that changing industry is not more probable for any of the two contract arrangements after a mass-layoff event.

	Permanent	Fixed term
Firm tenure at displacement (%)		
Less than 1 year	0.12	0.56
Between 1 and 3	0.21	0.24
Between 3 and 6	0.22	0.12
More than 6	0.45	0.08
Unemployment duration (%)		
Zero or Less than 1 quarter	0.38	0.55
Between 1 and 4 quarters	0.44	0.36
Between 5 and 12	0.13	0.07
More than 12	0.05	0.02
Contract mobility quarter of re-employment (%)		
To a PC	0.37	0.12
To a FTC	0.63	0.88
After two years (%)		
To a PC	0.63	0.30
To a FTC	0.37	0.70
Change industry (%)	0.54	0.51

Table 3: Differences between displaced workers depending on the type of contract.

Notes: Displaced are defined as those suffering mass-layoffs in the period 1999-2004. Source: Own calculations with MCVL2008

Figures 1a and 1b show the daily real wage path of individuals who separate from employment in 2001 relative to the control group. Figure 1b shows the wage path including the periods of unemployment with zero wages, while figure 1a shows only pure wage effects, i.e. being missing observations when unemployed. It is notable that before separation wages trends are similar relative to each other, for both types of workers. Figure 1a is the most interesting for us, since the regression analysis will have as dependent variable the logarithm of wages. If anything, there appears to be a simple intercept difference in the starting point of the wage paths at the start of the sample period between

<sup>5</sup>Most of fixed term contracts may not be extended after 3 years, although changing the nature of the job for hiring the same worker under subsequent temporary contracts has been a common practice among Spanish employers. This and the fact that “per task or service” contracts are easily extended, explains the high tenures of some fixed term employees.

<sup>6</sup>This makes sense since the majority all new hires are done using fixed term contracts (Güell and Petrongolo (2007))

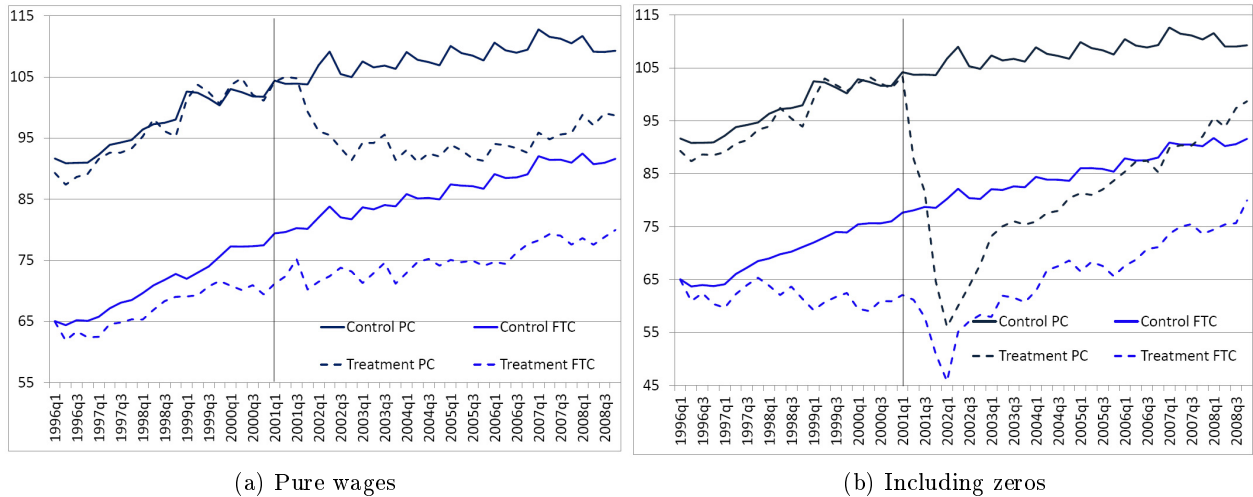


Figure 1: Wage Paths of displaced workers during 2001

Earnings paths are the *raw* wages, assuming (a) missing or (b) zero income during unemployment. Treatment group is defined according to the type of contract at the time of displacement. The control group of workers is classified according to the type of contract if not suffered mass-layoffs in the entire period. Source: MCVL 2008

displaced and non-displaced, and permanent and fixed term contracts. Thus, estimators such as the fixed-effects, which control for individual specific intercepts would be expected to effectively equalize earnings prior to job separation. Additionally, the figures show that workers experienced substantial long-term wage losses. The earning losses in figure 1b are larger than in figure 1a, related to the zero income during unemployment. In figure 1a, where pure wage losses can be analyzed, we can already see that fixed term workers experience much lower wage losses, if any, than workers holding permanent workers at the time of displacement.

## 4 Methodology and the definitions of wage losses

### 4.1 Definition of wage losses

We can measure wage losses as the difference between workers’ earnings in some post-displacement period and their earnings in a period shortly before separation. There are three reasons why this measure may not capture the full effects of displacement on workers’ earnings. First, this measure does not control for macroeconomic factors that cause changes in workers’ earnings regardless of whether they are displaced. Second, this measure does not account for the earnings growth that would have occurred in the absence of job loss; in the long term, workers’ earnings may return to their pre-displacement levels, but not to the levels expected prior to their job loss. Finally, firms’ declining fortunes may adversely affect workers’ earnings several years prior to their job loss. Therefore, to capture the full effect of the events that lead to workers’ displacement, it is important to calculate their earnings declines relative to a point several years prior to their separations.

Thus, we can define displaced workers’ wage losses to be the difference between their actual and

expected wage, that would be prevalent if the events leading to separation had not occurred.

## 4.2 Econometric model

The idea is compare wages of non displaced versus displaced workers. An augmented mincerian wage equation that captures the difference in earnings across displaced and non-displaced workers, can be estimated:

$$y_{it} = \alpha_i + \mu_t + \beta X_{it} + \sum_k \gamma_k D_{it}^k + \sum_k \delta_k D_{it}^k * PC_i^0 + \eta PC_{it} + \epsilon_{it} \quad (1)$$

$y_{it}$  is the logarithm of the real daily wage earnings for individual  $i$  at period  $t$ . Hourly earnings were deflated by the CPI (base: January 2008). The displacements episodes are represented through a set dummy variables:  $D^k$ . These dummies are equal to one if individual  $i$  was displaced at  $t - k$  ( $k$  can be negative, this means that are  $k$  quarters after being re-employed; or if  $k$  positive means  $k$  quarters before separation). I differentiate between the type of contracts, multiplying by a dummy that indicate if at the time of separation the worker hold a PC ( $PC^0$ ). Hence, the coefficient  $\gamma_k$  reflects the differences in earnings between separated and non-separated workers holding FTC at period  $k$  before/after separation, while  $\delta_k$  indicate the wage loss gap between PC and FTC workers. This allow us to see the different evolution in wage losses for displaced workers, distinguishing PC and FTC. The equation includes a matrix  $X_{it}$  with observable characteristics, including time varying individual characteristics, such as quadratic form in age, the region, sector and qualification, and their interactions. The equation includes a control for the type of contract holding  $PC_{it}$ , where  $\eta$  captures the gap of wages between permanent and fixed term workers, after controlling for observed and unobserved characteristics.

$\mu_t$  are time effects that capture the general time pattern of earnings in the economy.  $\alpha_i$  summarizes permanent differences among workers in observed and unobserved characteristics. The error term  $\epsilon_{it}$  is assumed to have constant variance, and to be uncorrelated across time and individuals.

This strategy is a form of the difference-in-differences (DiD) estimation method, which in this case is implemented by using a fixed-effects estimator. Much of the literature on displacement recognizes that the event is likely to be non-random. Non-random assignment is likely to be a problem, even for a mass-layoff or plant-closings sample. Employer selection suggests that those workers with lower productivity will be displaced in a mass-layoff, while employee selection suggests that those workers whose outside job prospects are better will choose to leave. In the case of firm closure, it may be that those workers who remain in the firm until closure are a non-random sample of all those in the firm at the point where closure become public knowledge.

If selection into the treatment and control groups is on the basis of permanent characteristics embodied in workers' fixed effects and the observable characteristics, then equation 1 will yield con-

sistent estimates of the expected wage loss. If firms tend to lay off workers partially on the basis of unobservable worker-specific time trends the baseline estimation in equation 2, will give consistent estimates in the presence of specific time trends,  $\lambda_it$ .

Hence, the assumption for interpreting  $\gamma_k$  and  $\delta_k$  as causal impact of job separation is that conditional on fixed effects and included observable characteristics, displaced workers are observationally equal to the workers in the control group.

$$y_{it} = \alpha_i + \mu_t + \lambda_it + \sum_k \gamma_k D_{it}^k + \sum_k \delta_k D_{it}^k * PC^0 + \beta X_{it} + \epsilon_{it} \quad (2)$$

If estimated losses in equation 1 are larger than the estimated in equation 2 means that employers tend to displace slowly earning workers more often.

Another comment we need to make at this point, is that estimations are only taking into account people that find jobs again. There can be a problem in selection since we only observe successful people that manage to be re-employed again. One can argue that there is a downward bias in the estimation of the earning losses, but the idea of the paper is to analyze pure wage effects of job displacement in order to capture the implication of the human capital theory. If we include the periods of unemployment as zero earnings, then the earning losses obtained are much larger, explained partially by the unemployment duration of the workers. Another relevant study would be the effects on non-employment periods of a displacement.

## 5 Results

### 5.1 Estimates of Wage Losses for Separators during Mass Layoffs

Figure 2 provides a graphical representation of the estimated wage losses,  $\gamma_k$  for FTC workers and  $\gamma_k + \delta_k$  for PC, and their 95% confidence interval, for the fixed-effects estimator (equation 1 in which  $X_{it}$  contains age, age squared, sector, qualification and regional dummies, the dummy indicating if permanent worker, and the interactions), and figure 3 including also individual time trends (equation 2). In the first quarter of re-employment displaced workers from permanent workers suffer a sharp drop in wages. The estimates of wage reductions of the fixed-effects and time trend estimators the first quarter they find a job are 21,9 percent and 15,2 percent with respect to the control group, respectively<sup>7</sup>. In the fourth year following re-employment, substantial recovery occurs and the estimated impacts average 11,7 percent and 4,5 percent, respectively. The estimated wage losses for workers holding fixed term contracts at the time of displacement are much lower. The first quarter they find a job the wage losses are 8,5 percent and 3,7 percent, respectively. After the fourth year of re-employment, substantial recovery occurs and the estimated impacts average 1,3 percent and 0,4

<sup>7</sup>Although these figures look big, they make sense, since unemployment benefits in Spain are 70% of the coverage wages in the first 180 days, and 60% from the day 181. The duration of the benefits go from three months to two years depending on the period the worker was employed in the last six years.

percent, respectively.

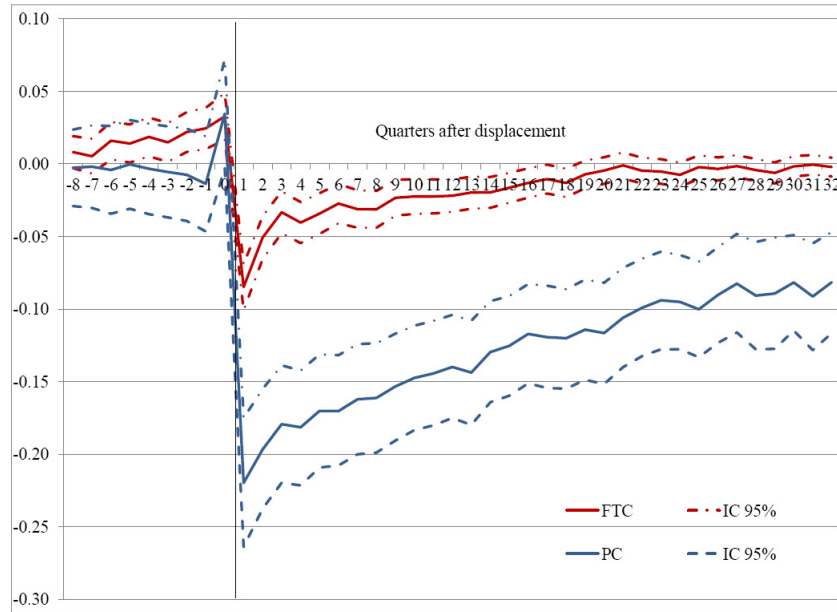


Figure 2: Wage losses from separation by type of contract. Fixed effects estimator

Notes: Dependant variable: log real daily wages. Standard errors clustered at the individual level. Regression with individual fixed effects. Other Controls: dummy for Permanent contract, age, and its squared, sectoral, regional and qualification dummies, time dummies. Displaced workers from 1999 to 2004. Source: MCVL2008

The differences in the wage losses between displaced from permanent or fixed term contracts are always significant, indicating that permanent contract workers loss more wages after a mass-layoff than their fixed term counterparts. Figures 4a and 4b show the estimation of the wage loss gap  $\delta_k$  and its 95% confidence interval in equation 1, and including specific time trends. In the baseline specification, the gap is 15% in the first quarter after re-employment, recovering slowly till 10% 6 years after. While when including specific time trends the recovery is much faster, showing a zero gap after six years. In any case, even with later specification there is a gap in the estimated wage losses of more than 10% after displacement. Because the estimated loss is smaller when we control for worker specific time trends, these estimates could be reflecting that employers are displacing workers with more slowly growing earnings.

## 5.2 Estimates of Wage Losses for low tenured workers

One of the main reasons behind the differences in the wage losses after displacement between PC and FTC is the clear differences in firm tenure that arise from table 3. In order to see if these differences are still present when restricting by tenure, we are going to apply the same methodology but taking into account, both in the control and treatment group, workers with less than three years of tenure in the last quarter of 1998, i.e. the quarter before I allow for mass-layoffs to happen.

Figure 5a shows the graphical representation of the coefficients in equation 1 using only workers



## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

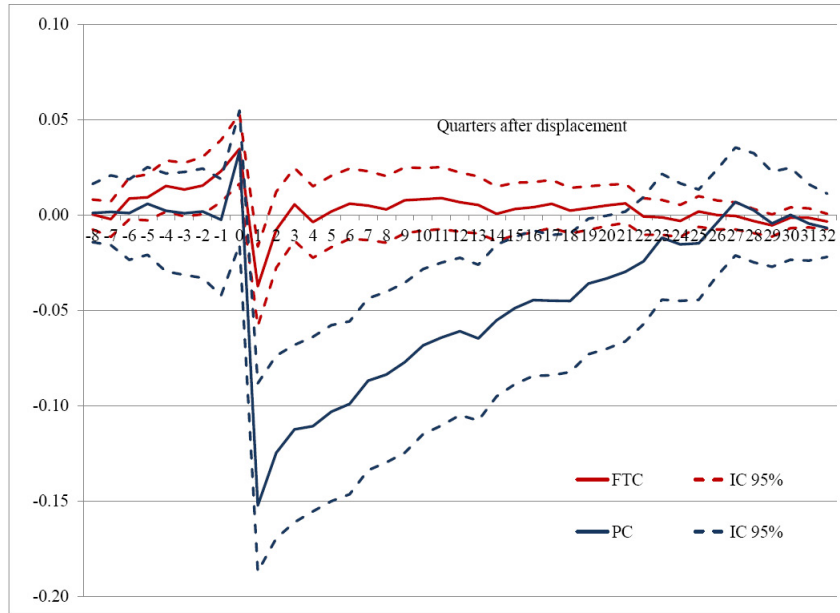
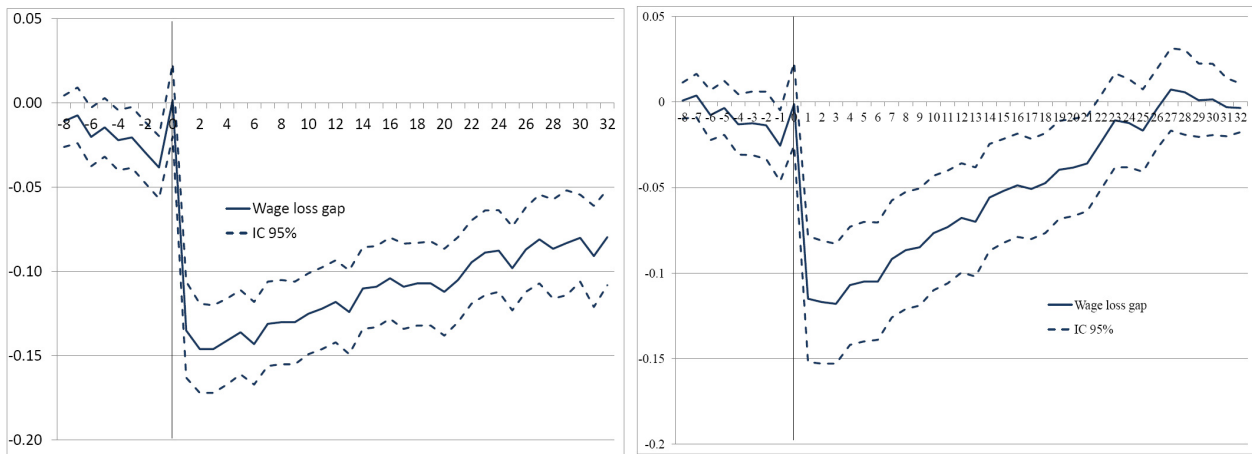


Figure 3: Wage losses from separation by type of contract including individual specific time trends. Notes: Dependant variable: log real daily wages. Standard errors clustered at the individual level. Regression with individual fixed effects and individual specific time trend time . Other Controls: dummy for Permanent contract, age, and its squared, sectoral, regional and qualification dummies, time dummies. Displaced workers from 1999 to 2004. Source: MCVL2008



(a) Regression with fixed effects estimator.

(b) Regression including specific time trends.

Figure 4: The wage loss gap  $\delta^k$ .

Notes: Graphical representation of  $\delta^k$ , wage loss difference between PC and FTC. Dependant variable: log real daily wages. Standard errors clustered at the individual level. Displaced workers from 1999 to 2004. Source: MCVL2008

with less than three years tenure. The figure is very similar to figure 2, but now the point estimates for PC workers are lower. This makes sense since we are restricting to people with lower tenure, and hence lower accumulation of specific human capital. Results are robust. The wage loss gap (in figure 5b is 10% the first quarter of re-employment, and after four years later still remains very high (7%).

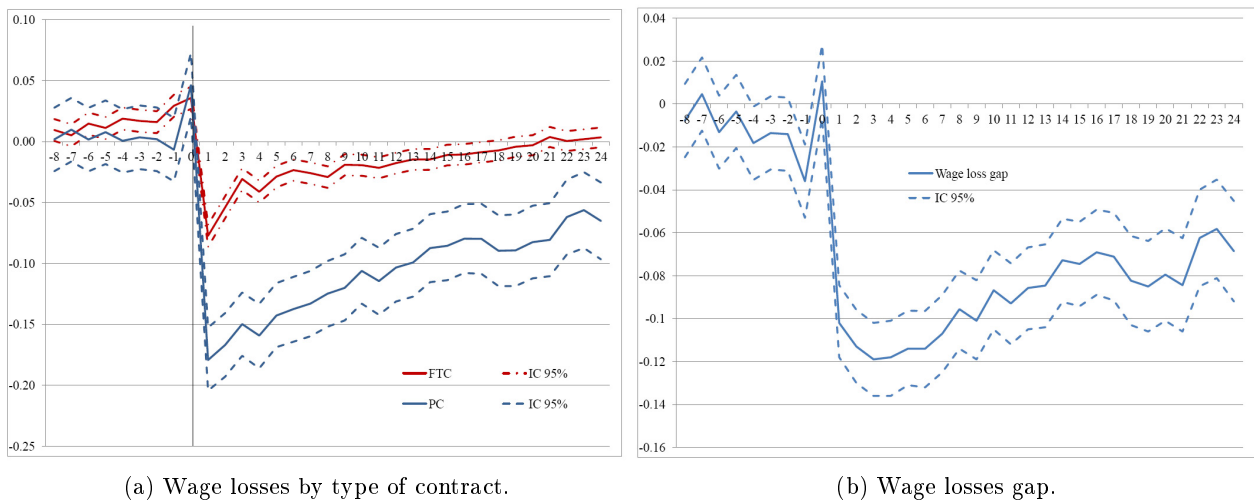


Figure 5: Wage losses from displacement for low tenured workers.

Notes: Dependant variable: log real daily wages. Standard errors clustered at the individual level. Regression with individual fixed effects. Other Controls: dummy for Permanent contract, age, and its squared, sectoral, regional and qualification dummies, time dummies. Treatment and control group include only workers with less than three years tenure at the beginning of the sample. Displaced workers from 1999 to 2004. Source: MCVL2008

### 5.3 Estimates of Wage Losses by different transitions

As shown in table 3 after displacement the majority of workers are re-hired in the first period as fixed term contracts<sup>8</sup>, but two years later more than 60% of the workers displaced from PC managed to be again in PC, while still workers displaced from FTC are still in FTC. Hence, is fruitful to see if the results are robust to the different transitions or if wage losses are driven by some group of workers. We re-estimate equation 1, but now the set of dummies for displacement distinguish among transitions: workers displaced from PC and after two years with PC again (PC-PC), displaced from PC but after two years with FTC (PC-FTC), and finally for displaced from FTC we are only taking into account displaced from FTC and that were not hired afterwards with PC contracts (FTC-FTC).

Figure 6a shows the results comparing FTC-FTC, and PC-PC workers. This results should show the lower bound of the wage loss gap (figure 6b). Because of the possibility of premiums for the type of contract, even after controlling by fixed effects, and a dummy for type of contract, the latter

<sup>8</sup>According to Güell and Petrongolo (2007) fixed term contracts account for most new hirings in all sectors and occupations

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

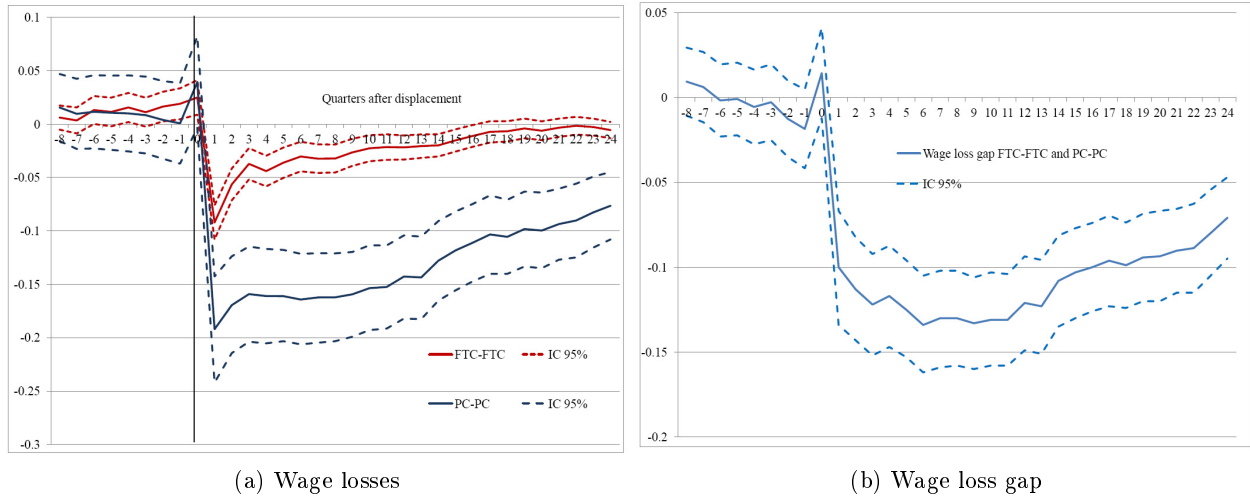


Figure 6: Wage losses among different transitions  
 Notes: (a) Wage losses of workers PC-PC and FTC-FTC (b) Graphical representation of  $\delta^k$ , wage loss difference between PC-PC and FTC-FTC. Dependent variable: log real daily wages. Standard errors clustered at the individual level. Displaced workers from 1999 to 2004. Source: MCVL2008

transitions should show the lower bound for the wage losses after displacement between the two type of contracts. The wage loss gap is lower with respect to the baseline estimation in figure 2. The estimated wage loss gap is 10% the first quarter, remaining more or less similar even 6 years after.

When we compare wage losses among permanent contracts with different transitions, we can see that PC-FTC suffer larger wage losses the first year of re-employment. A year later a recovery happens showing afterwards similar wage losses to the PC-PC workers (Figure 8).

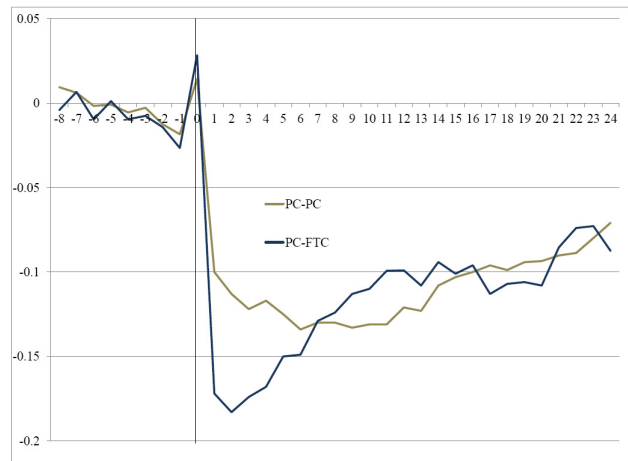


Figure 7: Wage losses from displacement. Different Transitions among PC workers.  
 Notes: Dependent variable: log real daily wages. Standard errors clustered at the individual level. Regression with individual fixed effects. Other Controls: dummy for Permanent contract, age, and its squared, sectoral, regional and qualification dummies, time dummies. Distinction between PC workers re-gaining a PC contract after two years of re-employment of still having a FTC. Displaced workers from 1999 to 2004. Source: MCVL2008

#### 5.4 Decomposition of wage losses

According to Becker's theory, if job tenure contributes to the accumulation of specific human capital or seniority rights, it should be positively associated with wage losses. On the other hand if, a component of wage gains are due to industry-specific capital, then displacement should affect future wages only in the event that workers switch industries. Finally, if deterioration of general human capital happens or an unemployment spell serves as a signal of low productivity, wage losses should increase with duration of unemployment.

In order to see the effects of the above variables, I am going to decompose the wage losses in different sources, using equation 1 :

1. loss that stems from the loss of job tenure → firm specific skills, loss of high quality job or seniority
2. loss related to changing industry → loss of sector specific skills not transferable
3. loss associated with unemployment duration → depreciation of general human capital, or signal of low productivity

The idea is to include to the baseline equation, one by one possible determinants of the wage losses: pre-displacement tenure, unemployment duration and if change industry. Including these variables we are explaining the wage losses, hence the estimated losses are the wage losses that remain after controlling for these sources. Thus, we expect a decrease in the estimated coefficients ( $\delta^k$  and  $\gamma^k$ ).

First, I am going to compute how the wage losses change when including the possible determinants, i.e. the coefficients on the displacement dummies, at one year after being re-employed, that is  $k = 4$ . After including one determinant, we are going to impute the change in the wage losses (the estimated coefficients) to that variable (e.g. unemployment duration). Since the estimated coefficients are sensible to the order on how we include these determinants, I am also going to change the order how these variables are included, and calculate a maximum and minimum change of the wage losses. These are interpreted as the range of change of the wages losses due to the different determinants.

The possible determinants included are pre-displacement tenure (equal to the tenure in the firm where the worker suffered the mass-layoff), duration of unemployment (total duration of unemployment after the mass-layoff), and a dummy that is equal to one after the mass-layoff if changed industry at two digit level in the new job. These variables are equal to zero before displacement and for the control group. At the same time, these variables are interacted with  $PC^0$ , the dummy that indicates if the worker had a PC at the time of displacement, in order to analyze the effects by type of contract.

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

Lets analyze the coefficients on the variables we are including as controls. Table 4 shows the the regression estimates after including all the variables explained above. On average, one quarter of duration of unemployment rises the losses in wages, with respect to the control group, in 0.99 percentage points (p.p.) for workers displaced from FTC, while 1.77 p.p for PC workers. This difference is significant, showing that duration of unemployment has a larger negative impact on worker displaced from PC. One explanation to this is that PC carries a worst signal of productivity after being displaced, or that the destruction of general human capital while unemployed is larger for PC workers.

Changing industry, has also a negative impact increasing losses by 3.4 p.p. and 3.6 p.p for FTC and PC, respectively. The difference of the impact is not significant. This indicates that accumulated sector-specific capital is important to explain wage losses, but the there is no difference in the accumulation between the two type of contracts, i.e. both contracts accumulate the same sectoral, more general, human capital.

Finally, having less than three years of pre-displacement tenure has no significant effect on post-displacement wages of FTC. The impact is negative and significant for worker with more then three years tenure under FTC, increasing the losses in 4.6 p.p.. For permanent contract workers, pre-displacement tenure has negative impact on wage losses after displacement, and increases with pre-displacement tenure. For workers with less or a year of tenure in the displacement job wage losses increase by 6.3 p.p. For workers with tenure between one and three year this reaches to 7.3pp and for more then three years 11,4pp. This differences with respect to FTC workers are significant. This is evidence of different accumulation of job specific capital human capital between the two type of contracts, supporting the prediction of the human capital theory.

Table 4: Determinants of wage losses

	<i>Displaced</i>	<i>Plus if PC</i>
<b>Duration unemployment</b>	-0.00994***	-0.00788*
	[0.00284]	[0.00417]
<b>Change industry</b>	-0.0341***	-0.0200
	[0.0126]	[0.0226]
<b>Pre-displacement tenure dummies</b>		
One year or less	-0.0141	-0.0631*
	[0.0114]	[0.0341]
Between one and three years	0.00668	-0.0732**
	[0.0148]	[0.0306]
More than three years	-0.0462***	-0.0675**
	[0.0147]	[0.0251]
Permanent		0.0690***
		[0.00218]
Age		0.0517***
		[0.00302]
Age <sup>2</sup>		0.0530***
		[0.000761]
Constant		-0.000420***
		[8.66e-06]
Time dummies		yes
Regional dummies		yes
Qualif. dummies		yes
Industry dummies		yes
R-squared		0.25
Observations		2,252,663
Number of id		45,821

Robust standard errors in brackets. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Regression includes all displacement dummies not shown

First column: sources are x = x\*dummy for after displacement

Second column: sources are x = x = x\*PC<sup>0</sup>\*dummy for after displacement

We can now turn to analyze what happens with the displacement dummies for the two type of workers. After including the determinants, the estimated wage losses can be interpreted as if workers did not experience unemployment, did not change industry, and did not loss tenure. Table 5 shows how change the coefficients on the displacement dummy after a quarter of re-employment in the base line equation 1, and the coefficient when adding controls one after the other. Since, coefficient can be altered by the order we include these controls, we show the maximum and minimum of the change in the wage losses.

As shown in the table 5, pre-displacement tenure is the more important source for explaining wage losses of PC workers; more than 25% of their losses are explained by the loss of pre-displacement firm tenure, while less than 20% of FTC losses. This can be interpreted as difference in the investment of firm specific human capital between the two type of contracts, confirming the hypothesis of lower investment in FTC. Once controlling for unemployment duration after the mass-layoff, the displacement dummies reflect the difference in the average hourly wages between the control group and those displaced workers as if they not experience a period of unemployment. This source is important explaining FTC and PC wage losses. From 6 to 22%, and from 14 to 23% of the wage losses of FTC and PC, respectively, are explained by the time spent in unemployment. Finally, the losses from changing industry explain a lower share of the wage losses, even if it seem to be very sensitive to the order on how we include variables. In any case, this is evidence that even if the accumulation of industry specific capital is important, is not different between the two type of contract arrangements.

Table 5: Contribution of each determinant to the earning losses

	Permanent contract		Fixed term	
	max	min	max	min
Pre-displacement tenure	50.0%	25.6%	22.0%	-25.6%
Unemployment duration	23.2%	14.7%	22.0%	6.3%
Change Industry	28.5%	0.9%	29.8%	-0.3%

Calculated contribution of each variable adding one by one and changing order of the determinants at one year after displacement ( $\Delta\gamma^{k=4}$  and  $\Delta\delta^{k=4}$ )

Finally, figure 8 shows how the wage loss gap,  $\delta^k$ , changes after including one by one the determinants. Is clear that including pre-displacement firm tenure lowers the wage loss gap by the most, explaining the largest portion of the gap. After including these three determinants wage losses become insignificant, indicating that we account for all the sources of wage losses.

## 6 Concluding remarks

In this paper I have analyzed the log-term wage losses of displacement during mass-layoffs for Spain, differentiating between workers holding permanent and fixed term contracts at the time of displace-

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

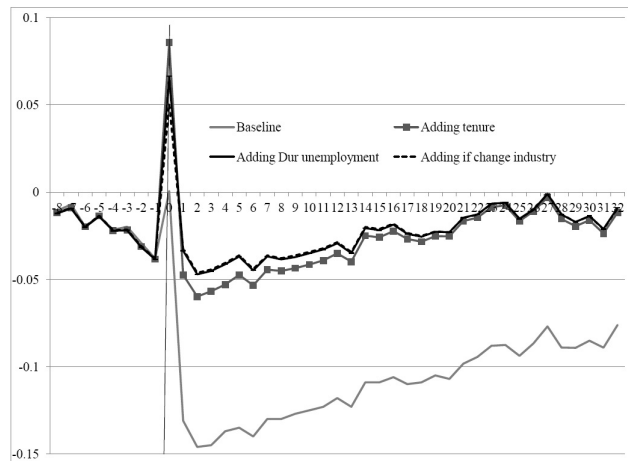


Figure 8: Wage loss gap including sources one by one.

Notes: Dependant variable: log real daily wages. Standard errors clustered at the individual level. Regression with individual fixed effects. Other Controls: dummy for Permanent contract, age, and its squared, sectoral, regional and qualification dummies, time dummies, and the determinants of wage losses. Ordering of including determinants: 1.tenure 2. duration of unemployment 3. if change industry. Displaced workers from 1999 to 2004. Source: MCVL2008

ment. The duality of the Spanish labour market allow us to study one of the basic predictions of the standard human capital theory (Becker (1964)): permanent contract workers are expected to accumulate a relatively higher share of firm specific human capital with respect to workers employed under fixed term contracts. For this purpose, the Continuous Sample of Working Histories, a large data set of the Spanish Social Security, is used.

The findings suggest that workers holding permanent contract at the time of displacement suffer larger and more persistent wage losses than fixed term workers. The highest earnings losses are registered during the first quarter of re-employment, and they are followed by a recovery of earnings, that in case of FTC workers almost disappears after five years. When restricting the estimation for lower tenure workers, the results are similar, even is the point estimates are lower. Hence, the wage loss gap is still present even when taking workers of less than three years tenure.

These losses are due, mainly, to the loss of pre-displacement firm tenure for PC workers, while much less important for FTC workers. This gap is taken as evidence of the different content of firm specific investment in human capital. Changing industry after unemployment seems to be the less important source explaining wage losses, and similar for the two type of workers. On the other hand, the time spent in unemployment is important for both type of contract arrangements. This allow us to conclude that while the accumulation of sector specific human capital (more general human capital) is important, is not different between permanent and fixed term contracts. Instead, firm specific human capital seems to be a very important source of human capital accumulation for PC workers, while FTC workers have no incentives to invest on this type of human capital.

## References

- ALBERT, C., C. GARCIA SERRANO, AND V. HERNANZ (2005): “Firm-provided training and temporary contracts,” *Spanish economic review*, 7(1), 67–88.
- AMUEDO-DORANTES, C., AND M. . MALO (2007): “How Are Fixed-term Contracts Used by Firms? An Analysis Using Gross Job and Worker Flows,” Working Papers 0026, San Diego State University, Department of Economics.
- ARRANZ, J., C. G. SERRANO, AND M. A. DAVIA (2010): “Worker turnover and wages in europe: the influence of unemployment and inactivity,” *The Manchester School*, 78(6), 678–701.
- ARULAMPALAM, W. (2001): “Is Unemployment Really Scarring? Effects of Unemployment Experiences on Wages,” *The Economic Journal*, 111(475), F585–F606.
- BECKER, G. S. (1964): *Human capital: a theoretical and empirical analysis, with special reference to education*. University of Chicago Press.
- BURDA, M. C., AND A. MERTENS (2001): “Estimating wage losses of displaced workers in Germany,” *Labour Economics*, 8(1), 15–41.
- CARNEIRO, A., AND P. PORTUGAL (2006): “Earnings Losses of Displaced Workers: Evidence from a Matched Employer-employee Data Set,” CEF.UP Working Papers 0607, Universidade do Porto, Faculdade de Economia do Porto.
- COSTAIN, J., J. F. JIMENO, AND C. THOMAS (2010): “Employment fluctuations in a dual labor market,” .
- COUCH, K. A., AND D. W. PLACZEK (2010): “Earnings Losses of Displaced Workers Revisited,” *American Economic Review*, 100(1), 572–589.
- DAVIA, M. A., AND V. HERNANZ (2004): “Temporary employment and segmentation in the Spanish labour market: An empirical analysis through the study of wage differentials,” *Spanish Economic Review*, 6(4), 291–318.
- DAVIS, S. J., AND T. V. WACHTER (2011): “Recessions and the Costs of Job Loss,” Working Papers 2011-009, Becker Friedman Institute for Research In Economics.
- DE LA RICA, S. (2004): “Wage gaps between workers with indefinite and fixed-term contracts: The impact of firm and occupational segregation,” Discussion paper, Department of Economics University of the Basque Country.
- DOLADO, J., P. C. S. BENTOLILA, AND T. L. BARBANCHON (2010): “Two-Tier Labor Markets in the Great Recession: France vs. Spain,” .
- DOLADO, J. J., C. GARCÍA-SERRANO, AND J. F. JIMENO (2001): “Drawing Lessons from the Boom of Temporary Jobs in Spain,” Working Papers 2001-11, FEDEA.



- DOLADO, J. J., AND R. STUCCHI (2010): “Work practices in two-tier labour markets. The effect of temporary contracts on TFP in Spanish manufacturing firms,” Discussion paper.
- ELIASON, M., AND D. STORRIE (2006): “Lasting or Latent Scars? Swedish Evidence on the Long-Term Effects of Job Displacement,” *Journal of Labor Economics*, 24(4), 831–856.
- FARBER, H. S. (1997): “The Changing face of Job Loss in the United States, 1981-1995,” *Brookings Papers on Economic Activity*, 28(1997-1), 55–142.
- FELGUEROSO, F., M. HIDALGO, AND S. JIMÉNEZ MARTÍN (2010): “Explaining the fall of the skill wage premium in Spain,” Discussion paper, FEDEA working paper.
- GARCÍA-PÉREZ, J. I., AND F. MUÑOZ-BULLÓN (2011): “Transitions into Permanent Employment in Spain: An Empirical Analysis for Young Workers,” *British Journal of Industrial Relations*, 49, 103–143.
- GARCIA PEREZ, J. I. (2008): “La muestra continua de vidas laborales (MCVL): una guía de uso para el análisis de transiciones,” *Revista de Economía Aplicada*, 16(E-1), 5–28.
- GARCIA PEREZ, J. I., AND Y. REBOLLO SANZ (2005): “Wage changes through job mobility in Europe: A multinomial endogenous switching approach,” *Labour Economics*, 12(4), 531–555.
- GÜELL, M. (2002): “Fixed-term Contracts and the Duration Distribution of Unemployment,” Discussion Paper 3264, Centre for Economic Policy Research Discussion Paper.
- GÜELL, M., AND B. PETRONGOLO (2007): “How binding are legal limits? Transitions from temporary to permanent work in Spain,” *Labour Economics*, 14 (2), 153–183.
- GUETTO, R., AND G. CUTULI (2011): “Fixed-term contracts, economic conjuncture and training opportunities: a comparative analysis across European labour markets,” Discussion paper, University of Trento.
- HALL, R. E. (1995): “Lost Jobs,” *Brookings Papers on Economic Activity*, 26(1, 25th A), 221–274.
- JACOBSON, L. S., R. J. LALONDE, AND D. G. SULLIVAN. (1993): “Earnings Losses of Displaced Workers,” *American Economic Review*, 93(4), 685–709.
- KAMBOUROV, G., AND I. MANOVSKII (2009): “Occupational Specificity of Human Capital,” *International Economic Review*, 50(1), 63–115.
- LEFRANC, A. (2003): “Labor Market Dynamics and Wage Losses of Displaced Workers in France and the United States,” Discussion paper, WDI working papers.
- NEAL, D. (1995): “Industry-Specific Human Capital: Evidence from Displaced Workers,” *Journal of Labor Economics*, 13(4), 653–677.
- PARENT, D. (2000): “Industry-Specific Capital and the Wage Profile: Evidence from the National Longitudinal Survey of Youth and the Panel Study of Income Dynamics,” *Journal of Labor Economics*, 18(2), 306–323.

- RUHM, C. J. (1991): “Are Workers Permanently Scarred by Job Displacements?,” *American Economic Review*, 81(1), 319–324.
- SAUERMAN, J. (2006): “Who invests in training if contracts are temporary? Empirical evidence for Germany using selection correction,” IWK-Discussion Papers 14, Institut für Wirtschaftsforschung Halle.
- SCHMIEDER, J. F., AND T. VON WACHTER (2010): “Does Wage Persistence Matter for Employment Fluctuations? Evidence from Displaced Workers,” *American Economic Journal: Applied Economics*, 2(3), 1–21.
- SCHMIEDER, J. F., T. V. WACHTER, AND S. BENDER (2010): “The long-term impact of job displacement in Germany during the 1982 recession on earnings, income, and employment,” IAB Discussion Paper 201001, Institut für Arbeitsmarkt; und Berufsforschung (IAB), Nürnberg [Institute for Employment Research, Nuremberg, Germany].
- STEVENS, A. H. (1997): “Persistent Effects of Job Displacement: The Importance of Multiple Job Losses,” *Journal of Labor Economics*, 15(1), 165–88.
- TOPEL, R. H. (1990): “Specific Capital and Unemployment: Measuring the Costs and Consequences of Job Loss,” *Carnegie-Rochester Conference Series on Public Policy*, 33, 181–214.
- VON WACHTER, T., AND S. BENDER (2006): “In the Right Place at the Wrong Time: The Role of Firms and Luck in Young Workers,” *American Economic Review*, 96(5), 1679–1705.
- VON WACHTER, T., AND E. W. HANDWERKER (2009): “Variation in the Cost of Job Loss by Worker Skill: Evidence Using Matched Data from California, 1991-2000,” Discussion paper.

**Appendix A: Types of contracts**

Fixed-term contract categories included in the research are:

1. Contracts for a specific task or service (*contratos para obra o servicio determinado*): The reference to a specific purpose has a double meaning: to delimit the purpose of the contract as well as its duration. As a result, the contract often has uncertain duration, expiring upon completion of the service contracted by the firm.
2. Casual employment contracts (*contratos eventuales por circunstancias de la produccion*): This contract is designed to meet unexpected changes in the firms' routine, such as an increase in export orders. It has a maximum duration of 6 months within a period of one year. However, in the case of seasonal activities, the duration may be modified through collective bargaining to a maximum of 12 months within a period of 18 months. If the contract has a shorter duration, it may be renewed once as long as the maximum duration is not exceeded.

The distinguishing factor between the regulation of fixed-term and indefinite contracts are dismissal costs. In particular, common to all fixed-term contracts is the provision of an advance notice for dismissal of 15 days if the contract duration exceeds one year. The exception are fixed-term contracts to fill the vacancy created by a worker on leave, for which the provision of an advance notice for dismissal depends on what the parties agreed upon signing the contract. If the work relationship is continued after completion of the project, time period, or circumstances detailed in the contract, the contract becomes an indefinite work contract. Additionally, the worker is entitled to receive the severance payment negotiated through collective bargaining or, most commonly, a payment corresponding to the salary of 8 days per year of tenure.

On the contrary, indefinite workers' dismissals typically need to be notified to the worker and worker's representative with an advance notice of 30 days, during which the employee also has the right to use up to 6 hours a week to look for another job (*Workers' Statute*, articles 51 and 53). Unless otherwise negotiated by the parties, severance payments traditionally amount to 20 days per year of tenure with a maximum of 12 months pay. The amount of the severance pay regulated by law varies according to the cause alleged by the firm for the dismissal. Toharia and Ojeda (1999) note that most individual dismissals take the form of an "objective dismissal" (based on economic and technological circumstances) or a disciplinary dismissal since the latter requires no advance notice and no initial severance payment. As Toharia and Ojeda (1999) further explain, the worker has the right to sue the firm for unfair dismissal. In that case, bargaining over the severance payment takes place resulting in the vast majority of the cases in severance pays well above the amounts established by law and closer to the amount of 45 days pay per year of tenure with a maximum of 42 months pay contemplated by law for the unfair dismissal. In the case bargaining fails, the case goes to the Labor Courts. If the latter decide the dismissal was unfair, the employer also has to pay the wages and social security taxes corresponding to the time period between the dismissal and the notification of the judicial decision.

It should be noted that there are not systematic institutional differences in the treatment of fixed-term and indefinite workers in Spain. Specifically, the Spanish law explicitly prohibits the inferior

## WAGE LOSS AND SPECIFIC HUMAN CAPITAL

treatment of fixed-term workers relative to indefinite workers in terms of pay. See: TS 13-5-91, RJ 3909, RJ 5483, and RJ 118. Additionally, the Constitutional Courts in TCo 177/1993 stated that the shorter contract duration is not sufficient to justify a lower rate of pay.

## Appendix B: Occupational categories

Table 6: National job category levels

Occupation category groups	Category levels
High Occupation	1. Engineers and graduates and managers 2. Technical engineers and other skilled workers
Upper-Intermediate Occupation	3. Chief and departmental heads 4. Other semi-skilled workers
Intermediate Occupation	5. Skilled clerks. 6. Auxiliary workers
Lower-Intermediate Occupation	7. Semi-skilled clerks 8. Skilled labourers
Low Occupation	9. Semi-skilled labourers 10. Unskilled labourers