Explaining the fall of the skill wage premium in Spain (*)

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Preliminary draft
(5 May 2010)

Abstract

The main purpose of this work is to document and explain the fall of the wage skill premium in Spain in the last two decades. We show that the (increasing) mismatch of educated workers and temporary contracts help explain the fall in returns to labor market experience and firm tenure of high-educated workers.

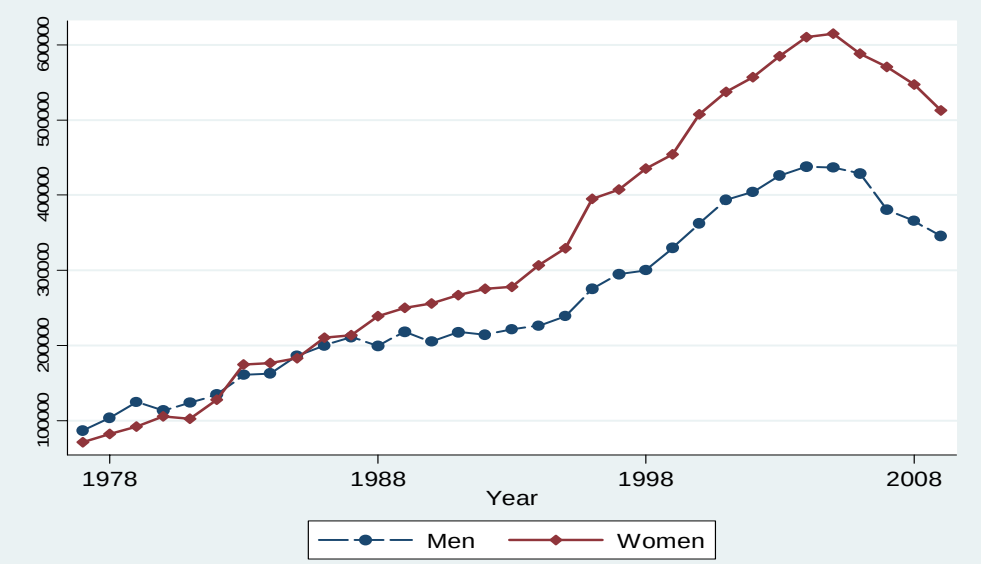
Keywords: wage premium, return to education, experience, seniority
JEL Classification:

(*) Paper prepared for the FEDEA Annual Monograph Conference *Talent, effort and social mobility* , 19-20 May 2010.

1 Introduction

The last three decades have been characterized by a huge increase in the number of college graduates in Spain. As shown in Figure 1, between 1977 and 2009, the number of male and female 25-29 graduates multiplied by 4.5 and 6, respectively. The star of the boom coincided with the entry in the market of the first baby boom generations accelerated by mid nineties, keep growing in the early 2000s despite the decreasing size of the cohorts born after 1975 and finally started falling very recently, after 2005.

Figure 1: College graduates aged 25-29 years by gender (1977-2009)



Source: LFS, 2nd quarters (EPA, INE)

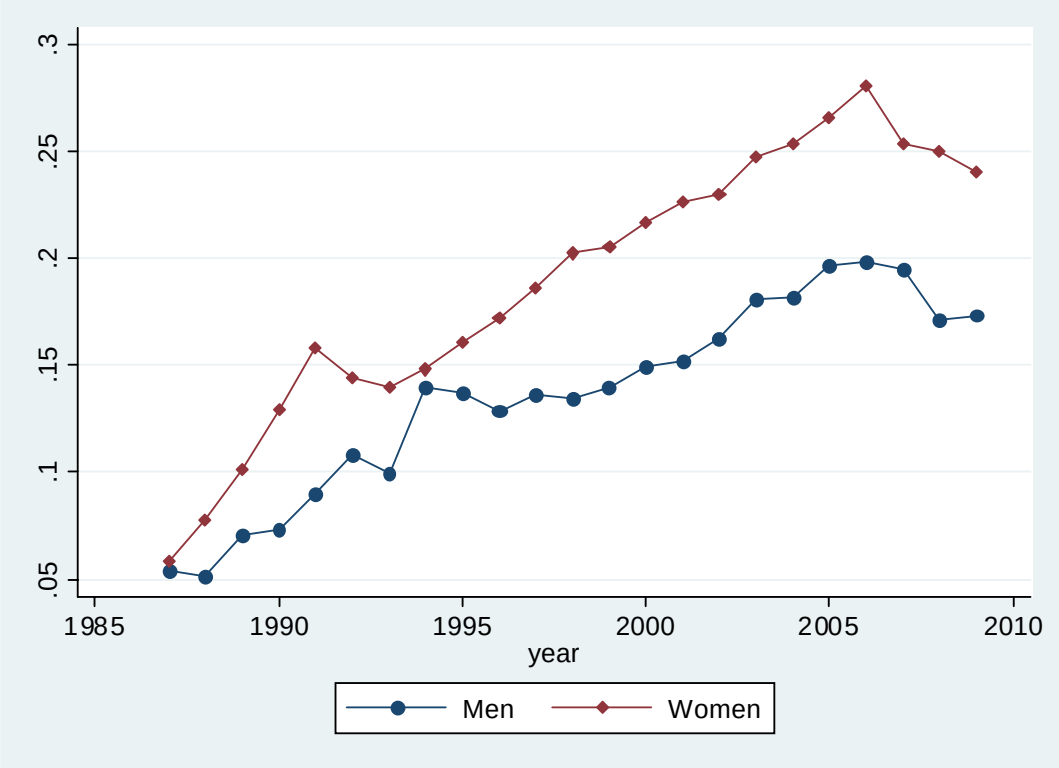
The evolution of the skill wage premium in Spain has been widely studied in recent years[1] and there is a fairly widespread consensus that this huge increase of college graduates has been accompanied by a decrease in the return to education at least since the early 90s. The neologism "mileuristas" ("thousand-eurists") has been used recently to define this phenomenon, referring to those persons belonging to the generation born in Spain after 1965 and whose earnings do not exceed 1,000 euros per month when they are aged over 30 years. In addition to their economic situation, the concept refers specifically to the recent, more educated Spanish cohorts, who tend to be overeducated at their jobs and often better trained than their own bosses. Felgueroso and Jiménez-Martín (2009) document the continuous increase in the rate of occupational mismatch amongst college graduates during the last

[1] See, for example, Abadie (1997), Arellano, Bentolila, and Bover (2001), Del Río and Ruiz-Castillo (2001), Febrer and Mora (2005), Izquierdo and Lacuesta (2007), Carrasco, Jimeno and Ortega (2008), Simón (2009), Felgueroso and Jiménez-Martín (2009), Pijoan and Sánchez (2010) and Hidalgo-Pérez (2010).

two decades and how overeducation has been one important factor for explaining the fall in the skill premium. However, this composition effect could only explain a fraction of the fall. Indeed, the wage premium for well-matched graduates has also fallen in the last decade.

Moreover, during this period, the Spanish labor market has also been characterized by a huge increase of temporary employment (both in absolute and relative terms), which has affected all age and educational levels, specifically college graduates of intermediate age. The succession of temporary contracts and layoffs at the start of their career may also have been responsible of the fall of the returns to experience and tenure and, consequently, the fall of the wage skill premium.

Figure 2: Temporary employment rates, university graduates aged 30-44 years (1987-2009)



Source: LFS, 2nd quarters (EPA, INE)

The causes of the divergent trend of wage inequality and skill Premium between US and Europa have been widely studied. (see, for instance, Nickell, 1995; Katz, 1995 or Acemoglu, 2003). All the studies, besides differences in the rate of growth of the relative demand and supply for skills in a context of rapid skill-biased technical change, stress that European labour market institutions have prevented wage inequality from increasing. In this sense, Spain not only has been characterized by very rigid wage-setting institutions but also a

regulation that favors temporary contracts and involuntary turnover, which has depressed wages of young cohorts.

Thus, in the Spanish case, any explanation of the college skill premium should take into account two basic factors. On the one hand, the effect of the quick increase in the supply of college graduates. On the other hand, labor market regulation. Regarding the first factor, the rapid increase in educational participation rates across cohorts are likely to imply changes in the ability-education relationship and thereby to impact on estimated returns to education. Naylor and Smith (2009) show that skewness in the underlying ability distribution has been a key determinant of the impact of graduate expansion on the college wage premium in Britain. The cohort crowding literature[2] offers an alternative explanation of the effect of increasing supply of graduates on the wage premium. The unifying idea underlying this literature is that workers with different amounts of labor market experience are imperfect substitutes in production and that individuals born in the same cohort are perfect substitutes, then an increase of a young cohort´s size is expected to deteriorate their earnings. The reason is that more experienced workers will generally perform somewhat different tasks than do younger workers, and compared to younger workers will tend to play different roles within a firm's organization. As the supply of labor with a given level of experience increases, the wages of workers in that group will tend to decrease relative to those with different experience levels. The smaller the degree of substitutability between workers with different experience levels, the greater the change in relative wages that will result from a given change in relative supplies. This is so because they compete mostly between themselves for the same jobs. Additionally, an increase of the educational level of young cohorts, combined with a high institutional employment protection of the old cohorts, also should reduce the degree of substitutability between both cohorts (Brunello, 2007). It is also important in this literature to test whether the relative wage reductions associated with being a member of a large cohort are concentrated in the early years of workers' careers or, alternatively, persist all over the lifecycle.

The likely effects of contract regulation and EPL on skill wage premium are due to their likely effects on human capital and occupational mismatch. Talented people are likely to self-select into the firms and occupations where they get a larger reward for their superior ability and effort. However, labor market institutions may distort job mobility patterns away from the efficient ones. For example, employment protection legislation can delay or even prevent the occurrence of the best matches between firms and workers, affecting

[2] See, for example, Welch, (1979), Murphy and Welch (1992), Freeman (1979), Berger (1985) or Card and Lemieux (1985).

productivity and wages throughout working lives. Also, the succession of temporary contracts and layoffs at the start of a career can prevent workers from acquiring sufficient specific human capital to enable them to fully exploit their talent. They may even induce those workers to choose an occupation or industry where their talent is inefficiently used. In other words, high employment protection can lead to a lower use of internal markets among the young early in their career. Once advanced in their career, high redundancy payments increase workers´ switching costs, discouraging their voluntary mobility and the use of external markets. Workers with high specific human capital may remain at their jobs for a longer time than optimal.

The main aim of this work is to investigate the explanatory factors behind the continuous fall of the observed wage skill premium for males of intermediate age in Spain. In particular we aim at responding questions such as: what is the role of labor market experience and seniority in the evolution of the observed wage skill premium? How much of the wage premium fall is due to demographic and other labor market factors? Likewise, we also investigate the potential causes/sources of persistence/trap of the "mileurismo". In particular, we like to assess the importance of cohort effects and how they transmit over the lifecycle.

To provide empirical evidence on whether earnings profiles vary over the demographic cycle, we estimate individual wage equations for the period 1988-2008. Following Dustman and Meghir (2006), we formulate and estimate a wage equation in which we control by the level of skills of the workers as well as their various sources of experience. In particular, we consider three types of experience: (a) general experience or potential experience gained by the employee; (b) sector specific experience; and, (c) and tenure in the firm or job. The investigation of how the firm-specific skills can determine the wage is an area currently under development because incorporating the effects of tenure on wages is by no means simple. In general, the problem is a combination of the traditional omitted variable problem (ability) and endogeneity/sample selection problems.

Our main source of data is the Muestra Contínua de Vidas Laborales 2008 (MCVL), a yearly extraction of working histories, covered wages, and benefits from the Spanish Social Security records. From 2005 on, data from the MCVL have been regularly matched with census and fiscal data. Particularly in our case we use census data to recover information about the level of education[3]. Although we dispose of monthly covered wages data from 1981 to 2008, we

[3] Our main evaluation of the SWP will be based in the comparison of the wage levels of low and high educated individual. Given this decision may be subject to strong critics we have evaluated the main trends of the SWP and returns to experiences under alternative definitions of skill (for example, by group of contribution). Fortunately all of them lead to similar qualitative conclusions.

restrict econometric analysis to males aged 30-44 in period 1988-2008. We do so because of retrospective data for the previous period is less representative of the male working population especially for young and older individuals. Likewise we exclude females from the analysis because part time work, which is very important for them, cannot be accurately identified in the MCVL.[4] It is important to note that monthly covered wages are a double censored version of wages. This data restriction substantially complicates the analysis of the wage equation. We use the procedure proposed by Boldrin et al (2004), recover uncensored wage information by predicting wages for those individual top censored[5].

The remaining of the paper goes as follows. In section 2 we describe the main trends of the WSP in the last three decades using working histories, while in section 3 we describe and characterize potential determinants of these trends, namely, the evolution of occupational mismatch and experience and seniority. In section 4 we describe the econometric model and data. Section 5 presents the key evidences obtained. Finally, section 6 concludes.

2. The wage skill premium in Spain, 1982-2008

2.1. Previous evidence for Spain

The study of returns to education and experience has been widely carried out for several countries. The evidence, however, is very varied. For the US, UK and the Canada, the returns to education and wage differentials in general have been growing continuously since middle eighties. Alternatively, for Continental Europe countries the evidence points to stability or, in some cases, of falling wage premium (Freeman and Katz, 1995; Nickell and Bell, 1996; Katz and al. 1995, and Acemoglu, 2003).

Wage inequality and skill wage premium in Spain have been studied by Abadie (1997), Arellano, Bentolila, and Bover (2001), Del Río and Ruiz-Castillo (2001), Febrer and Mora (2005), Izquierdo and Lacuesta (2007), Carrasco, Jimeno and Ortega (2008), Simón (2009), Felgueroso and Jiménez-Martín (2009), Pijoan and Sánchez (2010) and Hidalgo-Pérez (2010).

We analyze first those works that use Household Budget Survey data. For

[4] Part time work, much more important among females, induces substantial differences between monthly and hourly wage differentials.

[5] The bottom censoring of covered wage is different because is affected by minimum wages. So we decided to skip treatment of this problem.

example, Abadie (1997) examines wage inequality trends during the 1980s using quantile regression methods and the Household Budget Survey for 1980/81 and 1990/91. He documents a fall in the return to education during this period, which mostly affects the lower part of the distribution for younger workers and the upper part for elderly workers. In particular, young workers faced the largest drops in the coefficients related to the low tails at all schooling levels, specifically for secondary schooling. Del Río and Ruiz-Castillo (2001) found that income inequality has dropped continuously since 1973, and that returns to schooling showed a decreasing trend in the eighties and early nineties. Hidalgo-Pérez (2010) found that the education wage premium fell -1.52% during the 1980s and -0.92% during the 1990s. He argues that a big portion of these decreases are due to the relative increase in the supply of more educated workers. Moreover, he finds that the moderation of the decrease observed in the 90s is due to "some" stabilization of the relative supply of skilled workers, because relative demand of skill seems to be stable through the two different decades.

In a very recent study, Pijoan and Sánchez (2010) using the Continuous Household Budgets Survey for 1985-1996 and the European Community Household Panel for 1994-2000, found that the tertiary education premium, is stable until 1996 and then it decreases from about 1.57 to about 1.47 at the end of the decade. Also they found that the experience premium increases from about 1.2 in 1994 to around 1.45 in 1996 to remain almost steady afterwards. Composition effects are important because the decrease in the tertiary education premium in terms of Mincer regressions is more moderate than in terms of raw data. That implies that the age and sex composition changes of the tertiary educated is important to partially explain the evolution of its trend over the end of the nineties. This study also shows that inequality in individual labor earnings in Spain has decreased substantially most due to the decrease in the tertiary premium. In addition, the substantial decrease in unemployment from around 24 percent in 1985 to 13 percent in 2000 drives a hefty increase in the incomes at the lower tail of the distribution. Finally, part of the fall in the tertiary education premium is due to this reduction in unemployment, which affected differently different education groups.

Another series of papers have used data from the Encuesta de Estructura Salarial (EES), for which three waves (1995, 2002 and 2006) are currently available. Izquierdo and Lacuesta (2007) use non-parametric techniques to analyze Spanish wage inequality between 1995 and 2002 using the EES. They show that changes in the return to education and tenure decreased inequality, while changes in composition increased the inequality. Return to schooling has

decreased 5% in this period and more than compensate the previous effect on inequality due to composition alone. Carrasco, Jimeno and Ortega (2008) analyses the contribution of immigration to the observed changes in the Spanish wage distribution using the two first waves of the SSE using quantile method. They find that the effects of immigration on wage changes are small and that the patterns of changes in the returns of natives do not support the view that immigration negatively affects the evolution of wages. They suggest that other factors, besides immigration, should be identified as the key determinants of the wage moderation observed since the early nineties in Spain. Simón (2009) uses matched employer-employee data to examine wage inequality in Spain. The empirical analysis reveals that the bulk of the reduction observed between 1995 and 2002 can be mechanically explained by changes in the characteristics of economic agents. Finally Felgueroso and Jiménez-Martín (2009) analyze for the period 1995-2006 the role of education mismatch on wage premium. They document the fall of the wage premium for all levels of education. For them, the key explanatory factors are the production model (too specialized in low productivity sectors) and the increased occupational mismatch.

Finally, Arellano, Bentolila, and Bover (2001), using data for males from a large Social Security data sample, examine wage inequality trends for the 1980-1987 period. Their analysis focuses on the behavior of returns to skill and experience both over time and across sectors. They found that in medium-sized and large firms, returns to both college and junior college rise but in small firms, returns to junior college remain essentially constant.

In summary, although there is no a clear consensus about the evolution of the skill wage premium in the 80, all the evidence points to a fall of the skill wage premium since mid 90.

2.2. Estimating the skill wage premium from working histories

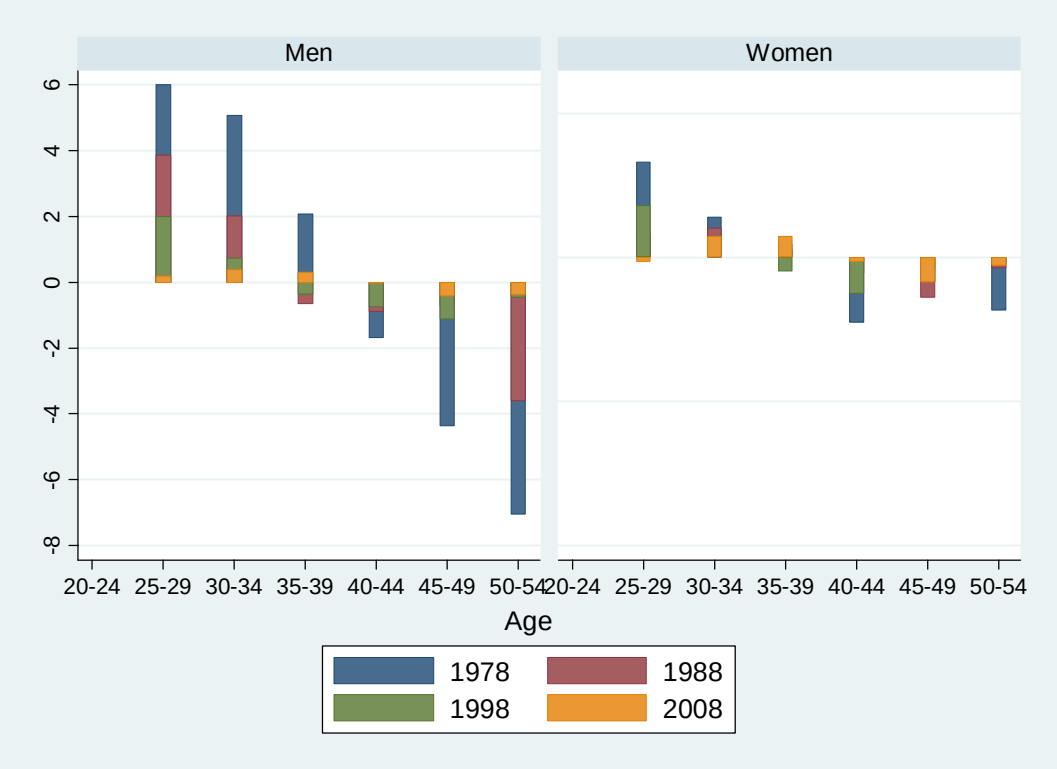
The main objective of this section is to document the skill wage premium trends in Spain using data from the MCVL2008. The dataset is a 4% sample of those individual with "some" relationship with the Social Security in 2004. If the individuals keep the relationship with the SS then they are included in the next period wave. Those lost are replaced with a new extraction in order to complete the desired 4% target (see García-Pérez (2008) for a detailed description). The SS information is then matched with census and fiscal data. Currently is the only available Spanish source to study longitudinally the evolution of the SWP. However, the dataset has some notable limitations that have to be carefully

considered: attrition, incomplete or missing information and censoring of covered wages.

The first important problem is attrition, that is, workers that having been contributed previously currently are not. As we move back in time the likelihood of attrition (or lack of representativeness of the sample) increases. Although we have retrospective information for the current pensioners, we do not have information for those that have contributed in the past and have died in recent years. Given the fact that life expectancy varies with gender, education and region, going back in time too far may cause important sample selection problem. Another potential cause of attrition is participation at young ages combined with non participation at older ages, which is typical of older generation of Spanish women. Consequently, information of women at younger ages, given they are current older, is conditioned to continuous participation, which maybe condition by individual characteristics like education. In this sense, low wage women are more likely to abandon the labor market at older ages, which may subestimate the retrospective estimation of the SWP for them.

Figure 3 present the evolution in the fraction of wage earners each age group represents at different points in time using information from the MCVL2008 and the EPA. Note that the distribution of male has a greater bias with respect to the EPA than the distribution of females, especially at younger and older ages. This discrepancy gets reduces as we move forward in time, being practically non-existent in recent year and, in any case, very small for male aged 30-49 since 1988.

Figure 3. Differences in the weights of age groups between the MCVL and the LFS by gender(wage earners, aged 25-54 years)



Note: % age group/wage earners aged 25-54 in the MCVL - % age group/wage earners aged 25-54 in the LFS. Sources: MCVL 2008 & EPA (2º quarters, 1978, 1988, 1998 & 2008)

The second problem we have to consider is the information about education which is collected from the population census, which was last actualized in 2001. Consequently it could be fairly inaccurate for younger cohorts. This is so because the only reason for revising the population census information is residential mobility, relatively infrequent among younger cohorts in Spain. Fortunately, the MCVL provides as with a proxy of the level of education. This is so because of the two first groups of contribution are referred to university graduates. However, this alternative definition is not exempt of problems, because of the first group of contribution also includes managerial staff, which may not necessarily have university studies. Apart of this, lower levels of contribution, typically occupied by less educated and dropouts are also not exempt of problems. This is so because an increasing fraction of educated young individuals enter the labor market through lower levels of contribution. Some of them advance to higher groups of contribution at latter stages of their career but other remain in lower levels for many years, even sometimes they never achieve the top levels of contribution.[6]

[6] This is for example the case of diploma and university graduates working in administrative jobs. An informal survey among UPF's department of economics staff showed that ¾ of mismatched university or diploma graduates.

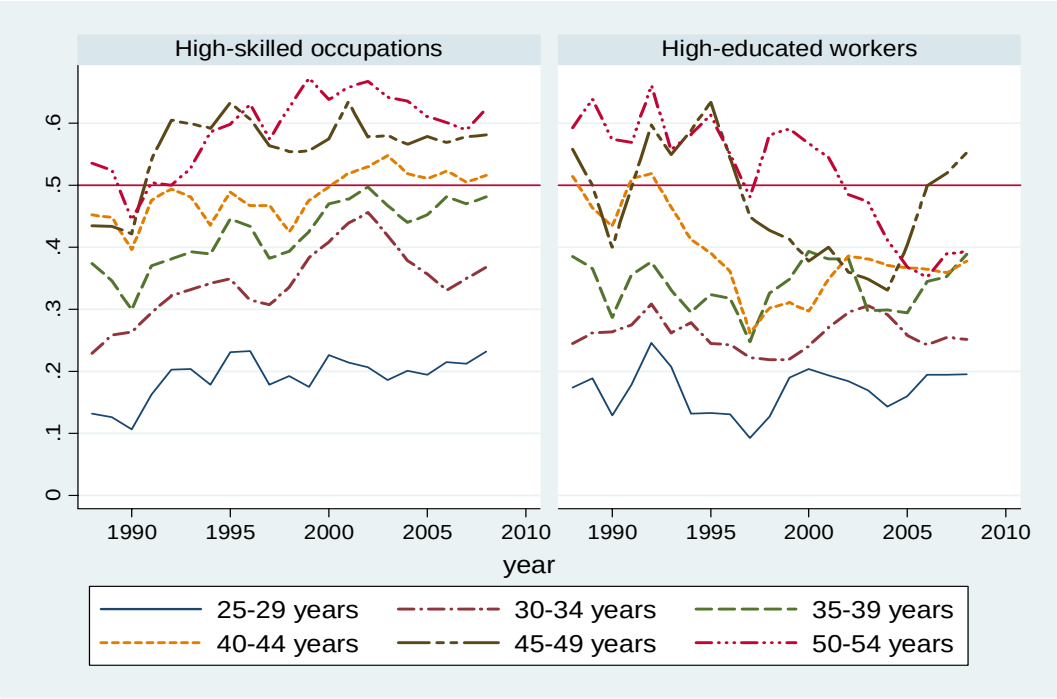
Given the latter problems we have decided to use the level of education obtained from the census to classify workers. In particular our main evaluation of the SWP will be based in the comparison of the wage levels of low and high educated individual.[7] Given this decision may be subject to strong critics we have evaluated the main trends of the SWP and returns to experiences under alternative definitions of skill (for example, by group of contribution). Fortunately, all of them lead to similar qualitative conclusions.

Another potential data problem derives from then changes in the group of contribution that are observed within a given contract. In this case they are not recorded in the data. However, preliminary exploration of the data reveals that this problem is not very important since only affect about 3% of the records. Something similar happens with workday time (either complete or part time). However in this case, the incidence is much more important for females, who change workday status much more frequently than male do. This is one of the key reasons for not analyzing data for women (at least for the moment). It also explain why we focus on monthly earning instead of hourly wages.

Finally, the third data problem is the censoring of the wage information. Wages are computed from covered wages that are censored from below and above. Minimum covered wages are related to statutory minimum wages and should not worry us too much. Alternatively, maximum covered wages do imply real censoring of monthly wages for an important fraction of the simple. As we can observe in Figure 4 censoring is especially important for male in qualified occupations (groups of contribution 1 and 2) and also for high educated individuals. For workers older than 45 in the top groups of contributions, censoring can even affect the median, that poses severe difficulties to quantile estimation methods. Finally, note than censoring is increasing with age for high-skill occupations and decreasing for high-education workers. Undoubtedly this is one of the consequences of the increasing mismatch of the Spanish educated population.

Figure 4. Share of censored wages (top-codded) by age
(High-skilled occupations & high-educated workers, men, 1988-2008)

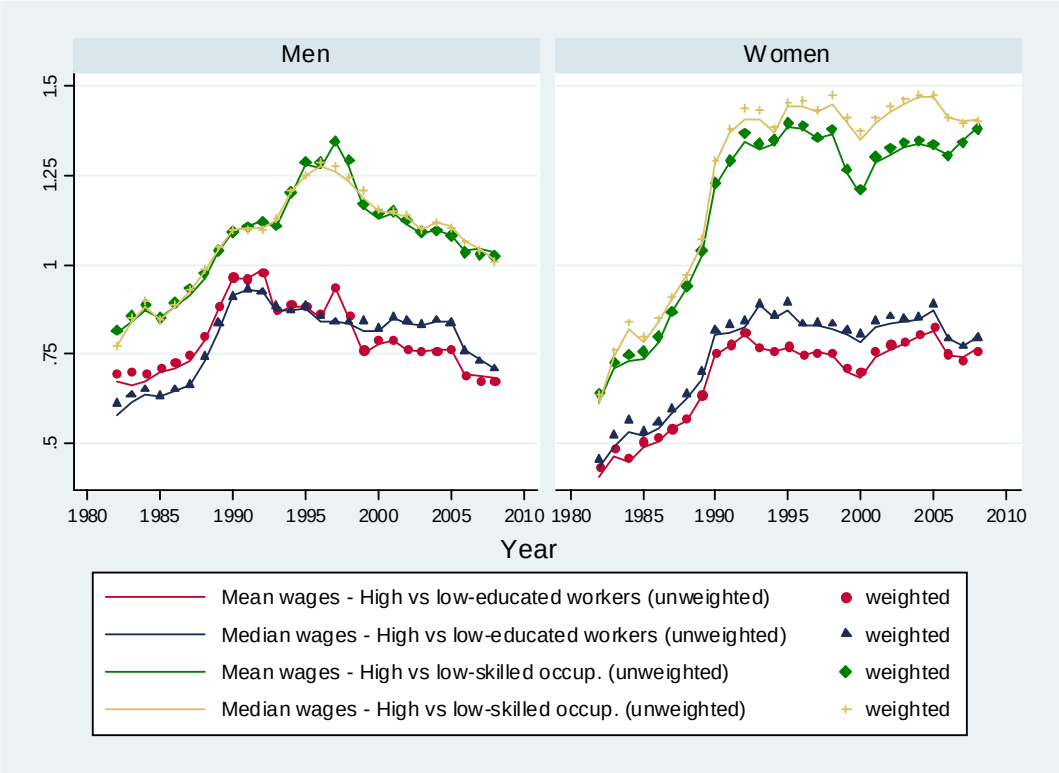
[7]The potential bias of choosing the census level of education as a reference to measure skill is due to the relationship between education and residential mobility for educated young. This would likely upward bias the skill Premium for young individuals.



Like some recent econometric work (see Hanoch & Honig, 1985, Bover et al., 2001 o Bonhomme & Hóspido, 2009), we correct censoring by means of standard econometric methods. In our case, like Boldrin et al (2004) we estimate a year-by-year Tobit reduced form wage equation and predict wages for top censored observations. See Appendix A for details.

Taking into account all these limitations we present descriptive evidence of the trends of the skill wage Premium in the 1982-20008 (recall that evidence for the 80s has to be taken with a lot of caution. We keep, for the moment, the gender distinction and compare using two definitions of skill: high educated (university graduates) versus low educated (without any post-compulsory studies) and high occupations (groups of contribution 1-2) vs low occupations (groups of contribution 9 and 10). In greater detail, Figure 5 presents the main trends of the percentage wage difference at both the mean and the median. Wages are corrected for censoring and skill premium is shown in two version unweighted and weighted using weights obtained from the EPA for workers between 25 and 54.

Figure 5. Skill wage premium by year and gender: differences in median & mean wages between high and low educated workers between high & low-skilled occupations (wage earners aged 25-54, 1982-2008)



Note: High-educated workers: university graduates; Low-educated workers: compulsory education attainment; High-skilled occupations: Social Security Groups 1 & 2; Low-skilled occupations: Social Security 9 & 10. Wage premium measured as % differences in median & mean monthly wages. Source: MCVL, 2008

The first relevant observation is that weighting does not affect wage differentials. Consequently attrition problem may be less relevant than what we were a priori expecting. In any case the larger deviations are observed for women before middle 90. The second important observation is that wage differential patterns are similar using mean or median wages.

Turning back to the evaluation of the SWP by educational level, we observe an important increase of the skill Premium in the 80 followed by a continuous decrease since the early 90 (above 25 pp) for males. For females, we also observe an increase during the 80 followed in this case by a long period of stabilization. When the comparison is based upon contributions groups, the SWP are much larger than those obtained using education. For males, mean and median are roughly equal and increase until 1997, and fall since them. For females, the evolution of the SWP by group of contribution is very similar to the one described before: increase in the 80 followed by stabilization from early 90.

At this stage of the work, it may be useful to compare the SWP obtained from the MCVL with the one we can obtain from alternative sources. In our case we do so by comparing the above numbers with the number we can obtain from Encuesta de Estructura Salarial (EES). In Table 1, we present the SWP by

educational level computed using hourly and monthly mean wages from the first EES (1995) and the last one (2006). We extract the following lessons: first, when considering monthly mean or median wages the SWP obtained from the EES, being the discrepancy much more evident for males than for females. The presence of non-regular wage information in the EES may help explain these discrepancies (see de la Rica et al., Dolado & Vegas, 2010).

Table 1
Estimations of the SWP by educational level using the MCVL & the EES.
(wage earners aged 25-54 years, 1995 & 2006)

		1995	2006
Monthly wages (MCVL)			
	Men	88.4	69.1
	Women	77.3	75.2
Monthly wages (EES)			
	Men	107.7	94.9
	Women	**83.3**	**86.7**
Hourly wages (EES)			
	Men	112.9	94.0
	Women	80.2	64.3

Sources: Encuesta de estructura salarial (EES, 1995 & 2006) and MCVL (2008)

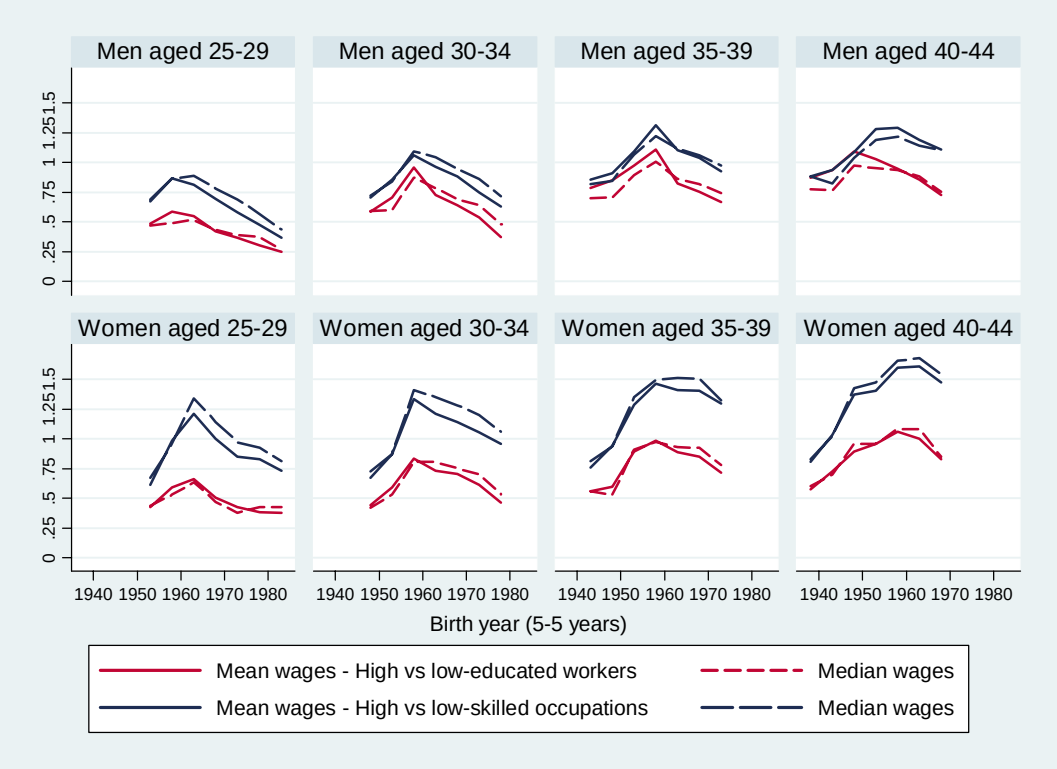
In any case, when considering mean monthly wage information, the evolution of the SWP is very similar to the one obtained with the MCVL: a substantial decrease for male and stabilization for female. Note that when we consider hourly wages instead of monthly wages we detect in the EES a fall in the SWP. This may be due to changes in the distribution between part and full time jobs among women, which can be hardly detected using the MCVL.

Figure 6 shows the evolution of the SWP by age, cohort and gender. Again we observe a similar pattern either comparing educational or qualification groups. The numbers are revealing: firstly, at the time of entry the SWP have been falling for cohort born after early 60 (with implies entry in the market after 1985); secondly, despite the apparent increase with the age, the SWP falls with time for all the male cohorts; the differences by gender are due to a delay in the SWP fall for women.

Specifically for women, we observe a substantial increase of the SWP for those born between 1963 and 1967, currently aged 43-47. For those born after 1967 a small decrease of the SWP is observed at all ages. Alternatively for males, the fall of the SWP starts for cohorts born between 1958-1962, currently aged

48-52. Note finally that for both gender the discrepancies between the SWP measured by educational level or occupation are larger for younger cohorts. In our opinion this is likely due to the increasing fraction of mismatched educated individuals present in younger cohorts.

Figure 6. Skill wage premium by age, birth year and gender: differences in median & mean wages between high and low educated workers & between high & low-skilled occupations (wage earners aged 25-44, 1982-2008)



3. Occupational adjustment, experience and seniority

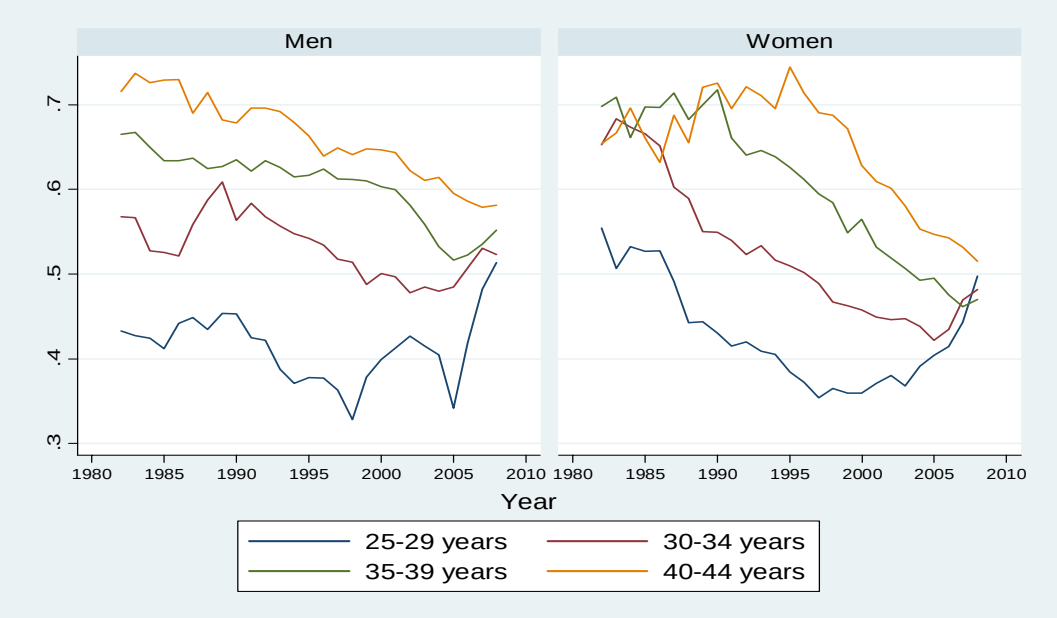
In this section we document the evolution of the two mechanisms we believe help explain the recent trends of the male SWP in Spain: the occupational mismatch and changes in labor market experience and seniority.

3.1. Occupational mismatch

An important characteristic of the Spanish labor market is the occupational mismatch, defined as university or diploma graduates that are not working in occupations that do not require this level of qualification. Felgueroso & Jiménez-Martín (2009) showed that the fraction of mismatched graduates grew substantially in the nineties. Figure 7 presents new evidence on mismatch obtained from the MCVL. As it can be easily detected, the fraction of well-

matched has been falling until very recently for all age and gender groups. The recent trend change has to clear explanations: firstly, the fall in the absolute number of graduates observed in recent years; secondly, as showed by Felgueroso and Jiménez-Martín (2009) the recent increase in the unemployment rate has affected much more those individuals mismatched, thereby increasing the fraction of well-matched ones.

Figure 7. Share of well-matched workers by age and gender (University graduates, 1982-1988)



What is the likely effect of mismatch on perceived SWP? Figure 8 shows that the SWP of mismatched male (female) graduates has remained stable (slightly increased) during the last 25 years. Alternatively, the SWP of well-matched male graduates increased substantially until 1997 and fell afterwards. For well-matched female graduates we also observe an increasing during the eighties followed by mild growth afterwards. Thus the global trend of the SWP is explained by the combination of two factors: changes in the composition of the educated workforce, and (after 1997) a decrease in the SWP of the well-matched (which can be due to the specialization in low productive sector observed in the last economic cycle). Evidence in Felgueroso and Jiménez-Martín (2009) using the EES offers support to these explanations. They found that the SWP fell because of both the increase in the fraction of mismatched workers and the decrease in the SWP of well-matched graduates.

Further exploration of the data reveals important age composition effect. Figure 9 reveals that the decrease in the SWP has been observed for both groups: mismatched and well-matched. Consequently, the stabilization of the

SWP for mismatched males as a whole has to be explained because of changes of the composition of the mismatched population in terms of young (characterized by a low SWP) and older cohorts (higher SWP).

Figure 8. SWP by gender: high-educated workers in high or medium & low-skilled occupations
vs lowed-educated workers (workers aged 25-54, 1982-2008)

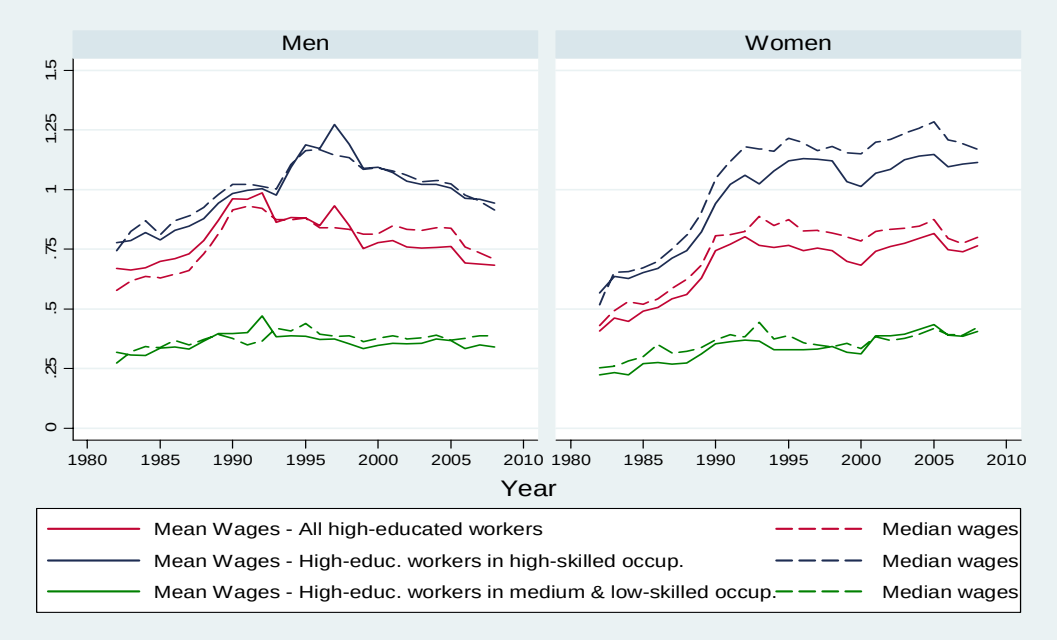


Figure 9. SWP by age and gender: high-educated workers in high or medium & low-skilled occupations vs lowed-educated workers

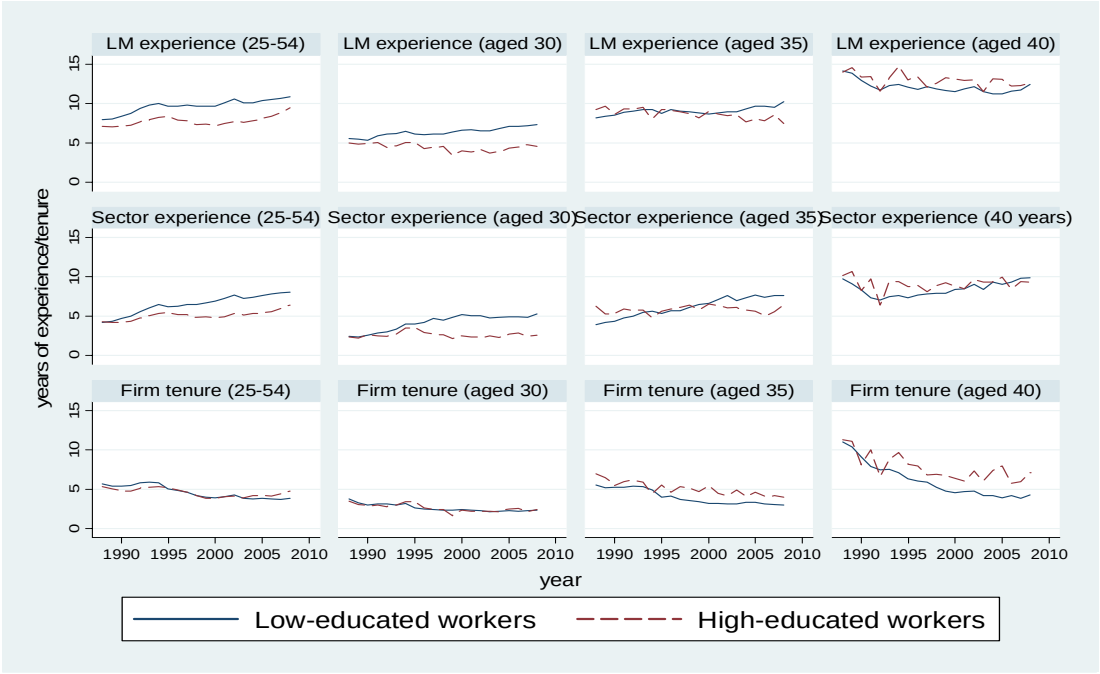
3.2 Labor market experience, sector experience & job tenure

It is well known that the Spanish labor market is characterized by a high (and persistent) fraction of temporary contracts and excessive rotation (see García-Pérez, 2008). In this section we document how these factors may have affected experience (labor market experience, sector experience and firm tenure) accumulation and, hence, may contribute to explain the observed reduction on the SWP in recent decades.

Figure 10 present the main trends of male accumulation of labor market and sector experience, and firm tenure by educational level at key ages (all, 30, 35, 40). Note first that average labor market and sector experience (reported in the first column) are greater for low educated than they are for high educated, with a difference that increases mildly with age. Note also that by age 40 this "advantage" is not present. The patterns of sector experience data are rather similar, larger for low educated at least until age 35.

Regarding firm tenure (reported in the bottom row of Figure 10), we find no differences in average firm tenure by level of education, although both are characterized by a mildly decreasing trend since middle 90s (likely due to increasing rotation). For key ages we stress the following findings: by age 30, most likely because of the increasing use of temporary contract, firm tenure has been always decreasing for both levels of education; by age 35 and also age 40, firm tenure has also a decreasing trend for both groups, being the negative trend much more evident for the less educated.

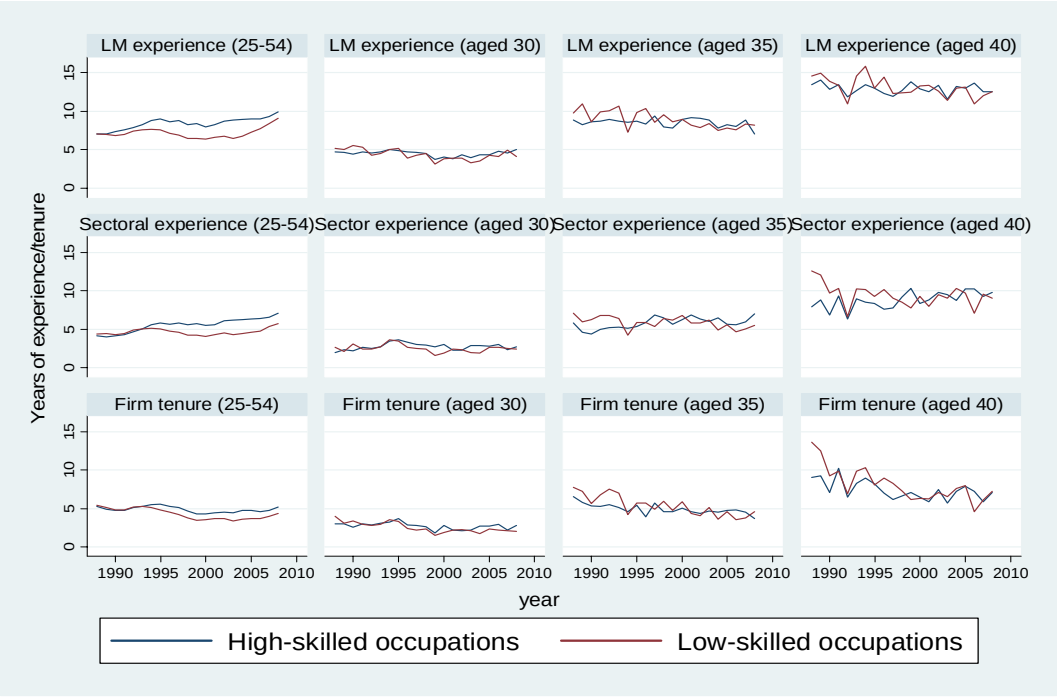
Figure 9. Labor market experience, sector experience & firm tenure by education level Males (1988-2008, aged 25-54 years & at 30, 35 & 40 years old)



Note: High-educated workers: tertiary education attainment; Low-educated workers: at most compulsory education attainment. Wage premium measured as % differences in mean wages. Source: MCVL, 2008

Finally, Figure 11 compares the main trends of male accumulation of labor market and sector experience, and firm tenure of educated workers classified by the skill level of the occupation at key ages (all, 30, 35, 40). We classify the educated in high skill occupations as well-matched and those in medium or low skill occupation as mismatched. Note that LM and sector experience of well-matched educated individuals has increased faster than those of mismatched educated individual due to the changes in the age composition of the mismatched population.

Figure 11. Labour market and sector experience, and firm tenure for high educated workers by occupation. Males (1988-2008, aged 25-54 years & at 30, 35 & 40 years old)



Note: High-skilled occupations: Social Security Groups 1 & 2; Low-skilled occupations: Social Security 9 & 10. Wage premium measured as % differences in mean wages. Source: MCVL, 2008

4 Econometric specification: returns to tenure and experience.

This section presents the econometric proceeding of the estimation of wage equations in which, following the seminal work of Dustman and Meghir (2006), we control by the level of skill of the workers as well as their various sources of experience. In particular, we consider three types of experience: (a) general labor market experience gained by the employee; (b) sector specific experience; and, (c) and tenure in the firm or job.

The inclusion of these three different experiences in a Mincerian wage equation requires a number of assumptions that must be discussed carefully. The investigation of how the firm-specific skills can determine the wage is an area currently under development because incorporating the effects of tenure on wages is by no means simple (see Dustman and Meghir, 2006, for a discussion). In general, the problem is a combination of the traditional omitted variable problem (ability) and endogeneity/sample selection problems. Given these problems, the literature offers different methods to achieve an estimate of the wage returns to education and experience.

Suppose we aim at estimating the following wage equation (we omit education):

$$Lnw_{it} = \beta_1 X_{it} + \beta_2 T_{it} + \varepsilon_{it} \qquad (1)$$

where X_{it} is the potential experience of worker i at time *t*, and T_{it} is the firm specific experience or *tenure* at the same time.

Regarding the estimation of the return to experience and tenure in equation (1), it is well known in the literature (Altonji and Shakotko, 1987, Topel, 1991 and Altonji and Williams, 1996) the existence of a potential bias in the coefficient of tenure. Three reason have been often argued: firstly, greater experience by a better job and wage choice; secondly, higher ability may imply greater capacity to keep the job; and, thirdly, workers with higher returns to experience are more likely to participate. The last cause is especially relevant in the correlated random effects class of models (Dustmann y Meghir, 2006). All of them generate the typical selection problem (with multiple sources) and pose severe difficulties in the estimation of β_1 and β_2.

Topel (1991) showed that it is possible to identify these two coefficients

from the first difference to (1). In more detail, take the wage growth equation:

$$\Delta Lnw_{it} = \beta_1 + \beta_2 + \Delta\varepsilon_{it} \qquad (2)$$

It is clear that for workers that keeps working in the same firm $\Delta X_{it} = \Delta T_{it} = 1$, so for them we can not identify both coefficients. Topel argued that it is possible to identify (an upper bound for) β_1 for entrants, for which tenure is zero. Given this estimate of β_1, Topel identifies β_2 in (2). He founds that the effect of tenure in wage increase is very important, about 25% after 10 years in the same firm.

However, this estimation strategy may bias upwards the estimate of β_2. This may be so because, in the US case, those workers with greater experience may switch jobs more frequently, so entry wage can be observed more frequently for those workers who benefit more from switching jobs. There may be the case that experience is greater for those workers that have a better match, so as the estimation will be biases for those that do not want to change job. Dustman and Meghir propose to restrict the estimation of the wage equation to displaced workers only. In particular, in order to avoid sample selection issues, they restrict the estimation sample to (exogenously) displaced workers because of plant closure. In this sample, there are two additional problems that have to be considered. Firstly, the potential correlation between unobserved ability and experience, which may downward bias the estimated coefficient of experience. And secondly, the sample selection bias associated to the fact that we only observe a fraction of the pool of displaced workers accepting an offer.

As Dustman and Meghir (2006) we consider three samples: firstly, the sample of all workers; secondly, the sample of new entrants, that mix two different types of workers: voluntary movers, who switch because they have a better wage offers, and unemployed, who decide to accept a job offer and, consequently, to abandon the unemployment pool (Dustman and Meghir, 2006); finally, the sample of displaced workers. In our case, we define displaced workers as those that have lost the job because of an ERE or a large employment adjusted (above 10% of the workforce) as well as those that lost the employment because of firm closure.

Apart of this, and as a major difference with respect to D&M, we carefully consider and control for the characteristics of the Spanish labor market. Before moving to data description and estimation, let us review briefly Dustman and

Meghir (2006) model.

4.1 The experience model.

Consider two groups of workers identified by their level of qualification; high ($a_i = 1$) and low ($a_i = 0$). For each of these groups, the wage can be described as follows:

$$lnw_{iet} = ln\omega_t^a + g(T_{it}^G \mid a_i) + s(T_{it}^S \mid a_i) + e(T_{iet}^e \mid a_i) + \eta_{it}T_{it}^G + \varepsilon_{it}T_{it}^S + v_{iet}T_{iet}^e + m_{iet}, \qquad (3)$$

where $ln\omega_t^a$ is the market return to qualification a. $g(T_{it}^G \mid a_i) + \eta_{it}T_{it}^G$, $s(T_{it}^S \mid a_i) + \varepsilon_{it}T_{it}^S$ and $e(T_{iet}^e \mid a_i) + v_{it}T_{iet}^e$ are the wage value of potential experience, sector experience and tenure, respectively. Each of these expressions is composed of two parts. The first one captures the mean effect of experiences on wages. The second part, represented by $\eta_{it}, \varepsilon_{it}$ and v_{iet}, captures the individual (unobserved) specific return to experiences. Finally, m_{iet} evaluates the effect of the matching between firm and worker.

The experience specific components in equation (3) imply a random return to experience model for each of the three types of experiences: general, sector and firm tenure. This type of model has been widely used in the estimation of returns to education and/or experience (Willis and Rosen, 1979; Heckman and Sedlacek, 1985; Heckman and Robb, 1985; Bjorklund and Moffit, 1987; Imbens and Angrist, 1994 and Heckman, 1995).

In their estimation strategy D&M propose using age as instrument for potential experience. For sector experience and tenure they propose using control functions based on the residuals from reduced forms for experience and participation (Heckman and Robb, 1985).

Model assumptions and empirical specification

As D&M our approach for estimating the average returns to experience for the workforce population is based on the following assumptions: firstly, displaced workers cannot predict firm closure. Secondly, both employers and employees have perfect information about their match (implicitly we assume there are no further gains from learning about the match). Thirdly, after controlling from observable characteristic, firms cannot differentiate between displaced workers.

Finally, the rank condition is satisfied. Note than condition three and four allow us to identify the mean returns to tenure.

Model implementation starts with the estimation of the reduced forms for participation and experience at the starting of the job spell. These reduced are aimed at controlling the potential selection biases we have commented above. In more detail we estimate:

$$T_{it}^{G} = \alpha_0^{aG} + \alpha_1^{aG} age_{it} + \alpha_2^{aG} c_{it} + \alpha_3^{aG} age_{it} c_{it} + ed_{it}^{'} \alpha_4^{aG} + (ed_{it}^{'} c_{it})^{'} \alpha_5^{aG} + x_{it}^{'} \xi^{aG} + v_{it}^{G}, \qquad (4)$$

Were the variables *age*, *c* and *ed* are the workers age, her potential experience and age indicators respectively. In x we include the level of education, a set of factors that control for the general and regional economic conditions, and year dummies. The same specification is used to model labor force participation. After estimation of these reduced form equation the corresponding residuals, $\hat{v}_{it}^{G}$ and $\hat{v}_{it}^{P}$, are used to control for participation and experience in the wage equation:

$$\begin{aligned} lnw_{iet}^{a} &= \ln \omega_t^{a} + g(T_{it}^{G} \mid a_i) + s(T_{it}^{S} \mid a_i) + x_{it}^{'} \gamma^{a} + \\ &+ \delta_1^{G} \hat{v}_{it}^{G} + \delta_2^{G} c \hat{v}_{iit}^{G} + \delta_1^{P} \hat{v}_{it}^{P} + \delta_2^{P} \hat{v}_{it}^{P} + \\ &+ \gamma_1^{G} T_{it}^{G} \hat{v}_{it}^{G} + \gamma_2^{G} c_{it} T_{it}^{G} \hat{v}_{it}^{G} + \gamma_1^{P} T_{it}^{G} \hat{v}_{it}^{P} + \gamma_2^{P} c_{it} T_{it}^{G} \hat{v}_{it}^{P} + \\ &+ \kappa_1^{G} T_{it}^{S} \hat{v}_{it}^{G} + \kappa_2^{G} c_{it} T_{it}^{S} \hat{v}_{it}^{G} + \kappa_1^{P} T_{it}^{S} \hat{v}_{it}^{P} + \kappa_2^{P} c_{it} T_{it}^{S} \hat{v}_{it}^{P} + e_{it}^{*}. \end{aligned} \qquad (5)$$

The residuals included in this regression to control selection and participation sample selection biases are obtained from the corresponding reduced form regressions described above. In addition we also include interaction of these residuals with labor market and sector experiences as well as the squared of all these variables (residuals and interactions of the residuals with experiences). Finally, the returns to tenure are obtained form the following expression:

$$\begin{aligned} \widetilde{lnw}_{iet} &= lnw_{iet} - \widehat{\ln \omega_t^{a}} - \widehat{g(T_{it}^{G} \mid a_i)} - \widehat{s(T_{it}^{S} \mid a_i)} = \\ &= e(T_{it}^{e} \mid a_i) + \lambda^{G}(c_{it}) v_{it}^{G} + \lambda^{P}(c_{it}) v_{it}^{P} + \lambda^{T}(c_{it}) v_{it}^{T} + \\ &+ \left[\rho^{G}(c_{it}) v_{it}^{G} + \rho^{P}(c_{it}) v_{it}^{P} + \rho^{T}(c_{it}) v_{it}^{T}\right] T_{it}^{G} + \\ &+ \left[\theta^{G}(c_{it}) v_{it}^{G} + \theta^{P}(c_{it}) v_{it}^{P} + \theta^{T}(c_{it}) v_{it}^{T}\right] T_{it}^{S} + \\ &+ \left[\xi^{G}(c_{it}) v_{it}^{G} + \xi^{P}(c_{it}) v_{it}^{P} + \xi^{T}(c_{it}) v_{it}^{T}\right] T_{iet}^{e} + e_{it}. \end{aligned} \qquad (6)$$

Were $\bullet(c_{it})$ represents a function of potential experience. In this

regression we have included the residuals from the first stage labor market experience and tenure reduced forms. As in the previous regression, we have also included interaction of these residuals with labor market and firm sector experiences as well as the squared of all these variables (residuals and interactions of the residuals with experiences).

Other explanatory factors

Given our primary interest is the identification of the main trends of the wage skill premium as well as the returns to experience, the non-stationarity of the Spanish population and labor market has to be considered in the analysis. In particular, and following our motivation in section 2, we control for the relative cohort size at the age of entry, the shares of low and high educated population, the female labor force participation (as a fraction of the 30-45 labor force), the fraction of temporary contracts, the production structure at the regional level, the unemployment rate, the capital to output ratio, and the ICT capital to capital ratio. All these variables (with the exception of the cohort size at the age of entry that is kept fixed) have both regional and time variation. These factors may have acted as confounders of the wage skill premium as well as the effect of the various experiences we have considered in the model.

4.2. Data and sample definitions.

Our main data source is the Muestra Continua de Vidas Laborales 2008 (MCVL), a yearly extraction of working histories and benefits from Spanish Social Security records. This database allows us to identify the key ingredients of the previous model: entry, transition to a new job or a new sector and their causes. As we have justified in section 2, we restrict the sample period to 1988-2008 because of data for the previous period is less accurate and because of the retrospective nature of the data set. The dataset is composed of three basic files: affiliation, contribution and benefit files.

Each record in the affiliation file contains detailed information from each of the different relationships between the individual and the Social Security. Each of these relationships includes information about the starting and ending dates of the affiliation spell and a number of characteristics of the job, including some firm characteristics (size, region, sector of activity). Thus, for each person, we have as many records as changes he/she has had with Social Security from his/her initial register. At this point, homogenization of existing information is necessary with the objective marked by the main research question: to explain wage differentials between skilled and unskilled workers in the last 20 years.

Obviously only those relationships originating a salary are interesting for this purpose given that this means the worker is paying the corresponding contributions and, thus, we know the corresponding wage. Therefore, the unemployed and pensioners in all forms are not included in the sample. Of the remaining workers, we exclude self-employed (since the information about contribution is unrelated with earnings for them, and all those who do not belong to the general regime of social security (domestic helpers and other special regimes are excluded from the analysis). From those contributing to the General Regime we restrict the analysis to those in groups of contribution 1 to 10. With regard to the employment relationship, some special cases, as those contributors who have some peculiarities that make them not being registered or those with a learning contract have been eliminated. Workers hired through temporary employment agencies were also eliminated. Finally, those workers with missing information that might be relevant for the subsequent analysis have also been eliminated.

The MCVL for 2008 includes 1,213,706 records of people who had some kind of relationship with Social Security this year, and who generated a total of 16.151.836 different affiliations for their entire working life. Filtering according to the criteria above, we reduce the valid sample to 754,615 wage earners which generated a total of 14,403,110 affiliations registers. Since this implies a huge amount of information we decided to extract a 13% random sample of the initial (valid) sample. Also, for this sample, those contributions for the selected affiliates previous to 1988 have been eliminated and also those below 25 and above 55 years. From this random sample we have selected only males. Thus, the final sample has 69,758 valid male wage earners in the 1988-2008 period.

Once we have the sample for affiliations, we match it with the file of contributions in order to get wage information. Recorded monthly contribution bases are a double censored (both from below and above) version of salaries. In order to recover wages we model censoring from above as Boldrin et al (2004) and then predict wages for those that are right censored (see appendix A for a description). As them, we consider that censoring from below is too noise (because of part time jobs and other incidences) and decide not to treat them at all. Our wage is the annual average of monthly covered earnings. Because we panel our sample in a worker-firm match, we may observe two or more wages within one year for a worker.

The 69,758 affiliates selected generated 3.31 different affiliations throughout their labor lives leaving us 230,947 different relationships with

firms and 757,677 contributions records From this sample we construct two subsamples: new contracts (or new matches) and displaced workers. The first group is constructed with workers that started their relationship with the firm after 1988. They could be previously either in another job or unemployed. This gives us 57,497 workers, 207,626 relationships and 574,346 records. Displaced workers are those workers that shift firms because involuntary job lose. To ensure that we do not include self-selected workers in the "displaced" sample we restrict it to those workers that has lost the job because firm closure or because the firms has gone through a major restructuring process (Expediente de Regulación de Empleo) or because a collective dismissal process (more than 15% of the workforce). The identification of these workers is not extremely difficult using the MCVL. First, we identify those firms (zero workers in a given years). Second, those workers with contributions in this particular firm one year before the firm closure have been considered displaced in the next job relationship. The rest of the observations that have been classified as displaced are defined similarly. Only the following job after a displacement is considered. The final displaced sample is composed of 31,406 workers that at least have lived one displacement, 60,434 relationships and 168,238 records.

We generate three subsamples in terms of level of education and occupations. Then, we defined skilled workers as those with college education and unskilled workers as secondary drop-outs. Also, within the first group we differentiated between the workers that having college education the job occupation is Management staff and College graduates (level 1 of Social Security Contributions Group) and Technical College Graduates and Colleges Assistant (level 2 of Social Security Contributions Group), and the workers whose their occupation are below these two levels (3 to 10). Those in the latest group are considered overeducated or mismatched. The percentage for each groups are 4.91, 6.14 and 88.96%.

To estimate the wage equations we have to define general experience, sector tenure and firm tenure. These variables are constructed using only the effective time the workers have had a labor relationship within these three different experience levels. So general experience is the time the workers has had a job since his first real register, firm tenure is defined as the duration of the current spells within the same firm and, finally, sector tenure is defined similarly.

To control within the wage equations, we use also some general variables that we consider may affect to the individual wages. In that case we use the regional, level of education and age dimension to impute these control variables.

Then, defining cells or cohorts by 17 Spanish regions, two years of interval for age between 25 and 55 years and the three education levels defined above. These controls are the capital-GDP ratio, the ITC-capital ratio, unemployment rate, the cohort size (à la Welch, 1979[8]) and female share in cohort employment. The first two variables are taken from the BD-Mores regional survey[9] , and the rest are constructed from the EPA survey.[10]

5 Results

All the estimations presented in this section include information for workers between 30 and 44 years between 1988 and 2008 from the MCVL2008. We decided to restrict the main estimation sample to the age range 30-44 in order to avoid all the potential forms of attrition pointed our in section 2. Results with a broader age definition are available on request. We estimate three first stage reduced forms as control functions (participation, experience, tenure and mismatching), a second stage wage equation in order to estimate the returns to experience and to sector tenure, and, finally, a third stage regression to obtain returns to firm tenure. In each table we present results for all workers in the given age range, and break down the sample by education level (high and low educated). Results for high educated workers are further broken down for well-matched and mismatched educated workers. Note that each set of estimations is carried out for all, new contracts and displaced workers as it was specified in section 5. Results with others definitions of skill (for example by occupation) are available from the authors or request.

5.1. Reduced forms

We have estimated three reduced forms: experience, participation, and tenure. Given the specification (4), the version of reduced forms that are estimated is given by:

$$T_{it}^{G} = \alpha_0 + \alpha_1 age_{it} + \alpha_2 c_{it} + \alpha_3 age_{it} c_{it} + ed_{it}^{aG}\,\alpha_4^{aG} + (ed_{it}\, xc_{it})\;\alpha_5^{aG} + x_{it}\,\xi^{aG} + v_{it}^{G}$$

Each of them includes dummies for age groups (five years brackets) as well

[8] The cohort size is computed as in Welch (1979), normalizing by the size of the population The proportion of group members at each age cohort is smoothed by computing a moving average with inverted V weights:

$$c(x) = \sum_{i=-2}^{2} \alpha_i n_{x+i}$$

where n_x is the fraction of those in the group who are in their xth year of work experience. The α weights are: α= 3 (3, 2, 1, 2, 3). For age 16-17, the distribution of α is truncated and remaining weights are scaled accordingly to sum to one.

[9] Ministerio de Economía y Hacienda

[10] For each year we use the information from the second quarter wave.

as age dummies interacted with potential experience (*c*). They also include occupational dummies, to approximate qualification, and times dummies. In tables A1 to A4 we present, for the sake of simplicity results for the whole sample period, 1988-2008, and ages, 30-44 years [Results for other groups are available from the authors on request]. In each table we present results for all workers (in the given age range) and also by level of education and qualification adjustment, except for mismatching where we present only estimations for all workers.

A quick inspection of the first stage results for labor market experience presented in Table A1 reveals that labor market experience for all workers increases in 1991-1994 and decreases since 1997. By skill level evidence is less clear since the positive effect of the 1992-1995 crisis is only observed for low-educated workers. After this period of time, LME of the low educated fell 4.2 years between 1998 and 2008. For educated workers, evidence is somewhat different: LME of those mismatched falls between 1994 and 2002 and mildly recovers afterwards; alternatively, for well-matched LME falls continuously since 2000. Note finally that the LME of those mismatched is greater the lower is the level of qualification of the job.

Regarding participation (see Table A.2) we detect, with perhaps the exception of the high-educated wellmatched, a mild decrease in the participation probability of this group. It is also important to note participation of mismatched individuals is greater the lower is the level of qualification of the job.

Likely due to increase job instability and rotation, firm tenure (see Table A3) falls continuously during the period: more than 3 years from 1988 to 2008. The fall in firm tenure for the low educated nearly doubles that of the high educated (3.7 versus 2.0 years). Likewise, the fall is larger for those mismatched (2.8 years) than it is for well-matched (1.3 years).

5.2 Returns to experience, sector tenure, activity and qualification

Provided with the reduced form's residuals obtained from the reduced form equation estimated above, we estimate the wage equation (5). These wage equations are estimated for all workers, and, following Topel (1991) and D&M, for those with a new match ($T_{it}^{f} = 0$), for those with a new contract (where contract born during the period 1988-2008) with a new match ($T_{it}^{f} = 0$), and

finally for those that have been defined as displaced with a new match ($T_{it}^{f}=0$). All the estimations are replicated by level of education, and, for those educated, by qualification adjustment. Before presenting the results, let us describe more precisely (in terms of the functions *g, s,* and *e)* the specification of the wage equation:

$$lnw_{iet}^{a} = \beta_0 + expe_{it}^{G}\eta + expe_{it}^{S}\theta + x_{it}\gamma^{a} + \delta_1^{G}v_{it}^{G} + \delta_2^{G}cv_{iit}^{G} + \delta_1^{P}v_{it}^{P} + \delta_2^{p}v_{it}^{P} +$$
$$+ \gamma_1^{G}T_{it}^{G}v_{it}^{G} + \gamma_2^{G}c_{it}T_{it}^{G}v_{it}^{G} + \gamma_1^{P}T_{it}^{G}v_{it}^{P} + \gamma_2^{P}c_{it}T_{it}^{G}v_{it}^{P} + \kappa_1^{G}T_{it}^{S}v_{it}^{G} + \kappa_2^{G}c_{it}T_{it}^{S}v_{it}^{G} + \kappa_1^{P}T_{it}^{S}v_{it}^{P} + \kappa_2^{P}c_{it}T_{it}^{S}v_{it}^{P} + e_{it}^{*}.$$

where vector $expe^{G}$ includes four dummies for the first four years of the workers experience plus a linear experience variable for experiences above 5. Likewise the vector $expe^{S}$ includes a dummy for the first five years of sector tenure and a linear sector experience variable for tenures above five. The coefficients for the set of experience and sector tenure indicators are interpreted as the level of wages at different experience levels. In each case the reference is an individual with less than one year of experience and sector tenure. The specification pooling all levels of education (skilled and unskilled) also includes a dummy for skilled workers, which controls for the skilled wage premium once we control for the rest of variables, and a set of controls which vary at the regional level. In this set we include the same set of control we described in the previous section: relative cohort size at the age of entry, the shares of low and high educated population, the female labor force participation (as a fraction of the 30-45 labor force), the fraction of temporary contracts, the production structure at the regional level, the unemployment rate, the capital to output ratio, and the ICT capital to capital ratio. Apart of this in all these estimations we include year effects (21 years), qualification (occupational groups) effects, a part time contract dummy, regional effects (17), age group dummies (from 30 to 44 years in five years brackets), and the set of regional variables mentioned in the previous section.

5.2.1. The effect of labor market and sector experience and firm tenure.

In tables A4 to A6 we present, for the sake of simplicity, results about the effect of respectively labor market experience, sector experience and firm tenure, for two periods, 1988-1996 and 1997-2008, and ages 30-44 years [Results for the whole period and other age groups are available from the authors on request]. In each table we present three panels: all matches, new matches, and displaced workers. In each panel we present results for all workers (in the given age range) and also by level of education and qualification

adjustment.

Table A4 helps explain the decline of the SWP observed in the last 15 years. It reveals that returns to labor market experience have declined in the second period (1997-2008) with respect to the first (1988-1995) for high educated individual, while they have increased for low educated individuals. Note that the decline of labor market experience is more evident for mismatched high educated individuals than it is for well-matched individuals (especially for new matches).

Table A5 also reveals a decline of the returns to sector experience for all workers, more evident for high educated individuals than for low educated ones. In this case, despite the low significance of many coefficients, one can get the impression that the decline in the value of sector experience is more evident for well-matched educated individuals than it is for the mismatched ones.

After inspection of Table A6, that presents the key results of returns for firm tenure, we get a similar impression. The value of firm tenure has fallen relatively more from 1997 for well-matched high educated (especially in the case of displaced workers). For well-matched the returns to short firm tenures (less than five years) have decreased and the returns to longer tenures have remained unaltered.

Figures 11 and 12 summarize the key results obtained from the analysis. The main conclusion we can extract from Figure 13 is evident: the distance between high and low educated in the returns to all types of tenures get reduced after 1997, that is, after the starting of the last period of growth of the Spanish Economy. As commented in section 2 this is likely due to the increase in the fraction of high educated workers that are mismatched.

Figure 11. Estimated experience & tenure returns High versus low-educated workers (2nd & 3rd steps, with control functions, males aged 30-44 years, 1988-2008)

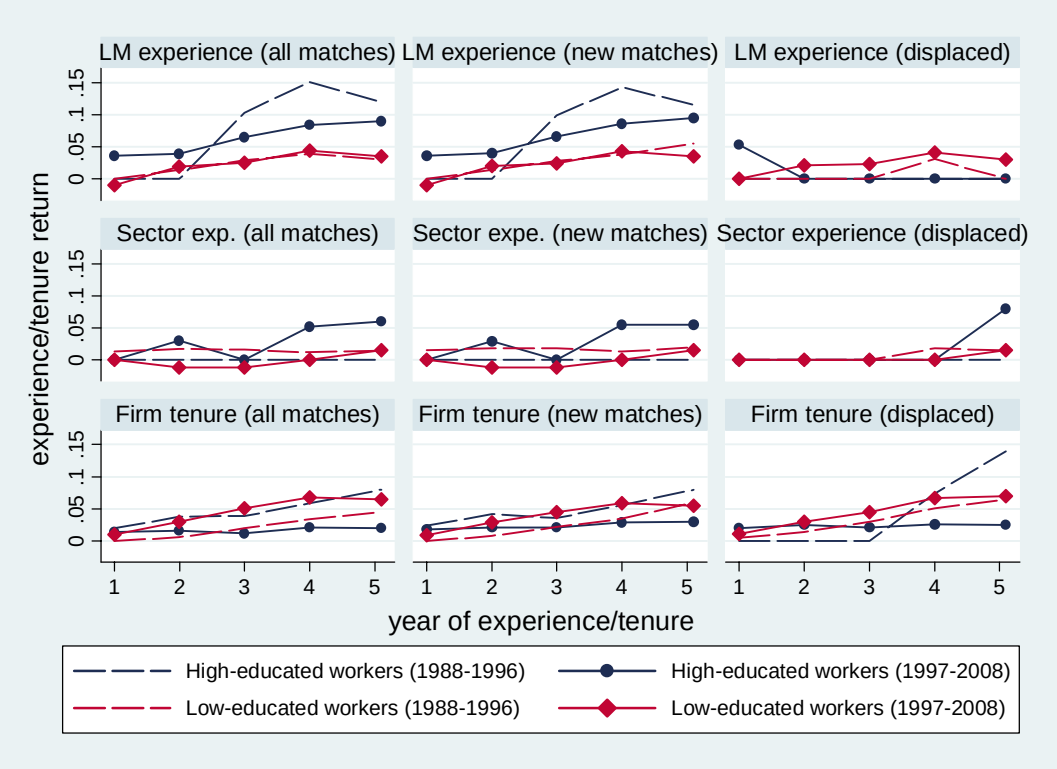
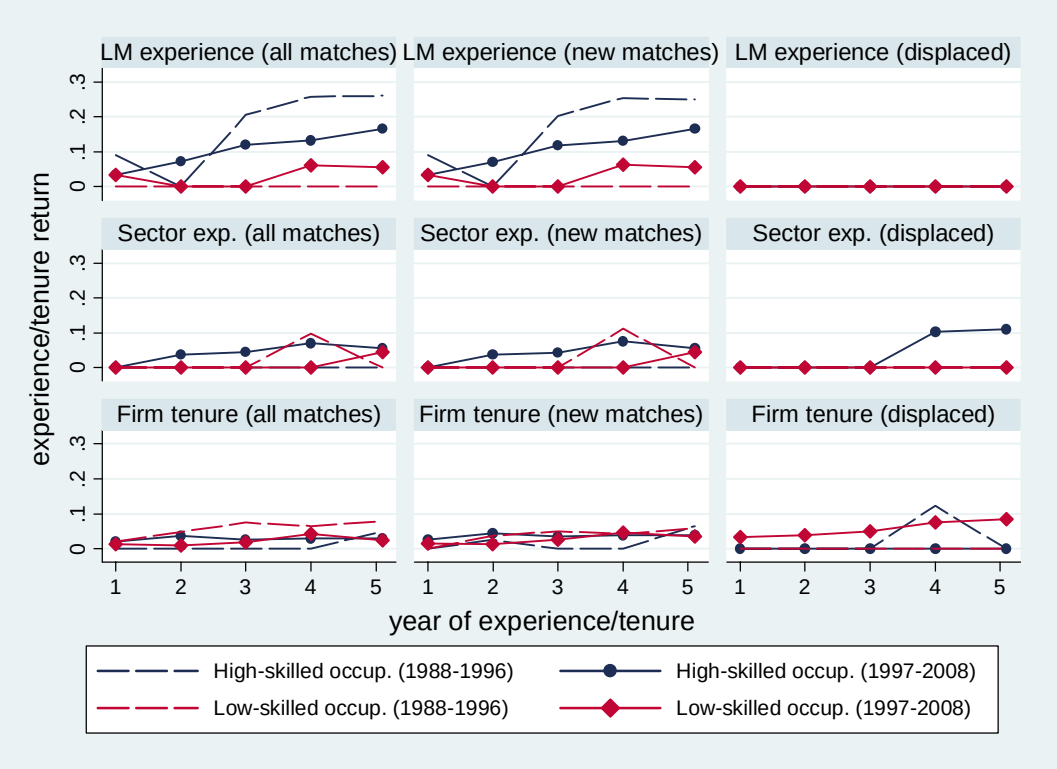


Figure 12 compares the returns to experiences for well-matched and mismatched high educated workers. First note that in this case evidence seems to be less clear because of the smaller sample size (especially in the case of displaced workers). Apparently, distances between returns to well-matched and mismatched high educated workers have not diverged after 1997, thereby offering support to our argument that the reduction of the returns to skill seems to be due to a change in the composition of the educated population, in favor of the fraction of mismatched.

Figure 12 Estimated experience & tenure returns. High educated, high versus low-skilled occupations. (2nd & 3rd steps, with control functions, males aged 30-44 years, 1988-2008)



5.2.2 The role of supply and demand control on wages and firm tenure.

The purpose of this section is to analyze the effect of both demand and supply controls on wages. In tables A7 to A9 we review for respectively all matches, new matches and displaced workers, the results of the regional variables in the wage regressions. Within each table we present results with and without control functions for the two periods considered: 1988-1996 and 1997-2008. Finally, table A11 evaluates the effect of cohort size in a model that also includes the cohort size at the age of entry as explanatory factor. Since we cannot construct the latter variable before 1997 we restrict this exercise to the 1997-2008 period.

Demand controls

The capital output ratio captures the degree of capital skill complementarity. Existing evidence has shown the presence of capital-skill complementarity for skilled workers (Berman et al. 1994, Machin and Van Reenen 1998, Chun 2003). O´Mahony (2008) analyzing the demand for Skilled Labor using a cross-country comparison find mixed results for the capital output ratio effects on wages by gender. For the highest skill group capital appears to be complement for females and substitute for males. The reverse is true for the lowest group

with positive coefficients for males and the more usual negative for females. In our specifications the capital-output ratio has a negative effect for mismatched workers in the first period and for all types of matches. In the second period we do not observe any significant effect, being the case of displaced mismatched workers an exception.

The previous literature suggests that ICT increases the wage shares of the highly skilled at the expense of the unskilled, consistent with previous literature (e.g O'Mahony et al. 2008). Furthermore, technology also favors female workers. Specifically for the case of Spain, Felgueroso and Jiménez-Martín (2009) showed that the absence of a strong group of medium educated workers affected negatively the occupational adjustment of high-educated workers.

In the present paper the effect of the ICT to capital ratio varies markedly between the first and the second period considered. In the first period affects positively the low-educated wage. Alternatively, in the second period, were ICT technologies have been mostly introduced, the effect on low-educated wages is clearly negative. At the same time we do not observe (maybe because of the small sample size) any significant effect on the demand of high-educated individuals. Thus, ICT diffusion in recent years seems to be associated to a reduction in the demand of low skilled, who are not well trained to work with ICT technologies (Felgueroso and Jiménez-Martín, 2009).

Finally, we do not observe any significant effect of the employment distribution by sector of activity. This is likely due to the impossibility, for a very long period, of obtaining a proper desegregation of the productive structure by sector.

Supply controls

Our key supply control is cohort size, constructed a la Welch (1979). Depending on the period, we consider two alternative definitions for this variable. In the first definition we let cohort size vary with time. In the second we kept cohort size fixed at its value at ages 24-25. Note, first, that cohort size effect change substantially between the specification with and without residual control functions. As noted by Dustman and Meghir (2006) this is likely due to the control of age effects in the estimation of first stage residual control functions. We also find substantial differences between the two periods considered. For example, we find, in the specification without residuals control functions, a negative wage effect for all workers and also for the low educated in the first

period and a positive effect for both groups (and also for those high-educated mismatched) in the second period. When including the residual control functions in the specification, we find a sizeable positive effect of cohort size on low educated and mismatched high-educated workers. Finally, for well-matched individual, with the exception of displaced workers, we do not find any clear pattern in the data.

Since we suspect the latter finding is due to the fact that current cohort size is not the relevant cohort determinant, we have introduced the cohort size at the age of entry (24-25) in the specification. However, this exercise can only be carried out for the second period due to data limitations (we cannot construct entry cohort size for many older cohorts). The results of this exercise are reported in Table A10 and partially confirm our a priori: in the specifications without control functions, entry cohort size is an important (negative) determinant of the wage skill premium of well-matched educated individuals for all types of matches (significant for displaced). After introducing residual control functions in the specification, the coefficients are still negative but are not found significant. Alternatively, the effect for mismatched individuals, mostly positive, is not found significant in any specification.

The share of female employment (by level of education) shows mixed results. In the first period affects positively the high educated displaced (with residual control function). Alternatively, in the second period we only found a negative effect for displaced mismatched (without control).

The share of population low-educated (which appears in the low-educated equation only) increases the low-educated wage in both period and for new matches. Acemoglu (2003) offers an explanation for this apparently surprising fact. He believes that institutions (collective bargaining in the case of Spain) may motivate (over) investment in low qualification technologies. In the Spanish case, collective bargaining is dominated by insiders who are basically low skilled workers, who prefer low qualification technologies.

Regarding the share of population high-educated, we find opposite results between the two periods. In the first period, while the high-educated in the labor market are still relatively very few, the effect is positive on displaced well-matched wages. In contrast in the second period, the large supply of educated workers hurts high-educated wages via two channels: on the one hand, it increases the fraction of mismatched, thereby affecting average returns of high-educated; on the other, it reduces the wage of those well-matched.

Regarding the effect of the regional unemployment rate we find opposite results by period, which may reflect some changes in the bargaining process introduced after 1997. In the first period we find a negative effect for all and for low-educated and a positive effect for those well-matched. The negative effect for low educated can be explained because of the prevalence in the period of a collective bargaining model worried about high unemployment (which implies a high probability of dismissal for low-educated insiders). In contrast with the first period, in the second one we observe a positive association of unemployment and wages for low-educated workers. This is likely due to a change of priorities in the collective bargaining process after 1997 for insiders, who believed that unemployment only was affecting temporary workers.

5.2.3. Evidence about the SWP dummy.

Finally in Table A11 we present some summary estimates of the coefficient of the skill dummy in regressions for all workers. In the first period considered (1988-1996) and after controlling for tenure and other factor the SWP is estimated around 0.2 in regressions without control functions and 0.3 in regressions with them. Surprisingly the estimated SWP is very stable across sample (all workers, new matches and displaced workers). More importantly, we document an important reduction in the estimated coefficient for the second period. The estimated coefficient falls from about 0.30 to 0.185, that is a fall of practically 40%.

5.3 Returns using other age range and other definitions of skill

In order to evaluate the robustness of our estimates we have performed several specification execices [The detailed results are available upon request], just checking some of the assumptions that can be controversials. We have, first, reestimated the model increasing the age range (30-54) covered by the sample. Secondly, we have used the group of contribution instead of the level of education to classify workers by skill. In particular, we have considered that those in groups of contribution 1 and 2 are considered skilled. Finally, we have expanded the former definition of skill to include those in groups 1 to 4.

Overall the results do not show large differences with the results described in the previous sections. In all case we observe an increase in the returns to labor market experience for low-educated/low-skilled workers. However, we also document some differences in the behaviour of returns to experience for well-matched and for those classified as high skilled with respect to the previous

sample. In contrast with the 30-44 sample, for which we were observing a continuous fall in returns to experience, in the extended 30-54 sample the fall in returns to experience is less evident. In fact, it turns into an increase when an alternative definition of skill (based on the group of contribution) is used instead.

Finally, from this samples we have been able to obtain new estimates of the skill coefficient. The summary results are presented in Table A12. First note that increasing the age range does not lead to a significant change in the coefficient in neither period. Secondly, the coefficient clearly increases when skill is defined by means of the group of contribution and, more importantly, its reduction in the second period is much less pronounced. Once again mismatched individuals help explain these discrepancies, since the differences a are due to the inclusion of mismatched educated individuals in the first definition and not in the second.

6 Skill Wage Premium Decomposition

Table A13 present the Oaxaca-Blinder decomposition of the SWP between University graduates and low educated workers aged 30-44 for the two periods we have considered in the analysis. We weight the differences in returns by means of the characteristics of low-educated and differences in characteristics by averages of the returns of the high-educated. The first column shows the total, and the following the contribution of variables that refer to the labor market experience and firm tenure and occupations. The main results obtained from this exercise are as follows:

(1) Overall, the fall of the skill premium was due to a fall in returns, since the changes in characteristics of the jobs have favored graduates.
(2) The fourth and fifth column show that the fall of the SWP are due largely to a reduction in the returns to labor market experience and firm tenure of graduates against the drop-outs, while changes in means of these variables do not seem to have been a factor.
(3) Interestingly, the composition effect of overeducation is not the result of the contribution of occupations to the evolution of the skill premium, since the differences in this variable characteristics have remained

virtually unchanged in the two periods. However, the evolution of the returns of occupations have been favorable to the best educated. They remain negative, thereby indicating a higher relative performance of low-educated when they are in higher occupations (eg if they are in the group of contribution 1 they will be managers while graduates may be in the group simply because having university degree) Moreover, this result may also reflect the fact that high-educated have lower wages than low-educated in occupations for which they are over-educated.

Since the previous analysis has serious limitations we present a more detailed analysis in Table A14, which goes one step further and shows the estimation results in more precise time periods, namely 1990-1992, the period in which the SWP begins to fall, and 2006-2008, the final period of our sample. In this case we consider and compare three groups of workers: the educated well-matched and mismatched as well as the low-educated (the comparison group).

This exercise shows that the fall in the returns between the beginning and the end of the period of analysis (1990-2008) are much larger than when we consider the average of the two sub-periods. It is also important to note that part of the changes in returns have been offset by changes in characteristics. The fall in the returns to labor market experience and firm tenure are key in explaining the fall of the returns for both well-matched and also for mismatched educated individuals. Note, finally, that returns to occupations have increased over the period for both well-matched and mismatched individuals, indicating that the reward to education within an occupation has evolved positively over the period.

7 Preliminary concluding remarks

The main purpose of this work is to document and explain the fall of the wage skill premium in Spain in the last two decades using Social Security data. Our estimation procedure follows the Dustman-Meghir method that allows to estimate the returns to various sources of experience, as well as for seniority,

while controlling for the likely biases and endogeneity associated with these models.

Taking into account all the limitations implied by the use of SS records, we observe an important increase of the skill wage premium in the 80 followed by a continuous decrease since the early 90 (above 25 pp) for males. For females, we also observe an increase during the 80 followed in this case by a long period of stabilization. When the comparison is based upon contributions groups, the skill wage premium is much larger than the one obtained using education. For males, mean and median are roughly equal and increase until 1997, and fall since them. For females, the evolution of the SWP by group of contribution is very similar to the one described before: increase in the 80 followed by stabilization from early 90. The evolution of the SWP by age and cohort shows a similar pattern either comparing educational or qualification groups. The numbers are revealing: firstly, at the time of entry the SWP have been falling for cohort born after early 60 (with implies entry in the market after 1985); secondly, despite the apparent increase with the age, the SWP falls with time for all the male cohorts; the differences by gender are due to a delay in the SWP fall for women.

We also document with this data the increasing share of occupational mismatch among collage and university graduates, which helps explain part of the fall in the wage premium of college and university graduates, especially in the early 90s. However, in the second part of the 90s and the 2000s the decreasing premium of well-matched graduates also contributes to explain the general downward trend of the wage skill premium.

We have also explored how temporary contracts and turnover may have affected experience (labor market experience, sector experience and firm tenure) accumulation and, hence, may have contributed to explain the observed reduction on the SWP in recent decades. We observe that both labor market and sector experience of well-matched educated individuals has increased faster than those of mismatched educated individual due to the changes in the age composition of the mismatched population. Likely due to increase job instability and rotation, firm tenure has fallen continuously during the period: more than 3 years from 1988 to 2008. The fall in firm tenure for the low educated nearly doubles that of the high educated. Likewise, the decrease in returns to firm tenure for mismatched is substantially larger for than it is for well-matched educated workers. Finally, after controlling for all types of return to tenures, we document a decrease in the coefficient of the skill dummy of about 40 per cent in the last decade with respect to the 90s.

The econometric results reveal that the distance between high and low educated in the returns to all types of tenures gets reduced substantially after 1997, that is, after the starting of the last period of growth of the Spanish Economy. Note that 1997 also coincides with the time of the last important reform of the Spanish labor market that introduced the employment promotion contracts (*Contratos de fomento de empleo*) and generalized employment subsidies, who have proved to be ineffective (García Pérez, 2010). Thus changes in the composition of the educated workers (in favor of those mismatched) and falling returns to experiences and tenures for the educated seem to explain a great fraction of the wage premium fall observed in the last 15 years.

We got a number of other interesting results regarding the effect of supply and demand controls such as cohort size, production capital and structure, composition of the population and unemployment rate. Specifically as regard cohort size, we have found the entry cohort size is an important negative determinant of the wage skill premium of well-matched educated individuals for all types of matches. However, what is in general more surprising is the change in the effect of many of these controls (cohort size and unemployment rate and two clear examples of this) between the first and the second period of the analysis (before and after 1997). Although these evidences merit further research, we believe that the increasing weight of low-educated workers among the insiders, and the change of priorities in the wage setting process after 1997 should help explain them.

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Appendix

A From censored contributions to wages.

The salary information is inferred from the data of members' monthly contribution. In this case, the usual problem facing any analysis using MCVL is that higher wages are censored because of the existence of maximum contribution bases. There are also minimum contribution bases, which, however, concern us less given the existence of minimum legal wages that would support such censorship. This fact can relevantly condition estimations done from wage equations with this sample.

Although the percentage of participants who show censorships in their contributions is not too high (14%), it will affect the estimates by the existence of a bias in the results of the same. To do this, in this work, censored contributions biases are corrected. The idea is transferring distribution structure of those wages which are near to censorship, but not censored, to those that did were. For that, the following methodology base don Tobit estimation models.

The (log of the) wage of a worker belonging to a group contribution g can be expressed as:

$$\begin{aligned} w_{ig} &= l_g \qquad si \quad x_{ig}\beta_g + \varepsilon_{ig} \le l_g \\ w_{ig} &= u_g \qquad si \quad x_{ig}\beta_g + \varepsilon_{ig} \ge u_g \\ w_{ig} &= x_{ig}\beta_g + \varepsilon_{ig} \le l_g \qquad otherwise \end{aligned} \tag{10}$$

where l_g and u_g are lower and upper limits of the contribution base for the group contribution g; x_{ig} it is a group of characteristics associated with worker (level of education, age, age squeare and firm size), β_g the returns to each of the above characteristics and ε_{ig} the error term.

Therefore, the idea is to estimate the model (10) by a double-censored Tobit, properly defining the role of maximum-likelihood assuming normality in the error term. Once the model has been estimated and given the structure for given estimated error, we simulate the wage and contribution base for those workers whose original base was censored. For those other workers no simulation is carried out, unless they are used to estimate the stochastic structure of the errors that will be used to describe simulation.

Being s_g the standard error of the original wage series w_g, and defining $\hat{u}_g$ as the estimated standard error and adjusted such that:

$$\hat{u}_g = \frac{u_g - \hat{w}_g}{s_g}$$

so that $\hat{u}_g \sim N(0,1)$,we re-estimate wages for those who are censored by the expression:

$$\hat{w}_{ig} = \hat{w}_g + s_g \frac{\phi(\hat{u}_g)}{1-\Phi(\hat{u}_g)} + s_g \phi^{-1}(u)$$

Where $\theta_i \sim U(0,1)$ and ϕ is normal density function with zero average and variance 1 and ϕ^{-1} is its reverse. That is to say, given a probability value a, $\phi^{-1}(a)$ gives us a value in $\mathbb{R}$. The second term on the right $\hat{w}_g$ corrects the estimate of bias derived from censorship. The third term on the right introduces randomness to the individual i and that is a function of the distribution of estimated errors with the information available for non-censored individuals.

In this way we correct the salaries of those employees whose basic minimum or maximum rate is equal to the limits set by law. This method ensures the maintenance of the structure due to stochastic information for the vast majority of workers.

The wages we definitely use in this paper is the annual monthly average wages.

Table A1: Reduced forms estimations for **LABOUR MARKET EXPERIENCE** by skill (Men aged 30-44 years, **1988-2008**)

	All workers	High-educated workers			Low-educated workers
		All occupations	Well-matched occupations	Mismatched medium-skilled occupations	
Age	0.428***	0.350***	0.464***	0.286***	-0.147***
C	-0.684***	-0.268***	-0.071	-0.405***	-1.854***
c x age	0.020***	0.014***	0.008**	0.018***	0.050***
35<age<=40	4.080***	0.326	-0.569	0.934*	8.320***
40<age<=45	10.990***	1.290**	-0.735	2.407**	20.087***
c x (35<age<=40)	-0.229***	-0.032	0.046	-0.083**	-0.394***
c x (40<age<=45)	-0.475***	-0.082**	0.058	-0.161**	-0.817***
SS group 2	0.779***	0.187***	0.144***	-	0.654***
SS group 3	2.343***	0.839***	-	0.445***	1.975***
SS group 4	2.267***	0.369***	-	(omitted)	2.178***
SS group 5	2.023***	0.033	-	-0.336***	2.135***
SS group 6	0.182***	-1.596***	-	-1.945***	-0.176**
SS group 7	0.365***	-1.413***	-	-1.768***	0.236***
SS group 8	0.264***	-2.815***	-	-3.075***	-0.137**
SS group 9-10	-1.586***	-3.950***	-	-4.213***	-1.949***
year 1989	-0.042	-0.226	-0.064	-0.336	-0.036
year 1990	0.007	-0.169	-0.043	-0.172	0.038
year 1991	0.111**	-0.127	-0.012	-0.162	0.175***
year 1992	0.249***	-0.104	-0.008	-0.122	0.354***
year 1993	0.327***	-0.174	-0.111	-0.172	0.530***
year 1994	0.199***	-0.123	0.065	-0.262	0.374***
year 1995	0.254***	-0.113	0.060	-0.246	0.453***
year 1996	0.065	-0.260	-0.085	-0.416*	0.294***
year 1997	-0.061	-0.303*	-0.028	-0.569**	0.173***
year 1998	-0.288***	-0.460***	-0.200	-0.732***	-0.102*
year 1999	-0.497***	-0.664***	-0.286	-1.066***	-0.321***
year 2000	-0.834***	-0.965***	-0.517**	-1.436***	-0.580***
year 2001	-1.210***	-1.176***	-0.613***	-1.764***	-0.945***
year 2002	-1.999***	-1.325***	-0.593***	-2.095***	-1.808***
year 2003	-2.292***	-1.350***	-0.712***	-2.014***	-2.148***
year 2004	-2.619***	-1.483***	-0.863***	-2.125***	-2.476***
year 2005	-3.198***	-1.629***	-0.820***	-2.426***	-3.127***
year 2006	-3.618***	-1.729***	-0.897***	-2.534***	-3.581***
year 2007	-3.953***	-1.829***	-0.987***	-2.635***	-3.952***
year 2008	-4.199***	-1.865***	-1.168***	-2.549***	-4.216***
Constant	-6.445***	-6.387***	-10.557***	-3177	16.500***
N	934987	68817	33870	34947	586518
Adjusted R Squared	0.341	0.434	0.456	0.414	0.309

Notes: High-educated workers: university graduates; Low-educated workers: less than upper secondary education attainment; Well-matched: high-educated workers in high-skilled occupations (Social Security groups 1 & 2); Mismatched: high-educated workers in low-skilled occupations (Social Security groups 3-10). c is the potential experience which is calculated as age-years of schooling - 6. * p<.1; ** p<.05; *** p<.01.

Table A2: Reduced forms estimations for **PARTICIPATION** by skill
(Men aged 30-44 years, **1988-2008**)

	All workers	High-educated workers			Low-educated workers
		All occupations	Well-matched occupations	Mismatched medium-skilled occupations	
Age	0.018***	0.002	-0.003	0.008**	0.022***
C	-0.007***	0.009*	0.004	0.015*	-0.014***
c x age	-0.000*	-0.000	0.000	-0.000	0.000
35<age<=40	0.010*	0.016	0.039*	-0.013	0.022*
40<age<=45	-0.001	0.011	0.077*	-0.078	0.048**
c x (35<age<=40)	-0.001**	-0.001	-0.002	0.001	-0.001*
c x (40<age<=45)	-0.000	-0.001	-0.004	0.004	-0.002**
SS group 2	0.018***	0.002	0.001	-	0.015**
SS group 3	0.023***	0.004	-	0.003	0.015***
SS group 4	0.028***	0.000	-	-	0.028***
SS group 5	0.018***	-0.019***	-	-0.019***	0.026***
SS group 6	-0.025***	-0.082***	-	-0.081***	-0.030***
SS group 7	-0.024***	-0.084***	-	-0.083***	-0.021***
SS group 8	-0.069***	-0.150***	-	-0.148***	-0.073***
SS group 9-10	-0.159***	-0.226***	-	-0.223***	-0.163***
year 1989	-0.001	-0.011	-0.009	-0.011	0.001
year 1990	-0.002	-0.019*	-0.023*	-0.009	0.000
year 1991	-0.012***	-0.018*	-0.010	-0.023	-0.013***
year 1992	-0.032***	-0.026***	-0.015	-0.034**	-0.036***
year 1993	-0.040***	-0.034***	-0.014	-0.053***	-0.043***
year 1994	-0.058***	-0.030***	-0.010	-0.047***	-0.069***
year 1995	-0.051***	-0.031***	-0.008	-0.052***	-0.060***
year 1996	-0.068***	-0.046***	-0.022*	-0.069***	-0.079***
year 1997	-0.062***	-0.031***	-0.002	-0.058***	-0.073***
year 1998	-0.062***	-0.031***	-0.008	-0.051***	-0.070***
year 1999	-0.057***	-0.036***	-0.009	-0.062***	-0.063***
year 2000	-0.062***	-0.042***	-0.015	-0.068***	-0.063***
year 2001	-0.062***	-0.035***	-0.005	-0.065***	-0.063***
year 2002	-0.090***	-0.043***	-0.006	-0.079***	-0.098***
year 2003	-0.072***	-0.037***	-0.010	-0.063***	-0.074***
year 2004	-0.079***	-0.046***	-0.012	-0.079***	-0.082***
year 2005	-0.097***	-0.045***	-0.008	-0.079***	-0.101***
year 2006	-0.072***	-0.027***	0.003	-0.056***	-0.071***
year 2007	-0.084***	-0.029***	-0.002	-0.056***	-0.085***
year 2008	-0.142***	-0.058***	-0.023**	-0.091***	-0.150***
Constant	0.510***	0.839***	0.956***	0.686***	0.471***
N	934987	68817	33870	34947	586518
Adjusted R Squared	0.116	0.089	0.007	0.104	0.083

Notes: High-educated workers: university graduates; Low-educated workers: less than upper secondary education attainment; Well-matched: high-educated workers in high-skilled occupations (Social Security groups 1 & 2); Mismatched: high-educated workers in low-skilled occupations (Social Security groups 3-10). c is the potential experience which is calculated as age-years of schooling - 6. * p<.1; ** p<.05; *** p<.01.

Table A3: Reduced forms estimations for **FIRM TENURE** by skill
(Men aged 30-44 years, **1988-2008**)

	All workers	High-educated workers			Low-educated workers
		All occupations	Well-matched occupations	Mismatched medium-skilled occupations	
Age	0.374***	0.223***	0.197***	0.255***	0.119***
C	-0.246***	-0.210**	-0.114	-0.332**	-0.790***
c x age	0.006***	0.009***	0.007*	0.011**	0.019***
35<age<=40	2.372***	0.337	-0.082	0.900*	3.963***
40<age<=45	6.553***	0.917	0.188	1.875*	9.572***
c x (35<age<=40)	-0.132***	-0.027	0.008	-0.073*	-0.187***
c x (40<age<=45)	-0.281***	-0.062	-0.015	-0.124*	-0.388***
SS group 2	0.587***	0.064	-0.028	-	0.598***
SS group 3	1.710***	0.601***	-	-0.226**	1.246***
SS group 4	2.029***	0.798***	-	-	2.002***
SS group 5	1.952***	0.558***	-	-0.227***	2.165***
SS group 6	0.127***	-0.611***	-	-1.401***	-0.104
SS group 7	1.116***	-0.244***	-	-0.999***	1.097***
SS group 8	-0.549***	-1.848***	-	-2.550***	-0.790***
SS group 9-10	-0.984***	-2.356***	-	-3.049***	-1.158***
year 1989	-0.273***	-0.446**	-0.307	-0.556*	-0.245***
year 1990	-0.439***	-0.653***	-0.625**	-0.573**	-0.386***
year 1991	-0.529***	-0.629***	-0.547**	-0.645**	-0.471***
year 1992	-0.420***	-0.354*	-0.234	-0.403	-0.391***
year 1993	-0.384***	-0.368**	-0.205	-0.471*	-0.304***
year 1994	-0.819***	-0.481***	-0.219	-0.693***	-0.834***
year 1995	-0.836***	-0.501***	-0.148	-0.821***	-0.838***
year 1996	-0.966***	-0.505***	-0.119	-0.871***	-1.002***
year 1997	-1.120***	-0.697***	-0.331	-1.042***	-1.138***
year 1998	-1.421***	-0.909***	-0.533**	-1.267***	-1.471***
year 1999	-1.857***	-1.426***	-0.998***	-1.848***	-1.825***
year 2000	-2.011***	-1.416***	-0.900***	-1.934***	-2.011***
year 2001	-2.269***	-1.633***	-1.097***	-2.173***	-2.279***
year 2002	-2.834***	-1.785***	-1.130***	-2.448***	-2.894***
year 2003	-2.904***	-1.805***	-1.186***	-2.433***	-2.961***
year 2004	-2.995***	-1.690***	-1.010***	-2.373***	-3.066***
year 2005	-3.263***	-1.827***	-1.047***	-2.596***	-3.359***
year 2006	-3.498***	-2.005***	-1.207***	-2.785***	-3.588***
year 2007	-3.719***	-2.207***	-1.434***	-2.967***	-3.777***
year 2008	-3.683***	-2.062***	-1.277***	-2.826***	-3.751***
Constant	-6.297***	-3.205**	-3.183*	-2495	4.532***
N	934987	68817	33870	34947	586518
Adjusted R Squared	0.160	0.184	0.158	0.207	0.130

Notes: High-educated workers: university graduates; Low-educated workers: less than upper secondary education attainment; Well-matched: high-educated workers in high-skilled occupations (Social Security groups 1 & 2); Mismatched: high-educated workers in low-skilled occupations (Social Security groups 3-10). c is the potential experience which is calculated as age-years of schooling - 6. * p<.1; ** p<.05; *** p<.01.

Table A4: Returns to labor market experience - (2nd step, with control functions) (Men aged 30-44 years)

	1988-1996					1997-2008				
		High-educated workers					High-educated workers			
	All workers	All	Low All Well-matched	Mismatched	Low-educated workers	All workers	All	High Low Well-matched	Mismatched	Low-educated workers
All matches										
1 year	-0.012***	0.041*	0.089***	0.002	-0.008**	0.018***	0.035***	0.019	0.038***	0.024***
2 years	-0.013***	0.066**	0.132***	0.018	-0.003	0.043***	0.045***	0.074***	0.036***	0.056***
3 years	-0.006	0.140***	0.253***	0.038	0.009*	0.056***	0.068***	0.106***	0.056***	0.073***
4 years	-0.000	0.165***	0.271***	0.058	0.020***	0.069***	0.095***	0.127***	0.091***	0.089***
X years (5+ years)	-0.006***	0.031***	0.053***	0.013	-0.000	0.013***	0.026***	0.042***	0.019***	0.017***
X squared (for 5+years)x1000	1.113***	-1.140**	-2.210**	-0.195	0.954***	-0.293***	-0.884***	-1.625***	-0.416	-0.287***
New matches										
1 year	-0.012***	0.041*	0.089***	0.003	-0.008**	0.018***	0.035***	0.020	0.038***	0.024***
2 years	-0.014***	0.061**	0.126***	0.013	-0.003	0.043***	0.046***	0.075***	0.037***	0.057***
3 years	-0.007	0.137***	0.251***	0.034	0.009*	0.056***	0.069***	0.106***	0.057***	0.073***
4 years	-0.001	0.159***	0.268***	0.048	0.020***	0.069***	0.096***	0.127***	0.093***	0.089***
X years (5+ years)	-0.006***	0.031***	0.053***	0.012	-0.000	0.013***	0.026***	0.042***	0.019***	0.017***
X squared (for 5+years)x1000	1.133***	-1.084*	-2.142**	-0.151	0.970***	-0.296***	-0.903***	-1.622***	-0.442	-0.287***
Displaced										
1 year	-0.010	-0.046	-0.127	0.005	0.001	0.020***	0.064**	-0.008	0.077***	0.021***
2 years	-0.017*	0.016	0.151	0.032	-0.000	0.034***	0.055*	0.010	0.057*	0.040***
3 years	-0.022*	0.070	0.223	0.079	0.001	0.048***	0.087***	0.004	0.100**	0.055***
4 years	-0.011	0.156	0.376**	0.119	0.017	0.054***	0.091**	0.034	0.090**	0.064***
X years (5+ years)	-0.007**	0.028	0.086*	0.029	0.001	0.009***	0.021**	-0.012	0.027***	0.011***
X squared (for 5+years)x1000	1.025***	-0.934	-3295	-1279	0.747***	-0.018	-0.304	1301	-0.629	-0.042

Table A5: Returns to sector experience - (2nd step, with control functions) (Men aged 30-44 years)

	1988-1996					1997-2008				
	All workers	High-educated workers			Low-educated workers	All workers	High-educated workers			Low-educated workers
		Low All					High Low			
		All	Well-matched	Mismatched			All	Well-matched	Mismatched	
All matches										
1 year	0.010***	-0.029	-0.052	0.004	0.011***	-0.005*	-0.008	-0.005	-0.010	-0.004
2 years	0.017***	0.005	0.015	-0.021	0.017***	-0.014***	0.034***	0.042**	0.031*	-0.017***
3 years	0.015***	0.009	-0.008	0.038	0.016***	-0.016***	0.010	0.050**	-0.009	-0.018***
4 years	0.011***	0.011	-0.069	0.108**	0.012***	-0.006*	0.046***	0.072***	0.024	-0.009**
X years (5+ years)	0.003***	-0.001	-0.013	0.013	0.003***	0.003***	0.009***	0.012***	0.004	0.003***
X squared (for 5+years)x1000	0.163*	0.149	1.048	-0.961	0.172**	0.058*	-0.163	-0.457*	0.288	0.066*
New matches										
1 year	0.014***	-0.023	-0.042	0.003	0.015***	-0.005*	-0.007	-0.005	-0.009	-0.004
2 years	0.019***	0.006	0.016	-0.020	0.019***	-0.014***	0.033***	0.041*	0.030*	-0.017***
3 years	0.018***	0.015	-0.007	0.052	0.018***	-0.016***	0.010	0.049**	-0.009	-0.018***
4 years	0.013***	0.017	-0.067	0.120**	0.013***	-0.006*	0.049***	0.076***	0.027	-0.009**
X years (5+ years)	0.003***	-0.001	-0.013	0.013	0.003***	0.003***	0.008***	0.011***	0.004	0.003***
X squared (for 5+years)x1000	0.155*	0.157	1.039	-0.934	0.165**	0.060*	-0.146	-0.438*	0.294	0.068*
Displaced										
1 year	0.006	-0.017	-0.133	0.128	0.007	0.001	-0.004	-0.051	0.031	-0.000
2 years	0.007	-0.035	-0.075	-0.002	0.007	-0.001	-0.019	-0.045	-0.010	-0.001
3 years	0.006	-0.041	-0.122	0.093	0.006	-0.011	-0.017	-0.026	-0.001	-0.012
4 years	0.015**	0.024	0.028	0.043	0.014**	-0.002	0.020	0.079	-0.019	-0.003
X years (5+ years)	0.002	0.000	-0.045**	0.007	0.002	0.003**	0.013**	0.024***	0.007	0.002**
X squared (for 5+years)x1000	-0.025	-1200	2.950	-2426	0.032	0.083	-0.307	-1014	0.164	0.100

Table A6: Returns to firm tenure - (3rd step, with control functions) (Men aged 30-44 years)

	1988-1996					1997-2008				
	All workers	High-educated workers Low All			Low-educated workers	All workers	High-educated workers High			Low-educated workers
		All	All Well-matched	Mismatched			All	Low Well-matched	Mismatched	
All matches										
1 year	0.000	0.020***	0.008	0.025***	-0.001	0.006***	0.011***	0.020***	0.011***	0.005***
2 years	0.012***	0.042***	0.031***	0.035***	0.010***	0.023***	0.018***	0.029***	0.023***	0.023***
3 years	0.029***	0.042***	-0.003	0.083***	0.025***	0.042***	0.008*	0.020***	0.017***	0.044***
4 years	0.045***	0.062***	0.024**	0.078***	0.041***	0.057***	0.021***	0.022***	0.049***	0.059***
X years (5+ years)	0.013***	0.025***	0.021***	0.023***	0.012***	0.011***	0.003**	0.004**	0.012***	0.011***
X squared (for 5+years)x1000	0.019	-0.980***	-1.180***	-1.040***	0.035	-0.131***	-0.336***	-0.104	-0.787***	0.034
New matches										
1 year	-0.000	0.020***	0.017**	0.015*	-0.003**	0.007***	0.014***	0.026***	0.012***	0.005***
2 years	0.008***	0.035***	0.038***	0.015	0.004**	0.024***	0.023***	0.037***	0.025***	0.023***
3 years	0.020***	0.032***	0.012	0.050***	0.015***	0.042***	0.015***	0.030***	0.020***	0.041***
4 years	0.032***	0.050***	0.038**	0.039**	0.025***	0.053***	0.028***	0.033***	0.049***	0.052***
X years (5+ years)	0.007***	0.020***	0.020***	0.012**	0.005***	0.011***	0.005***	0.006**	0.012***	0.010***
X squared (for 5+years)x1000	0.509***	-0.530*	-0.852**	-0.087	0.571***	-0.179***	-0.466***	-0.170	-0.894***	0.073
Displaced										
1 year	0.007***	0.022	0.021	0.017	0.006**	0.010***	0.022***	-0.003	0.034***	0.008***
2 years	0.020***	0.059***	0.127***	-0.006	0.017***	0.023***	0.027***	-0.005	0.043***	0.021***
3 years	0.036***	0.047*	0.051	0.036	0.032***	0.038***	0.021**	-0.042**	0.055***	0.036***
4 years	0.057***	0.072**	0.117**	0.010	0.052***	0.055***	0.040***	-0.036	0.082***	0.052***
X years 5+ years)	0.012***	0.036***	0.033**	0.009	0.010***	0.012***	0.009**	-0.016**	0.024***	0.010***
X squared (for 5+years)x10000	0.586***	-2.236**	-1478	0.908	0.676***	-0.176**	-1.327***	-0.289	-1.824***	0.162*

Table A7: Estimations of wage equations (2nd step)- Regional variables (Men aged 30-44 years)-**All matches**

	Without control functions					With control functions				
		High-educated workers					High-educated workers			
1988-1996	All workers	All	Low All Well-matched	Mismatched	Low-educated workers	All workers	All	High Low Well-matched	Mismatched	Low-educated workers
Cohort size	-0.761***	-0.184	-2.231	1.864	-0.450***	1.176***	1.030	-2.336	5.179*	0.263**
Share low-educ. pop	-	-	-	-	0.236	-	-	-	-	0.211
Share high-educ. pop	-0.024	0.057	0.764	-0.593	-	-0.047	-0.151	1214	-1029	-
Share female empl	0.062	-0.354	0.045	-0.889	0.069**	0.116	-0.014	0.636	-0.668	0.074**
IT/K	2.570***	6.134*	1.570	9.550*	1.976***	2.552***	6.514	2.434	8.649	**2.777*** **
K/Y	-0.228*	-2.073*	-1300	-2.518*	-0.190	-0.190	-2.479**	-0.757	-3.751**	-0.118
Share of construction	0.061	1.002	1.546	0.230	0.116	0.111	0.282	0.512	-0.327	0.053
Share of manufact.	0.049	-0.017	-0.067	-0.370	0.127*	0.202**	-0.433	-0.373	-0.829	0.140*
Share of services	-0.131**	0.351	0.094	0.271	-0.012	0.088	0.004	-0.093	-0.151	0.030
Unemployment rate	-0.205***	0.536	1.137*	0.028	-0.273***	-0.261***	0.679	1.007	0.289	-0.291***
Constant	11.216***	10.461***	9.940***	10.988***	10.806***	11.062***	10.822***	9.535***	11.707***	10.691***
N	124195	4.258	2171	2.087	119937	101199	3.544	1793	1.751	97655
1997-2008										
Cohort size at current age	1.852***	-1.500**	0.311	-2.437***	0.640***	1.339***	1.780*	0.950	1857	1.323***
Share low-educ. pop	-	-	-	-	1.153***	-	-	-	-	0.984***
Share high-educ. pop	-0.749***	-0.706***	-1.350***	-0.343	-	-0.636***	-0.591**	-0.940**	-0.262	-
Share female empl	-0.007	0.006	0.428	-0.072	0.180***	0.007	0.163	0.364	0.283	0.220***
IT/K	-2.566***	1.474	3.903	1.229	-3.202***	-2.276***	1.719	5.125*	0.425	-2.934***
K/Y	-0.097*	-0.282	-0.353	-0.254	0.111*	-0.096	-0.110	-0.190	-0.036	0.099
Share of construction	0.230***	0.075	-0.002	0.099	0.221***	0.150**	0.049	0.054	-0.018	0.204***
Share of manufact.	0.123**	-0.245	0.191	-0.504	0.073	0.040	-0.061	0.414	-0.353	0.085
Share of services	0.097*	-0.306	-0.047	-0.419	0.098*	0.052	-0.162	0.045	-0.308	0.039
Unemployment rate	1.007***	0.282	-0.406	0.506**	1.096***	0.937***	0.315	-0.225	0.505*	1.002***
Constant	11.406***	11.714***	11.771***	10.961***	10.425***	11.436***	11.374***	11.252***	11.058***	10.468***
N	243784	16959	6023	10936	226825	197602	13854	4951	8903	183748

Table A8: Estimations of wage equations (2nd step)- Regional variables (Men aged 30-44 years)- **New matches**

	Without control functions					With control functions				
	All workers	High-educated workers			Low-educated workers	All workers	High-educated workers			Low-educated workers
1988-1996		All	Low All Well-matched	Low All Mismatched			High Low All	High Low Well-matched	High Low Mismatched	
Cohort size	-0.791***	-0.253	-2.303	1.801	-0.461***	1.209***	0.683	-2.677	4.805*	0.269**
Share low-educ. pop	-	-	-	-	0.268*	-	-	-	-	0.248
Share high-educ. pop	-0.042	0.084	0.895	-0.671	-	-0.066	-0.087	1.391	-1.078	-
Share female empl	0.055	-0.358	0.075	-0.939	0.066**	0.107	-0.012	0.678	-0.724	0.071*
IT/K	2.663***	6.332*	1.398	10.189**	2.076***	2.636***	6.777*	2.278	9.583*	2.885***
K/Y	-0.247*	-2.104*	-1.303	-2.584*	-0.209	-0.204	-2.528**	-0.770	-3.847**	-0.132
Share of construction	0.045	1.014	1.522	0.283	0.099	0.088	0.296	0.447	-0.224	0.029
Share of manufact.	0.049	0.097	0.034	-0.267	0.121*	0.201**	-0.276	-0.249	-0.664	0.132
Share of services	-0.134**	0.401	0.136	0.306	-0.017	0.089	0.095	-0.040	-0.051	0.025
Unemployment rate	-0.213***	0.587	1.152*	0.109	-0.281***	-0.267***	0.739	1008	0.424	-0.300***
Constant	11.239***	10.374***	9.792***	10.997***	10.813***	11.081***	10.671***	9.350***	11.615***	10.695***
N	123113	4236	2163	2073	118877	100117	3522	1785	1737	96595
1997-2008										
Cohort size at current age	1.840***	-1.515**	0.264	-2.442***	0.639***	1.298***	1.661*	0.735	1.798	1.327***
Share low-educ. pop	-	-	-	-	1.157***	-	-	-	-	0.990***
Share high-educ. pop	-0.744***	-0.714***	-1.392***	-0.335	-	-0.631***	-0.594**	-0.983**	-0.251	-
Share female empl	-0.011	0.006	0.396	-0.058	0.185***	0.003	0.168	0.335	0.303	0.226***
IT/K	-2.529***	1.617	4349	1.207	-3.170***	-2.238***	1.887	5.779*	0.382	-2.899***
K/Y	-0.101*	-0.260	-0.354	-0.219	0.106*	-0.101	-0.070	-0.192	0.031	0.094
Share of construction	0.228***	0.099	0.006	0.135	0.215***	0.145**	0.085	0.067	0.034	0.195***
Share of manufact.	0.120**	-0.213	0.180	-0.449	0.067	0.035	-0.017	0.406	-0.285	0.079
Share of services	0.094*	-0.274	-0.057	-0.364	0.093*	0.048	-0.123	0.032	-0.241	0.032
Unemployment rate	1.006***	0.279	-0.419	0.515**	1.094***	0.936***	0.310	-0.230	0.509*	1.000***
Constant	11.406***	11.692***	11.840***	10.899***	10.502***	11.397***	11.336***	11.288***	10.528***	10.470***
N	242435	16896	6007	10889	225539	196253	13791	4935	8856	182462

Table A9: Estimations of wage equations (2nd step)- Regional variables (Men aged 30-44 years) – **Displaced**

	Without control functions					With control functions				
	All workers	High-educated workers			Low-educated workers	All workers	High-educated workers			Low-educated workers
1988-1996		All	Low All Well-matched	Low All Mismatched			High Low All	High Low Well-matched	High Low Mismatched	
Cohort size	-0.429	-3.221	-18.182***	5.004	-0.323***	1.279*	-3.846	-26.355***	7.766	0.385*
Share low-educ. pop	-	-	-	-	0.125	-	-	-	-	0.373
Share high-educ. pop	0.046	2.245	5.114*	2.586	-	-0.094	0.771	5.227	1.573	-
Share female empl	0.307*	2.328*	2.911	2.575	0.154**	0.325*	1.347	2.163	1.558	0.155*
IT/K	-0.488	-5798	-5.771	-8.200	-0.501	-0.443	-6.304	-5.218	-16.884	**0.700**
K/Y	0.186	-4.391	3.354	-10.352***	0.357	0.212	-4263	6.445	-14.181***	0.444
Share of construction	-0.092	0.458	0.664	-1.108	-0.051	-0.158	0.141	1.563	-2.515	-0.204
Share of manufact.	0.018	-0.217	-0.669	-0.592	0.078	0.083	0.216	0.835	-0.909	0.028
Share of services	-0.188	-0.186	-1.232	-1.029	-0.083	-0.045	-0.313	-0.624	-1.668	-0.084
Unemployment rate	-0.256*	2.865**	4.249**	1.770	-0.390***	-0.284*	3.164**	3.805*	2.274	-0.394***
Constant	11.204***	8.656***	6.508**	9.380***	10.887***	11.240***	10.053***	5.807	11.569***	10.783***
N	28123	739	348	391	27384	22181	600	278	322	21581
1997-2008										
Cohort size at current age	1.122***	1.638	6.352**	-0.742	0.364***	1.757**	4.232*	6.794	2.244	0.841***
Share low-educ. pop	-	-	-	-	0.997***	-	-	-	-	0.715***
Share high-educ. pop	-0.693***	-0.771	-2.977***	0.086	-	-0.524***	-0.041	-2.866**	1.077	-
Share female empl	-0.196	-0.804	0.497	-1.326*	0.038	0.122	-0.550	-0.163	-0.414	0.120
IT/K	-2.194***	-2.371	10.739	-4.132	-2.575***	-1.805**	-8.351*	3.160	-7.644	**-2.136*** **
K/Y	-0.139	-0.302	-1.838*	0.173	0.005	-0.203	0.663	-0.110	0.678	-0.080
Share of construction	-0.117	0.020	-1.629	0.791	-0.113	-0.213	0.190	-2.371*	1.553	-0.221
Share of manufact.	0.003	-0.789	-1.415	-0.532	0.055	-0.000	-0.192	-1.064	0.434	0.055
Share of services	-0.082	-0.438	-1.481	0.087	-0.064	-0.047	-0.320	-2.005	0.722	-0.046
Unemployment rate	0.754***	0.767	0.923	0.579	0.819***	0.734***	0.350	0.839	0.325	0.770***
Constant	11.683***	12.050***	12.955***	10.579***	10.810***	11.426***	11.540***	14.127***	9.145***	10.662***
N	49970	2803	919	1884	47167	37761	2131	705	1426	35630

Table A10: Estimations of wage equations (2nd step)- Regional variables
(High-educated workers, men aged 30-44 years, **1997-2008**) – Effects of cohort sizes

	Without control functions			**With control functions**		
	All	Well-matched	Mismatched	All	Well-matched	Mismatched
All matches						
Cohort size at current age	-0.751	0.884	-1.867*	1.574	0.831	1.445
Cohort size at age 24-25	-2.370**	-2.539	-1.559	-0.650	-2.308	0.788
New matches						
Cohort size at current age	-0.692	0.827	-1.752*	1.552	0.606	1.536
Cohort size at age 24-25	-2.494**	-2.520	-1.772	-0.852	-2.344	0.501
Displaced						
Cohort size at current age	2.928	10.187***	-0.542	4.049	6.890	1.855
Cohort size at age 24-25	-5.057*	-9.655**	-2.475	-0.744	-3.931	2.005

Table A11. Coefficient of the skill dummy. Men aged 30-44. All workers regressions.

	Without control functions	With control funcionts
All Matches		
1988-1996	0.202***	0.306***
1997-2008	0.115***	0.185***
New Matches		
1988-1996	0.204***	0.308***
1997-2008	0.115***	0.184***
Displaced		
1988-1996	0.196***	0.304***
1997-2008	0.130***	0.184***

Table A12. Skill Wage Premium. Sensibility Análisis. All Workers and estimations with control functions

	30-54	Skilled Workers with Occupation Level less than 4	Skilled Workers with Occupation Level less than 5
1988-1996	0.280***	0.470***	0.428***
1997-2008	0.186***	0.429***	0.406***

Table A13. Decomposition of Skill Wage Premium
(University Graduates-Compulsory education attainment) (Men aged 30-44 years)

	Total		Labor Experience and Firm Tenure		Occupation	
	1988-1996	1997-2008	1988-1996	1997-2008	1988-1996	1997-2008
Total	49.2	44.2	8.0	-2.8	-3.0	10.6
Returns	30.7	24.1	8.8	-3.5	-32.7	-21.0
Characteristics	18.5	20.1	-0.8	0.8	29.8	31.6

Table A14. Decomposition of Skill Wage Premium by period and labor market adjustment.
(University Graduates-Compulsory education attainment) (Men aged 30-44 years)

	Total		Labor Experience and Firm Tenure		Occupation	
	1990-1992	2006-2008	1990-1992	2006-2008	1990-1992	2006-2008
All University Graduates - Low Educated						
Total	50.3	46.0	12.4	0.5	1.6	16.1
Returns	66.6	30.1	13.3	-5.2	-27.6	-14.5
Characteristics	-16.2	15.9	-0.9	5.7	29.3	30.6
Well Matched-Low Educated						
Total	66.6	70.8	15.2	13.7	18.2	41.8
Returns	35.5	23.4	15.9	6.3	-28.8	-18.4
Characteristics	31.1	47.4	-0.7	7.4	47.0	60.2
Mismatched-Low Educated						
Total	32.3	25.9	17.0	-2.8	4.2	23.7
Returns	44.3	32.8	16.1	-10.0	-5.3	15.7
Characteristics	-12.0	-6.9	0.9	7.2	9.5	8.0