The Schooling Response to a Sustained Increase in Low-Skill Wages: Evidence from Spain, 1987-2009

Preliminary and incomplete

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Abstract: The response of human capital accumulation to changes in anticipated returns to schooling determines the productivity of future cohorts in the labor market and the evolution of inequality. Unlike other advanced economies, like the US, the UK or Germany, Spain has experienced since the mid-90s a *drop* both in the returns to medium and tertiary education and, with a lag, a drop in schooling attainment of recent cohorts, providing the setup to estimate the response of human capital acquisition to relative increases in low-skill wages. We use two different approaches. Our first identification strategy relies on the fact that different cohorts in local labor markets - defined by the regional scope of collective bargaining- faced very different wage structures at the age of 17. A second strategy identifies expected returns to skill using variation in the relative wage of unskilled workers associated to different industry mixes across provinces and wages bargained in multi-year collective agreements. Our estimates suggest that a 10% increase in the ratio of wages of unskilled workers to the wages of mid skill workers increases the fraction of youth who end up achieving basic schooling by about 2 percentage points.

JEL Codes: J24 (Human Capital), J52 (Collective Bargaining)

Introduction

The response of human capital to changes anticipated returns to schooling determines the productivity of future cohorts in the labor market and the evolution of inequality. For example, the fact that college enrolment among US young adults has not kept up with the increase of the returns to college has led some authors to forecast an increase in wage inequality during the next decades (see Altonji et al., 2009). Unlike other advanced economies, including the United States, the United Kingdom or Germany, Spain has experienced since the mid-90s a *drop* both in the returns to medium and tertiary education (see Lacuesta and Izquierdo, 2010 or Pijoan and Sanchez-Marcos, 2010) and, as we document below, a drop in the schooling attainment of recent cohorts (measured at the age of 25). Hence, the Spanish case provides an ideal setup to estimate how the decisions of young adults to accumulate human capital in the schooling system respond to increases in low-skill wages relative to high-skill ones.[2]

The basic model of human capital acquisition stresses the role of the expected return to skill acquisition as a key determinant of the decision to enrol in formal education. In the absence of credit constraints, the opportunity cost of attending school relative to expected returns of acquiring formal skills determines the supply of human capital in an

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[2] See, for example, Autor, Kearney and Katz (2008), for the US, Meghir, Gosling and Machin (2000) for the UK and Dustmann and Schoenberg (2009) for Germany. For evidence of the Spanish case, see Izquierdo and Lacuesta (2006), Pijoan and Sanchez-Marcos (2010)

economy. On the empirical side, there is evidence that young adults' enrolment probabilities decrease with the wages of unskilled workers – McKinnish et al. (2005) Neumark and Wascher (1995) –the unemployment rate –Clark (forthcoming) or Petrongolo and San Segundo (2002) or proxies for the demand in industries intensive in unskilled labor –Aparicio (2010). Unfortunately, while enrolment is very important, it provides little information about the type of skills finally acquired in the formal education system. Firstly, early school leaving decisions may be later compensated by other forms of human capital acquisition, such as GEDs in the US. Secondly, the evolution of productivity depends on the level of schooling finally attained by an individual, not on point-in-time enrolment decisions.[3]

We provide estimates of the impact on human capital acquisition of the drop and subsequent increase of the relative wages of unskilled workers in Spain between 1986 and 2009. We start by documenting that, similar to the development in the US and other OECD countries, the schooling attainment of male Spanish citizens has stagnated during the last 15 years (see Autor and Dorn, 2010, or Goos, Manning and Salomons 2010). Secondly, we provide some evidence that wages in low-skilled jobs, relative to those in mid-skilled ones, experienced a sustained increase after 1995 - after a fall between 1987 and 1992. The wages in mid-skill jobs, relative to those in high skill ones, stagnated after 1995. Both developments in the wage structure were hence sustained over time, thus making it likely for young adults to infer that the movements in the relative wages of unskilled workers had indeed a permanent component and were likely to shape the decision to acquire human capital.

We focus on the educational decisions right after the legal working age- 16 years in Spain. As Spain has a dual track schooling system, we consider the following choices of the youth at age 17 finishing at most compulsory schooling, enrolling and finishing the vocational track, a professionally-oriented track involving training in firms, and engaging in the academic track –the main way to access college.

To mitigate the biases associated to the simultaneity between quantities of unskilled workers entering the labor market and changes in unskilled wages, we use skill-specific wages determined in collective agreements at the province-industry level. The strategy is based on three observations: unskilled and skilled young adults work in different industries. Unskilled young men work in construction and retail, while skilled young men work in service-related industries. Second, due to a construction boom that has lasted some 10 years, the construction sector has experienced higher-than-average wage growth. Thirdly, wages set in collective agreements effectively act as minimum wages at the province-industry cell level, as there is substantial concentration in the wages of the youth around collectively bargained wages for unskilled workers and variation in those wages does not seem to reflect shifts in the outside opportunities of youth.

We construct a measure the return to skill anticipated at age 17 by combining public information on skill-specific collective bargained wages across industries and the

[3] A closely related literature fits a structural model with agent preferences and labor market opportunities to examine the behavioral responses of enrolment and youths' decision to work, like Eckstein and Wolpin (1997) . López-Mayán (2010) fits a structural model to the 1985 cohort in Spain to study issues related to those we address here. Our study exploits mainly cross-cohort variation in wage structure, and this allows us to experiment with several measures of wage returns. We compare our results to López-Mayan's in several points of the paper.

industrial share of young adults in the province before the boom. The results suggest that a 10 percent increase in the relative wages of unskilled workers leads cohorts who are 17 to be between 2 and 5 percentage points more likely to complete basic education –depending on whether or not we adjust for unemployment differences across skill levels. We also provide some evidence suggesting that young adults responded by leaving the educational system at the early stages of tertiary education.

Section 2 provides some background on schooling and wages in Spain. Section 3 describes the data and methods. Section 4 shows the results when we use market wages and Section 5 shows the results of our preferred empirical strategy when we use measures of the return to skill based on wages in collective agreements.

2. Trends in Wages and Schooling in Spain

This Section provides the basic facts about educational attainment and the wage structure that each cohort observes at the age of 17.

2.1 The Educational System in Spain.

Spain features a dual track system. This involves that, once a young adult finishes compulsory education, he or she has two options. The first is to enter the academic track that, upon completion, gives access to college. The second is vocational training (*Formación Profesional*), a more professionally-oriented track that involves training in firms and trains for specific occupations.

For almost all cohorts in our study (those born between 1969 and 1983), compulsory schooling ended at age 14. After that age youth could opt for leaving the system altogether, or for entering either the academic or the vocational training tracks.

The *Academic track* consisted of three grades, with common curricula during the first two years and partial choice of subjects during the last one. An additional grade gave plus passing a national-level exam gave access to college.

The *Vocational training* track consisted of three levels (or "modules"). The first two were assimilated to secondary schooling, and each of them took two years to complete. The third one also took two years and is assimilated to tertiary education by the definition of Eurostat and the OECD.

A new Educational Act passed in 1990 but introduced in 1993 (LOGSE law 14/1990) extended compulsory education until age 16. It maintained the first two grades of the academic and the vocational tracks in the former system as secondary education, but as "compulsory" secondary education. Access to tertiary education or the composition of the last two grades of the vocational training remained unchanged.[4]

What cohorts would be affected by that change? The law specified that those who were attending 3rd and 4th degree of primary education in 1993 were to initiate 3rd and

[4] The new system also introduced changes in the way grade retention could happen during primary education. Regarding secondary education, the system introduced a new system of upper secondary school that lasted two years.

fourth degree of the "new" primary education. In principle, and according to such legislation, the first birth cohort completely affected by the new legislation would then be the one born in 1984 the last cohort in our study.[5] Many schools, however changed before and even in the case of a late change, some individuals born before could have been affected by the reform if they repeated some courses. Hence, as we lack information about the share of students whose school anticipated the law change, we create a taxonomy of grades that is consistent over time, and discuss if legislative changes are likely to affect our measures of schooling attainment.

Namely, we distinguish between

1. "Primary Schooling or Less": We include here young adults who completed at most primary schooling under any of the systems. We include in this category individuals who fail to complete "compulsory" schooling, a group that constitutes a non-trivial fraction of the population, reaching 30% for cohorts born after 1985.

2. "Upper secondary" school: This group includes all young adults who completed at least high school (in the academic track) in either the old or the new systems Young adults in this group failed to finish education without a tertiary education degree.

3. "Vocational training": Young adults who complete any form of vocational training under both systems.

4. "Tertiary education" Young adults who complete some form of college.

2.2 Trends in Schooling Attainment:

Figure 1 shows the evolution of the educational attainment for male young adults born between 1967 and 1983, measured as of age 25 in the Spanish Employment Survey. The four categories are: primary schooling, vocational training, upper secondary (or high school) and tertiary education.[6] The Figure documents a rapid increase in the educational attainment across cohorts born in the early seventies: the fraction of male young adults who completed only primary school (or less than upper secondary school) dropped from 50% (cohort born in 1967) to 32% (1977 cohort). The 1977 cohort had a fraction of youth with a vocational training degree or upper secondary school 4 and 5 percentage points higher than the 1967 cohort, with college attainment also increasing by some 9 percentage points.

Nevertheless, that upward trend in attainment was reversed for cohorts born in the late seventies and early eighties. Cohorts of young adults born after 1977 have not attained higher degrees of college or upper secondary schooling than the preceding cohorts. This might reflect that individuals are attending longer university degrees over time. The stagnation in educational attainment is especially evident in lower levels of schooling,

[6] We compared the educational attainment of the same cohort across years to establish what was the earliest age when the report was "stable"- i.e,. the fractions of individuals in each attainment level was invariant to the age of reporting. While ages 28 and 29 were those earliest ages, we chose 25 as a compromise: attainment did not vary "too much" afterwards and we could observe the wage structure that those cohorts faced at the age 17 in recent years.

with an increase in the fraction of youth having attained basic education or less after the 1980 cohort.

2.3 Trends in Wage Structure at age 17

Next, we plot a series of the returns to skill that cohorts could observe at the age of 17 in Figure 2. The construction of these series is detailed in Section 3.2, but we provide here an overview. We basically computed for each of the 50 provinces in Spain the median of the wage of unskilled workers (those that the Social Security classifies as "laborers") between ages 16 and 45, workers with some skill level that is inferior to college (ages 25-45) and the wages of workers in positions that require college (ages 25-45). Figure 2 plots the national averages of the ratio of the wage of unskilled workers to mid-skill ones (*Wunsk_med*) and the ratio of mid-skill workers to college (*Wmed_high*). The horizontal axis has the birth year of the cohort. The vertical axis contains the ratio of unskilled-to mid-skill wages (*Wunsk_med*) prevailing the year when the cohort turned 17.

According to our measure, the cohorts born between 1969 and 1977 would have observed a drop in relative wages of unskilled and mid-skill workers. When the cohort born in 1969 turned 17 –year 1986- the median wage of unskilled workers was 76% that of mid-skill workers. Ten years later, at the time of taking the decision of whether or not to finish upper secondary school, the 1977 cohort observed that the median wage of unskilled workers was only 69% the median wage of mid-skill workers. Since then, all cohorts have been observing a secular increase in the relative wage of unskilled workers. The remainder of this study uses several methods to assess whether if the evolution of wages observed at age 17 may have caused the trends in schooling attainment depicted in Figure 1.

3. The data and methods

3.1. Methods

We start with some simple analytical considerations. A risk-neutral youth decides whether or not to invest in human capital by comparing the discounted stream of earnings upon a certain schooling decision and an alternative one.

$$S_i > 0 \;\; if \;\; E\left[\sum_{t=16+S}^{T} \beta^t \frac{P_t(E=1|S>0)w(S)}{(1+r)^t}\right] - k(S) > E\left[\sum_{t=16}^{T} \beta^t \frac{P_t(E=1|S=0)w(0)}{(1+r)^t}\right]$$

Where r is the discount rate, E(.) is the expectation operator, $P_s(E=1)$ is the probability of working in each year, that depends on the level of human capital chosen, $w(S)$ are skill-specific wages and *k(S)* are the set of costs (monetary and in terms of effort) associated to enrolment

In the Spanish case, a young adult who has completed primary schooling would choose between the academic secondary schooling and the vocational track. We assume that the academic track permits youth to attend college, while the vocational track does not –not

an unrealistic assumption, given the difference in curricula and the scant flows from VT to college. Hence, upper secondary completion is more likely to respond positively to increases in the stream of earnings associated to college –relative to other wages. In other terms,

$$S_{upper} = f[\frac{W_{mid\_skill}}{W_{college}}, \frac{W_{mid\_skill}}{W_{unskilled}}, k(upper), k(coll)]$$

$$S_{vt} = f[\frac{W_{mid\_skill}}{W_{college}}, \frac{W_{mid\_skill}}{W_{unskilled}}, k(upper), k(coll)]$$

Where W_{med} is shorthand for the discounted, unemployment-adjusted discounted earnings associated to "less-than-college" education. Ideally, we would like to be able to distinguish between the returns to vocational training and upper secondary school. Unfortunately, due to data problems we can only lump both returns in a single measure of the "returns to less-than-college education". We further assume that the personal discount rate is constant and identical for all individuals and equals the market rate.

One can obtain two results:
Result 1: Holding $\frac{W_{unskilled}}{W_{mid\_skill}}$ constant, an increase in $\frac{W_{mid\_skill}}{W_{college}}$ leads to an decrease in P(S_{upper}) and an increase in P(S_{vt}) -as vocational training is not an effective door to college.

Result 2: Holding $\frac{W_{mid\_skill}}{W_{college}}$ constant, an increase in $\frac{W_{unskilled}}{W_{mid\_skill}}$ leads to an decrease in both P(S_{upper}) and P(S_{vt})

Testing results 1 and 2

A substantial literature has tested whether or not different components of equation (1) affect enrolment of young adults or, more sparsely, final schooling attainment.

The literature provides several alternatives to estimating results 1 and 2. One is resort directly to measuring wage expectations by young adults (Beffy et al, 2009). The second is to assume that expectations are formed by taking current of the contemporaneous adults as the wage the young adult will have when older (Manski 1993, López-Mayán, 2010). More sophisticated strategies involve young adults solving a labor market equilibrium problem that takes into account that current schooling decisions end-up affecting actual returns to schooling (Heckman and Taber , Buchinsky)

The route we take is to estimate a reduced-form model of educational attainment where final educational outcomes are regressed on the opportunity cost of attending some form of formal education at the age of 17. Equation (1) stresses the conditions under which changes in relative wages have the potential to change educational decisions: First, the differences in wages across skill groups must be persistent enough that they have the potential to affect the discounted stream of lifetime earnings. Second, the measures of wages used must (a) contain information young adults can condition expectations on and (b) display limited sensitivity to the share of young adults who drop schooling to become workers. We discuss below if our measures satisfy those conditions.

We estimate the following reduced-form multinomial Logit for a sample of 25-year old males:

$$A_{ipt}^{c} = \beta_0 + \beta_1 \frac{W_{unskilled}}{W_{mid\_skill}} + \beta_2 \frac{W_{mid\_skill}}{W_{college}} + \beta_3 \frac{U_{unskilled}}{U_{mid\_skill}} + \sum_{p=2}^{p=50} \delta_p P_p + \sum_{t=1995}^{t=2009} \lambda_t D_t + \theta X_{ipt} + \varepsilon_{ipt}^{c} \quad (2)$$

As educational attainment is hard to order in a dual track system, we define four levels of attainment by a young adult *i* in a province *p* at time *t*. A_{ipt}^{c} can either be basic schooling (or less), vocational training, or a joint outcome that lumps together secondary academic track and college. $W_{unskilled}$ is a measure of the opportunity cost of enrolling in formal education at the age of 17. $U_{unskilled}$ measures of the unemployment rate at the provincial level, again distinguishing among different skill levels. ε_{ipt}^{c} is a type-1 extreme distribution.

Rather than computing measures of the unemployment-adjusted expected lifetime-earnings a young adult would expect upon a particular course of education, we condition on measures of skill-specific earnings and unemployment separately, and examine if the different terms have different impact on the decision to acquire human capital. As most of the relevant variation we use is at the provincial level, we take ratios of magnitudes to avoid problems related to inter-provincial differences in the cost of living (see Moretti, 2010). P_p and D_t are a set of provincial and time dummies, respectively.

Familial characteristics exhibited a steady improvement over the sample period. To control for those, in some specifications we focus on a sample of co-resident young adults, as for those some family characteristics are available (86% of our sample live with their parents at the age of 25). Namely, we include in Xs controls for family size (at age 25), dummies for only the mother or only the father being present and three dummies with educational attainment of the mother (basic, high school and college). Finally, we also include province and year dummies. Year dummies absorb any nationwide trend, such as changes in the educational system. In some specifications, we add provincial trends, to capture possible differences across provinces in the implementation of the 1990 law.

The coefficients of interest are those of the two measures of the returns to skill β_1 and β_2 The identification is obtained from changes across provinces (or, in the specification with provincial trends, from deviations from province-specific trends) in the ratios of unskilled to skilled wages when a cohort reaches the age of 17. We use two measures of wages.

Measure 1: Cross-sectional wages. The first measure is the average wage in the province of residence of the young adult is computed by averaging skill-specific wages

a young adult can observe at the time the educational decision is taken. There are 52 provinces in Spain, and provinces provide a natural measure to define a local labor market.[7] The wage setting mechanism in Spain is heavily influenced by collective agreements. These are bargained by representatives of unions and workers at various industrial and geographic levels, and the minimum conditions bargained bind for all workers within the industry/geographical area (regardless of whether or not they belong to a union). The most common level of bargaining is the industry-province level, which is what we use.

Hence, $W_{unskilled}$, W_{mid_skill} and $Wcollege$ are cross-sectional medians of wages within skill groups in a given year. We take medians by age group. For the unskilled, we take separate medians of wages at ages 16-25, 26-35 and 36-45. For the rest, we take medians of the groups between 26-35 and 36-45. We then take averages of those cells to construct a proxy of the projection of lifetime earnings a young adult would infer upon a given educational choice. We describe the measures of skill in Section 3.2.2.

We see two problems with this measure is one of simultaneity between the wages of unskilled workers and the decisions of school enrolment. For a young adult, the alternative to school enrolment is to participate in the labor market. Within a given province, an increase in school enrolment reduces the supply of unskilled young workers, possibly affecting the equilibrium wages. A second concern is: what wages do the youths actually observe? To address this concern we use a second measures

Measure 2: Wages set in collective agreements. The second measure uses the final wage set in collective agreements for each province, industry and skill measure (where "skill" is defined in the following Section). We see three main advantages in the use of bargained wages. First, collective agreements set for two to three years typically a yearly wage increase, usually on top of national inflation growth. Hence, wage increases vary across regions depending on the moment when the contract was signed in each industry, expectations about the local labor market at the time of signing the agreement, and national inflation. Importantly for our purposes, wage growth bargained at period t is unlikely to capture unanticipated subsequent changes in the number of young adults leaving school to start working. While we do not make any special correction to predictable wages, some specifications include province specific trends capturing slowly moving demographic factors that unions and firms may use to forecast the evolution of worker's supply.

A second attractive feature in using wages set in collective agreements is that, due to the limited number of occupations an unskilled young adult can work on, a few industry-province specific wages describe relatively well the labor market opportunities of unskilled youth.

Finally, we provide evidence there is substantial concentration of the wages of unskilled young workers around the levels set in a collective contract. Those wages are likely to form the basis of young adults decisions: the degree of accumulation at those points suggest that young adults can learn about those levels from (similar) worker's experiences.

[7] We exclude the autonomous cities of Ceuta and Melilla, with information on city-specific wages that we deemed unreliable.

Hence, our second strategy proxies $W_{unskilled}$ in (2) using an average across industries the wage for different skill levels in 6 different industries where the proportion of young adults working in 1992-1995 in the industry and the province acts as the weight.

$$W_{p,t}^{unskilled} = \sum_{i=1}^{i=5} \frac{N_{p,i,1995}^{unskilled}}{N_{p,1995}} W_{p,i,t}^{unskilled}$$

Where $\frac{N_{p,i,1995}^{unskilled}}{N_{p,1995}}$ is an estimate of the share of (unskilled) young adults working in industry *i* in province *p* and period *t* in 1995. $W_{p,i,t}^{unsk}$ is the wage agreed in the collective contract for the unskilled. We use the weights at the beginning of the sample period to avoid simultaneity biases associated to specific industries developing in a province because of a higher supply of unskilled workers.

3.1.2. Channels

Finally, we also investigate age-specific impacts of current ratio of unskilled to skilled wages on schooling attendance. While we find enrolment less informative than schooling attendance –much more is known about the monetary returns to school attainment than about the returns to school attendance, the response of school attendance is important to understand the channel through which wages affect schooling attendance. Basically, we want to assess if the impact of wages on schooling attainment at age 25 is due to drop outs or to grade repetition. To that end, we estimate OLS and Probit models of the following form:

$$S_{ipt} = \alpha_0 + \alpha_1 \frac{W_{unskilled}}{W_{mid\_skill}} + \sum_{p=2}^{p=50} \delta_p P_p + \sum_{t=1992}^{t=2009} \lambda_t D_t + \theta X_{ipt} + u_{ipt}^c$$

S_{ipt} is a binary measure of (regular) schooling attendance between 16 and 18 years of age, and $\frac{W_{unskilled}}{W_{mid\_skill}}$ is the contemporaneous ratio of skilled to unskilled wages.

3.2. The data.

3.2.1 Main dataset:

We use the 1992-2009 waves of the Spanish Labor Force Survey "*Encuesta de Población Activa*", the Spanish equivalent to the US CPS. The survey is conducted by the Spanish Satistical Institute and it is mainly used to compute the unemployment rate and the active population. The EPA is representative of the Spanish population, interviewing some 20,000 households every quarter. It also provides detailed information on the educational attainment and labor market outcomes of individuals above 15 years old and when they are in school, the current grade. In the case of young adults person still resides in the parental house we also have information on the

structure and characteristics of the household. While the public-release EPA typically codes the age of individuals in five-year bands, the Spanish Statistical Institute generously provided us with the age in years. The EPA does not contain wages.

The question on *schooling attainment* is asked from every respondent above the age of 16. The question about *schooling enrolment* asks about whether children over 16 were in school during the last four weeks. We dropped the third quarter (spanning the summer).[8] Prior to 2005 there was only one question on attendance, but after that date there was a separation of regular and non-regular courses. The mere fact of separating the pre-2005 question into two seems to have led additional respondents to report they were attending school. Since before 2000, the distinction between regular and non-regular courses was not available, we are forced to consider non-regular students as enrolled in the educational system. However, the break in the series due to the change in the questionnaire is not evident below the age of 20.

3.2.2 Information on wages:

We rely on out-of-sample information to construct two measures of the wages that a young adult would use to form expectations about earnings in different education paths.

Measuring the expected return to skill at age 17 using actual wages

We use administrative records of earnings as drawn from Social Security records *Muestra Continua de Vidas Laborales*: Waves 2007. This dataset is a random sample of 4% of individuals who were affiliated to the Social Security system in 2007 (either as employees or as unemployed). The sample contains the monthly earnings of all labor relationships since the moment when the person joined the Social Security system. The main advantage of this dataset is that it contains high quality information on wages. An important drawback is that it lacks information about the education level of the worker. While there have been attempts of linking that information with Census data, the quality of the information on education is not extremely reliable for younger individuals.[9]

We construct reliable proxies of wages by skill level using the fact that workers are grouped into 11 categories for Social Security purposes. The grouping consists on a partition that is a mix of occupation and skill. The first two groups explicitly correspond to individuals with a college degree or equivalent. The rest of groups are numbered according to decreasing level of qualification, with the bottom two groups representing "laborers" or positions for which no degree is required. Admittedly, there are cases of individuals with a college degree whose employer pays wages according to contribution groups other than the first two. Nevertheless, Felgueroso et al (2010), in a study of the evolution of the wage structure in Spain document that returns to skill using

[8] Respondents have the option of reporting to be on vacation, but we found an inconsistency with the data before and after 2005 and that is the reason we preferred to drop all third quarters (the quarter spanning the summer)

[9] The Census contains information on the educational level of individuals when they register in a new dwelling. As the vast majority of young adults at age 25 still live with their parents, unless their parents have changed dwellings recently, there is little update on the education of household members as they progress through the educational level.

contribution groups or education level give a very similar picture. Hence, in what follows we rely on the classification for Social Security purposes. It is worth noting that such classification is not merely administrative: collective agreements specify wages for each of those groups separately, and those increase with the occupational level.[10]

There are two additional concerns with our measure of earnings. The first is that monthly earnings are capped at the maximum wage that the Social Security uses to compute contributions to old age and health pensions. The second is that the sampling method does not guarantee that the wage that a worker in 2006 perceived ten years before is representative of the distribution of earnings in 1996 if there is selective attrition. To overcome the problem of censoring in earnings, our analysis focuses on *median* wages. Censoring affects very little the median of young worker's wages, that are very concentrated and typically far away from the cap. The issue becomes more problematic for our measures of other age groups, so we limit ourselves to groups up to 45 years of age. Second, regarding the representativeness of the sample, we use only males' earnings.

We construct a measure of the expected wage profile over a lifetime if the worker obtains tertiary education (first two contribution groups) intermediate education (groups 3-9) or no education at all (group 10 or laborers).

Measures based on Bargained Wages in Collective Agreements

The second measure is obtained from the Registry of Collective Agreements between 1990-2009. This source contains the duration of each collective contract, as well as the industry and geographical coverage. We selected those agreements whose coverage was at the province-industry level. Between 1993 and 2001 and for approximately half of the agreements the registry contains information about the wage levels for each contribution group, which is the information we use to construct an alternative measure of earnings that is more visible and less sensitive to short run changes in the supply of unskilled workers. The concept we use is the "base wage". Such concept excludes any premia linked to tenure on the job, age or performance at the job.

We construct proxies of the wages of workers with college education using the "base wages" of the first and second contribution groups. We proxy the wages of unskilled workers using the base wage of laborers. For the group with intermediate education, we assign the wage of group 3 (administrative workers).

4. Results

4.1 Schooling attainment at the age of 25.

[10] For each group there is a different maximum contribution to old-age pensions and to the public health system. Namely, the 11 groups are 1: Holders of a college degree (*Ingenieros y Licenciados*) 2: Holders of a 2-year college degree (*Ingenieros Técnicos, Péritos y Ayudantes Titulados*), 3: Administrative qualified workers *(Jefes Administrativos y de Taller*) 4. Administrative workers without a degree (*Ayudantes no titulados*) 5: Officers (*Oficiales Administrativos*) 6: Sub-officers (*Subalternos*) 7: Auxiliary Workers (*Auxiliares Administrativos*) 8: Officers of class 1 and 2, 9 Third class officers 10: Laborers 11: Workers below 18 years of age.

Table 3 presents estimates of the impact on final schooling attainment (measured at age 25) of two measures of the skill premium when a young adult was 17. The measures utilized are the return to some form of high school education –either vocational training or high school- measured as the provincial ratio of wages in unskilled jobs over wages in mid-skill ones: $\frac{W_{unskilled}}{W_{mid\_skill}}$. The second measure is the (inverse of the) return to college –measured as the provincial ratio of wages in jobs that require a college degree and wages in jobs that require some training: $\frac{W_{mid\_skill}}{W_{college}}$. The estimates shown are the marginal effects of the variable in each row on the probability of observing the educational outcome in each column.[11] All specifications include province and year fixed effects. Standard errors are all clustered at the province level.

The coefficient shown in Table 3, Panel A, row 1 and column 2 is .0166 (standard error: .009). A cohort that observes an increase of 10 percentage points in the ratio of the wages of laborers relative to mid-skill jobs at the age of 17 in its province is 1.6 percentage points less likely to complete vocational training. The coefficient of basic schooling is .012 (standard error: .011). The estimate implies that young adults in a cohort exposed to a 10 percent increase in the ratio of unskilled-to skilled wages $\frac{W_{unskilled}}{W_{mid\_skill}}$ is more likely to finish basic schooling instead. Nevertheless, the coefficient is not statistically significant.

Unemployment in the province at age 17 seems to play a small role in the educational decisions of young males. A cohort that observed a one percent increase in the ratio of the unemployment rate of unskilled workers relative to that of skilled workers at the age of 17 seems is a .002 percent more likely to finish basic schooling, contrary to the idea that unemployment leads young adults to stay at school. The result suggests that, conditional on the wage the young adult obtains if working, the rate of arrival of new offers does not seem to be an important determinant of schooling attainment. Clark (forthcoming) using UK data and Petrongolo and San Segundo (2002), with Spanish data, document that regional unemployment diminishes the chances of school enrolment between 16 and 18. Nevertheless, those studies do not control for relative wages. We also note that enrolment at age 16 or 17 may be a different outcome than schooling attainment at age 25 if young adults re-enter the educational system at some point. We study the enrolment decisions of those cohorts below.

Table 3, Panel B shows the coefficients when we select to the sample of workers who live with their parents at their age of 25 –85% of the sample. The advantage of that sample is that we can observe the educational level of the parents of the youth, as well as proxies of the number of siblings –measured by current family size. The coefficients become more precise: a 10 percentage points increase in ratio of wages in low-skill positions relative to mid-skill positions observed at age 17 leads to an increase of 1.8 percentage points in the fraction of young adults who only complete basic schooling (standard error: 1.1) and a drop of 2.3 percentage points in the fraction of young adults completing vocational training.

[11] The estimates reflect the impact of an increase in 10% of the relevant ratio of wages on a young adult living in Madrid, born in 1974 and, in the specifications that only use coresidents, who live in a family with 4 members, where both the father and mother are present and the mother has a high school degree.

A 10% increase in the ratio of medium to high skill wages observed at age 17 leads to a 1.7 percentage point drop in the chances of completing upper secondary schooling. The result is consistent with what we expected; holding $\frac{W_{unskilled}}{W_{mid\_skill}}$ constant, an increase in $\frac{W_{unskilled}}{W_{mid\_skill}}$ leads to a drop in the chances of completing upper secondary schooling . That is, an decrease in local wages of college workers leads to a drop in the share of youth completing upper secondary schooling –a gate for attending college. What looks surprising is that the drop in the share of young adults completing upper secondary schooling coincides with an increase in the share of workers with basic schooling, while we'd expect an increase in vocational training instead. Again, unemployment plays little role in any of the specifications examined.

Table 3 Panel C shows the results of the specification (2) when one adds province-level trends. Such trends absorb any province-specific development in educational attainment - like if the reform of the educational system was province-specific – or wages –like trends in population growth that affect relative wages. Such specification is very demanding, as coefficients are now identified out of variation in changes in the skill-wage profile that depart from a province level trend. The coefficients are very similar to those in Table 3 Panel B, suggesting that omitted biases related both to wages and schooling attainment at the province level are not driving our results.

Finally, we test the suitability of the cohort-level specification by regressing the schooling attainment of a cohort on the wages that that cohort observed at the age 22 – once schooling decisions are basically taken already. The coefficients are either statistically insignificant and lower in magnitude than those in Table 3.B. This finding suggests that the results are not driven by spurious trends at the province level and that the timing of changes in relative wages matters for educational attainment.

5. The response of schooling attainment to wage structure: using collective agreement wages

Our second strategy identifies the causal impact of the perceived return to skill at the age of 17 on schooling attainment using changes across provinces and over time in the inter-industry wage structure detailed in collective agreements. Namely, the identification strategy here draws on two observations. The first is that unskilled and skilled young males work in markedly different industries. Workers below 40 years of age and with basic education or less- work mainly in construction (20% in 1995), retail (7% in 1995) and agriculture (10%). On the other hand, males with at least upper secondary schooling work in (1) services to industry and (2) the education and health sector (23% in 1995). While workers with upper secondary schooling or higher also work in construction, they do so to a lesser extent than unskilled young adults (10% in 1995, and the fraction did change much after that year). Between 1997 and 2009, the concentration of unskilled youth working in construction increased substantially: see Figures 3 and 4.

The second observation is that between 1993 and 2001 unions and firm representatives in the construction sector bargained higher wage growth than those in the rest of the industries. Figure 5 compares the evolution of the year-on-year growth of wages in collective bargaining agreements in construction and other industries. Bargained wages in construction have been consistently higher than the rest of industries since 1998.

Hence, the returns to any form of skill are most likely to fall in provinces where young adults were, as of 1995, more likely to work in construction.

In other words, wage changes of unskilled workers at the province level can be written as follows

$$W^{u}_{2000} - W^{u}_{1995} = \sum_{i=1}^{i=I} \frac{N_{ind,1995}}{N_{1995}} \Delta W^{u}_{ind,2000} + \sum_{i=1}^{i=I} \Delta \frac{N_{ind,2000}}{N_{2000}} W^{u}_{ind,1995}$$

Wage changes can be decomposed into two components as in Bartik. The first one measures wage growth within the industry holding the initial share of employment in the industry constant. The second component reflects compositional effects due to the increasing weight of certain industries. Our measure of the returns to skill uses only the first component, as part of the increase in the employment in the construction sector may be associated to the fact that the youth that abandoned the schooling system work in industries that are intensive in unskilled workers.

We compute $\frac{N_{ind,1995}}{N_{1995}}$ using the Spanish employment survey (EPA). We proxy $\Delta W^{u}_{ind,2000}$, using the wage in the industry-province collective agreement cell. Those wages are bargained by unions and firms for all workers. Crucially for our purposes, unions and firms set different wages for different skill levels, but the "base wage" bargained upon does not vary by age.

We use five industries: construction, services to firms, metal, retail, and rest of industries. The first four industries account for some 40% of the employment of unskilled young adults –with less than upper secondary schooling- and for about 50% of the employment of young adults with some form of education. The wage of an unskilled worker wages for year t in province p is measured as:

(3) $$W^{u}_{p,t} = \sum_{i=1}^{i=5} \frac{N^{unskilled}_{p,ic,1995}}{N_{p,1995}} W^{u}_{p,ci,t}$$

Similarly, skilled wages for year t in province p are:

(4) $$W^{college}_{p,t} = \sum_{i=1}^{i=5} \frac{N^{skilled}_{p,ic,1995}}{N_{p,1995}} W^{college}_{p,ci,t}$$

5.1. Do collective agreement wages reflect the economic opportunities of young adults?

We present three pieces of evidence suggesting that the wages bargained in collective agreements do reflect the opportunity cost of studying. Firstly, we document that the wages settled for unskilled workers actually bind, as there is substantial concentration of actual wages around the levels bargained in collective agreements (at least for construction). Secondly, we document that variation over time of bargained wages basically reflects the outside opportunities of prime age workers. Finally, we show that changes in bargained and actual wages are linked.

Accumulation of wages at the level settled by collective agreements: First, we provide some graphical evidence to build intuition. Graph A.1. show the histogram of the wages

in a large Spanish province: Barcelona. Those wages are obtained from Social Security records, and correspond to male adults with at least one year of experience, between 18 and 35 years of age and belong to the "laborers" group in all industries –the "laborers" are the group with lowest skill. The histogram also displays two lines: the wage in the collective agreement for retail and for construction. Graph A.1. displays substantial accumulation of monthly earnings around the bargained wage in construction. Graph A.2. shows the same histogram for 2000 –same province, age and contribution group. Once again, we find substantial accumulation at the collectively bargained wage in construction for that year. Hence, both from a legal and an economic point of view, the wage level settled in the construction collective agreement acts as an industry-province specific minimum wage.

Some determinants of wage growth in collective agreements

The identification strategy in our study relies in the time-series variation in industry-specific minimum wages within provinces. A key assumption is that province-specific changes in bargained wages are uncorrelated with province-specific shifts in the supply of unskilled young adults. Otherwise, if wages reflected the increasing weight of additional unskilled workers in the local labor market, the estimates would fail to identify the schooling response to wages.

We study how bargained wages respond to age-specific measures of the local unemployment rate. Models of wage bargaining typically assume that final wages depend on the outside opportunities of firms and workers, and stress the role of unemployment as an (inverse) measure of outside opportunities. To understand whose outside opportunities are taking into account in wage bargaining, we regress wage growth on (one-year lagged) unemployment rates of the unskilled workers in four age groups: 16-25, 26-35, 36-45 and 46-55. The regression also includes province-level and year dummies. The first control for provincial long-run specialization, and the latter for macro factors that affect wage growth (such as the inflation rate). We lag the unemployment rate to mitigate simultaneity biases.

Table A.3 presents the results for 4 different agreements: construction, retail, metal and a composite of the rest of the agreements. All regressions are weighted by the number of workers in the province. The result is column 1 row 1 is -239. That is, a 10% increase of the provincial unemployment rate of workers between 16 and 25 years of age reduces wage growth in construction by .239 percentage points (standard error: .18). The estimate in row 4 column 1, measuring wage responses to unemployment among the 46-55 year old is -755. That is, increases in unemployment rate among individuals between 46 and 55 years have three times the impact on wage growth than that of 16-25 years of age. The estimates vary a bit across industries but generally suggest a much larger responses to the unemployment rate of workers over 35 than to the unemployment rate of unskilled young workers. Those results suggest that bargained wage growth reacts to the economic condition of prime-age workers.

Bargained and actual wages The third piece of evidence shows the link between wages in collective agreements and the measures of wages used in the previous section –the median of actual wages perceived by unskilled workers relative to the median of actual wages perceived by mid- and high-skilled workers.

Table 4, row 1 shows weighted-least squares estimates of the impact of the ratio of the wages of laborers on mid-skill groups on the wage bargained for laborers in the province for the five industries considered: construction, metal, services, retail and rest. Each province-year unit provides one observation, and the coefficients are estimated using Weighted Least Squares, where the weights are the number of workers in the province in the Social Security database (as that was the database used to compute median wages). One thousand euros extra in the collective agreement wage in construction increases the ratio of unskilled to mid-skill wages by 1.9 percent (standard error: .6). We also obtain a significant coefficient for the retail industry (albeit much smaller in magnitude) and for the rest of industries. Overall, the measure obtained by taking the ratio of measures (3) and (4) is a significant determinant of the ratio of low-to mid- skill wages.

We obtain a worse fit for skilled wages. Such result is well known in the literature: collectively bargained wages matter more in the lower and in the higher part of the distribution of wages.

5.2. The response of schooling attendance to collectively bargained wages.

5.2.1 The Response of Males.

Table 5A shows the estimated response of schooling attainment to within-province changes in skill wage premia. The specification is identical to that in Table 3, but instead of using actual wages, we now use the structure of wages fixed in collective agreements. Now, there are some caveats. First, we could only construct reliable measures of the wage structure in collective agreements for the period between 1993 and 2001. For the remaining period, the Ministry of Labor provided the average year-on-year wage growth fixed in the agreement but not the exact wage structure by skill level. Secondly, we were unable to construct the wage measure for all provinces, so out of the 50 provinces, we only use 35.

Table 5A shows the impact of the ratios of average bargained wages in low-skill jobs relative to mid- and high-skill jobs at age 17 on human capital acquisition. As before, we differentiate between two types of returns. The first are the (inverse of the) returns aimed at measuring the incentive to acquire at least some schooling: the ratio between the median wage of unskilled workers and workers with some level of skill– administrative workers. The second is the (inverse of the) returns to college: the ratio between mid-skill wages and the bargained wages of jobs that require college.

The coefficient of the first row of Table 5, Panel A, column 1 is .055 (standard error: .015). That is, a cohort exposed at age of 17 to a ratio of unskilled-to mid skill wages 10% higher than the provincial average is 5.5 percentage points more likely to attain only basic schooling and 6.5 percentage points less likely to finish high school than a cohort who faced at age 17 the average ratios in the province. The result is qualitatively similar, but larger than that in Table 3, suggesting a possible attenuation bias due to simultaneity. Another difference with respect to the results in Table 3 is that cohorts affected by an increase in the ratio of unskilled to med-skill wages were less likely to have completed high school, rather than vocational training. López-Mayán (2010) successfully estimates a structural model of grade progression for the 1985 cohort, finding that students of vocational training are most sensitive to relative changes in the

return to vocational training, measured in a way that is similar to our first measure. While our estimates in Table 3 resemble those of López-Mayán, once we use what we think is a measure of relative wages that is less sensitive to relative changes in the supply of unskilled workers, the high wage sensitivity of vocational training students disappears.

The impact on schooling attainment of our measure of the returns to college is shown in the second row of Table 5A. A cohort who was exposed at 17 to a ratio of mid-skill wages to college wages 10% higher than the provincial average is 3.6 percentage points less likely to complete high school (standard error: 1.5 pp) and 3.8 percentage points more likely to finish vocational training. The result suggests again that young adults engage in upper secondary schooling as a route to complete college. Reassuringly, holding constant the ratio of unskilled wages to mid- skill ones, a drop in college returns does not affect the chances of completing primary schooling. That pattern of results also departs from what we found in Table 3, where the fraction of youth with basic schooling increased when the return to college dropped while that with vocational training was affected little.

Panels B and C in Table 5 examine the robustness of the results in Panel A when we limit the sample to coresidents (and are thus able to control for parental background characteristics) or add province-specific trends. The main result that an increase in the relative wage of unskilled workers leads to affected cohorts to complete at most the compulsory schooling level is robust to changes in the specification. The most noticeable change is that, when we add provincial trends, we no longer find statistically significant impact of the returns to college on the share of young adults completing either upper secondary or vocational training. A possible reason for that is that, unlike the return to acquiring some education, returns to college fell uniformly during the sample period –see Figure 2. It may be hard to empirically distinguish between a provincial trend and a decreasing return to college.

5.2.2 Adjusting for unemployment

The returns to education are not only observed in higher wages, but also in a lower probability of losing the job –see De la Fuente and Jimeno (2009). There is a strong relationship between the educational level and the probability of being unemployed. Hence, we adjust the measure of wages (3) as follows

$$E(W^u_{p,t}) = \sum_{i=1}^{i=5} \frac{N^{unskilled}_{p,ic,1995}}{N_{p,1995}} W^u_{p,ci,t}(1-U^u_{p,t}) \quad \text{(3a)}$$

That is, we weight the average wage of unskilled workers in collective agreements by the province-specific probability of being unemployed among workers with basic education level and and ages between 26 and 35 when the cohort was 17.[12] The measure assumes that income is zero when a young adult that does not work –ie, we ignore unemployment benefits. We adjust the returns of mid-skill (high-skill) workers by

[12] We use ages 26 and 35 to compute unemployment rates to mitigate simultaneity between schooling attainment (that is inversely correlated with labor supply) and unemployment. We experimented using the unemployment rate between 16 and 25 year old, and the results were much weaker.

multiplying by 1 minus the probability of being unemployed by workers with vocational training or only with upper secondary school (college). The probability of being unemployed is computed only among active workers, and ignores nonparticipation.

The results of the new measure are shown in Table 5B. In that specification, we also control for the ratio of unemployment rate between the unskilled and the mid-skilled workers as well as for the ratio of unemployment between the mid-skilled and the high skilled. The results are similar to those in Table 5A and we do not comment them in detail.

5.2.3 The Response of the schooling attainment of females

The educational attainment of females also stagnated among Spanish nationals, but to a lesser extent than for males. The share of female Spanish citizens that by the age of 25 had achieved compulsory schooling or less dropped from 50% (1967 cohort) to 26% (1979 cohort) to subsequently increase to 30% among the 1984 cohort. Aparicio (2010) documents that unskilled Spanish females do not work in the construction sector and thus the construction boom between 1995 and 2007 had little impact on their schooling decisions. Yet, wage growth in the sectors where unskilled females typically work (retail and restaurants+hotels) was also higher than that in skill-intensive industries. Hence, it can be argued that females' incentive to acquire higher education also fell during the sample period.

Table 6 redoes the whole exercise for females. Panel A of Table 6 suggests that the increase in unskilled wages, relative to mid-skill ones has little explanatory power for schooling attainment at the age of 25 whatever the sample considered.

Unlike in the case for males, there is some evidence of a response of schooling attainment to increases in the relative wage of wages in high-skilled jobs. When we control for parental background, a 10% increase in the ratio of the wages in high-skill jobs relative to mid-skill ones decreases the share of females completing vocational training by 0.99 percentage points (Panel B, row 4, column 2) increasing the fraction completing upper secondary or more by .96 pp (Panel B, row 4, column 3). Interestingly, the negative response of vocational training to increases in high-skilled wages is robust to the inclusion of province level trends. Still, some of the estimates are imprecise.

5.2.4 Quantification of the impact for males.

Table 7 provides an alternative quantification of the impact of the responses in the fourth panel of Table 5, conducting the following counterfactual: what would have been the evolution of schooling attainment of the 1984 cohort had it faced at age 17 the wage structure of the 1978 cohort? The results suggest that the changes in the wage structure –relative increases of the wages of unskilled workers relative to mid-skill ones- have risen the fraction of youth with basic schooling by some 1.8 percentage points at the cost of .4% reduction of males with vocational training and 1.5 percentage points reduction of males with at least upper secondary school.

5.3. The response of school enrolment to changes in wage structure.

We provide evidence on the dynamics of the response of human capital investment to changes in the structure of wages at ages 16-18. The aim of the exercise is to check whether a higher ratio of the wage of unskilled workers relative to wages in mid-skill jobs leads the youth to leave the school (in the spirit of the exercises by Black et al). As in the previous Tables we use measures that rely on wages signed in collective agreements.

The OLS coefficient in row 1, column 1 in Table 8 indicates that a cohort that observes a 10% increase in the ratio of the wages of laborers and the wages of mid-skill workers is .7 percentage points more likely to abandon the schooling system between the ages of 16 and 18 than a cohort that observes the mean ratio of unskilled to mid-skill workers. The standard error, corrected for arbitrary correlation across observations in the same province is .39. The response of enrolment to a 10% increase in the wage of unskilled workers is slightly lower when we examine at the sample of coresidents: .6 percentage points. Probit estimates are qualitatively similar but smaller and less precise –and not statistically significantly different from zero at the 5 percent confidence level.

Overall, the estimates of enrolment are broadly in line with the evidence from the educational attainment specifications, and suggest that one of the channels by which young adults end up achieving a lower level of attainment is through leaving school at early ages.

7. Implications and conclusion (incomplete)

Between 1986 and 2009 Spain experienced a drop and a subsequent increase in the wage of unskilled young workers relative to mid-skill ones. That ratio diminished during the 1992 crisis - that expelled some 8% of the workforce from the labor market- but increased steadily during the subsequent expansion, that involved a large increase of the construction sector. At the same time, the schooling attainment of Spanish cohorts experienced improvement until that born in 1976 and deteriorated afterwards. We combine administrative records on earnings, information on industry-province collective agreements and information on educational attainment in an employment survey to estimate the response of schooling attainment to changes in the return to skill that adults may observe at the age of 17. Unlike previous work, we examine the response of final schooling attainment to changes in the return to skill. Hence, our estimates can inform about how perceived returns may affect the final set of skills acquired in the formal education system (academic skills in upper vocational branch and professional skills acquired in the vocational branch). We use the wage structure in collective agreements to obtain variation in wages that unskilled workers effectively get and that are not affected by the contemporaneous changes in the supply of labor.

Our preferred estimates suggest that changes in the wage structure have effects on the composition of skills that males acquire in the formal education system. In particular, the 4 percentage points increase in the unskilled to mid-skill wages ratio observed between the years 1993 and 2001 led to a 1.5 points increase in the fraction of youth who completed primary education (or less), mainly at the expense of the proportion of youth completing upper high school. The finding is robust to adjustments for differential incidence of unemployment across education groups and suggests that the investment in academic skills is more elastic to unskilled wages that investments in skills directly related to professional activities. Our findings to date suggest weaker

evidence for educational responses to perceived wage increases in high-skill jobs. As for females, we find a weak response of the probability of investing in academic skills in response to relative increase in high skill wages, but no response whatsoever to increases in wages in low-skilled jobs.

These estimates have implications on the future productivity of those cohorts – wages of workers in their twenties with basic schooling were 6 and 9 percent lower than those with vocational training and 3 percent lower than those with upper secondary schooling only according to the 2006 Spanish Survey on the Structure of Wages. A quantification of the amount of this loss is left for future research.

Appendix 1: Correspondence between schooling levels, both systems

This appendix describes our assumptions to make a correspondence between systems. To provide some intuition, Table A.1 shows the educational system before and after 1990.

Basic schooling: Equivalent to 8th grade of primary schooling (or less) under the old system and second cycle (or less) under the new one.

Upper secondary schooling: Equivalent to finishing pre-University (and high school) under the old system, and the second cycle of upper secondary schooling under the new one.

Vocational training: Completing any of the grades under both systems. Ideally, we would like to distinguish between grades within each systems and, even better, across systems. Unfortunately, the coding in the Spanish Employment Survey does not allow a clear correspondence between the old and the new system. We lumped together all vocational training together, and note that students finishing the degree under the new system may be better qualified than those under the old system if the first grade of Vocational Training was prevalent under the old system.

College: Any college under any of both systems.

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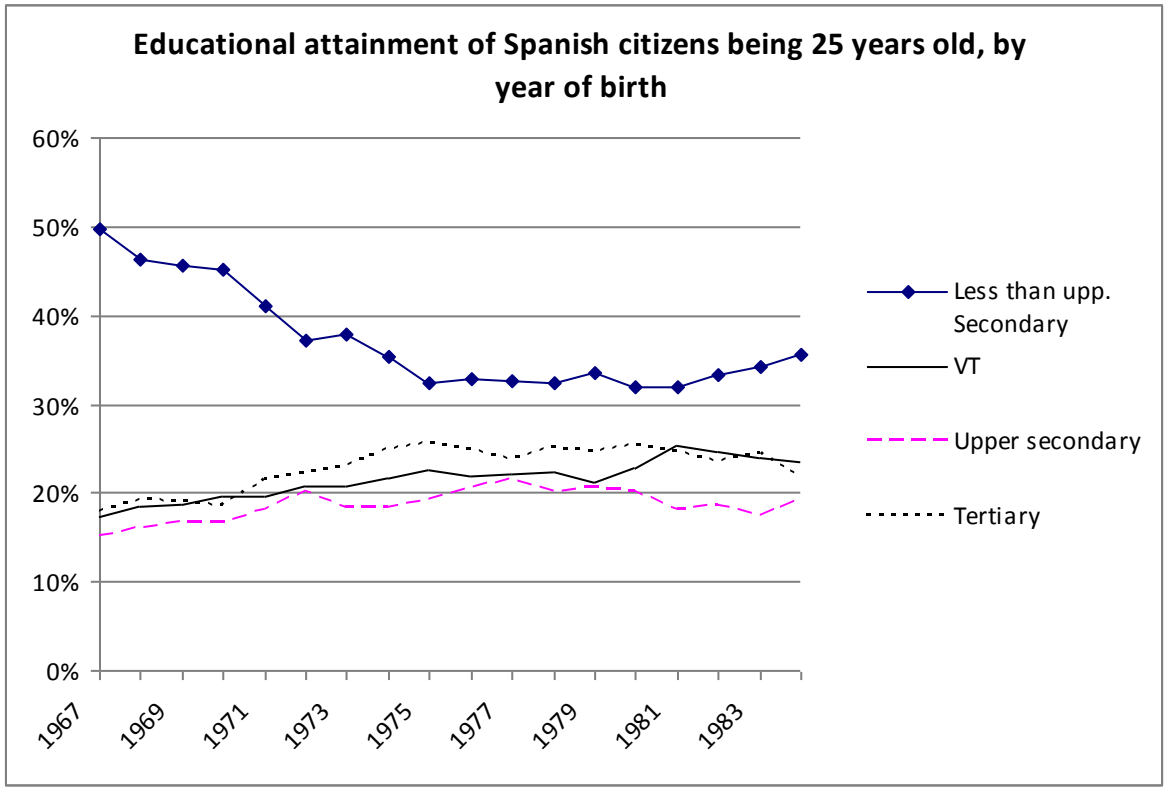
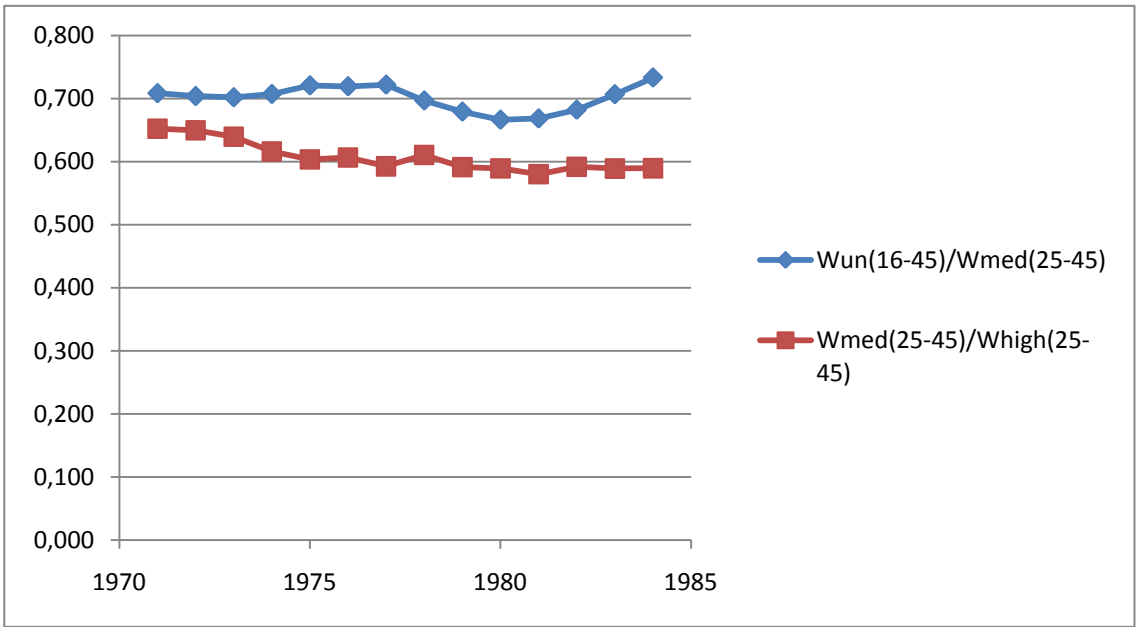
Figure 1: Educational attainment at age 25, by year of birth



Source: Spanish Employment Survey (EPA): 1992-2009. Sample of native males age 25

Figure 2: Returns to medium and high skill, perceived at age 17



Source: Social Security Records (retrospective info of 2004-2008), median wages of top 2 contribution groups for high skill (by province, ages 25-45). For medium group, median wages of groups 3-7 (by province, ages 25-45). For unskilled, median of groups 8-10. (by province)

Figure 3: 2nd digit industry of workers with two lowest levels of schooling

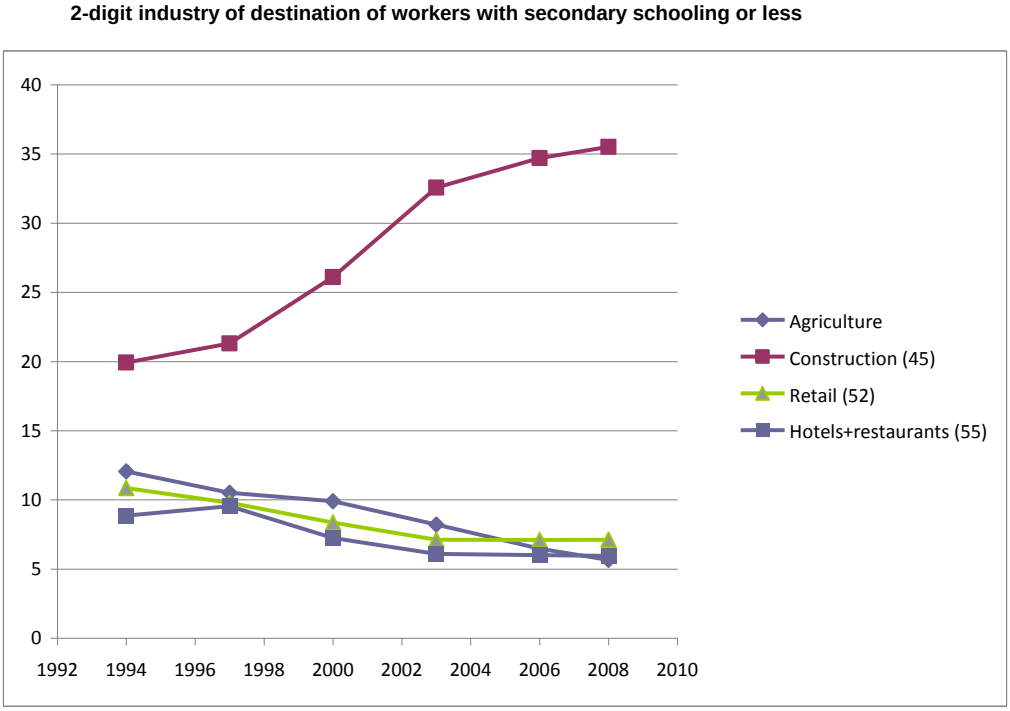


Figure 4: Industry of destination of skilled youth workers

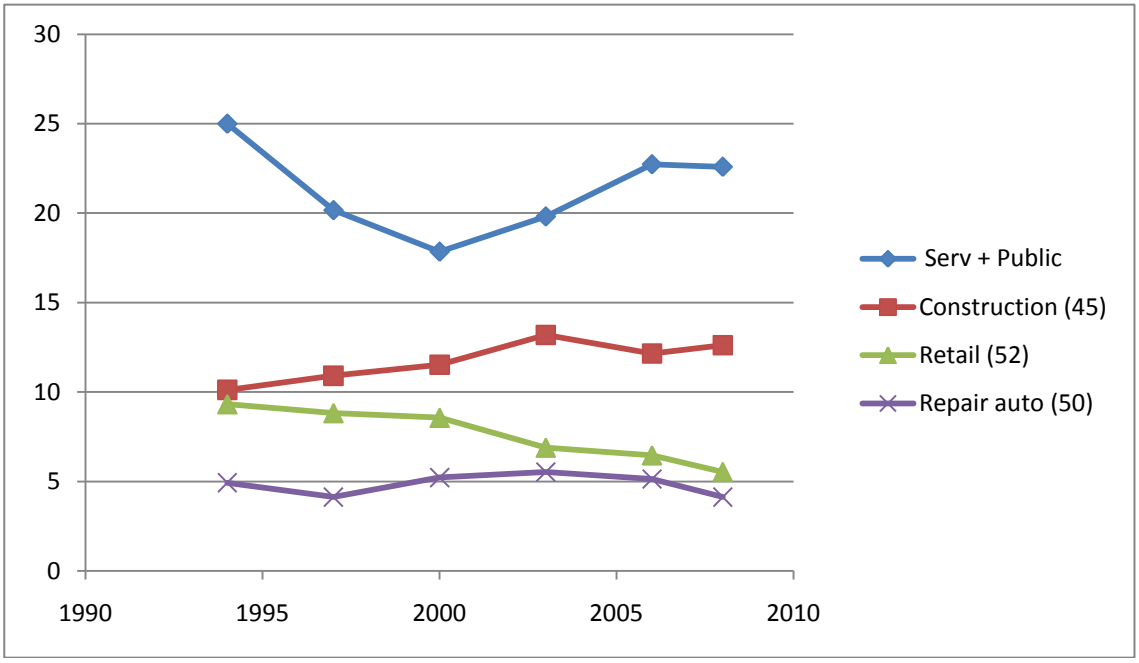
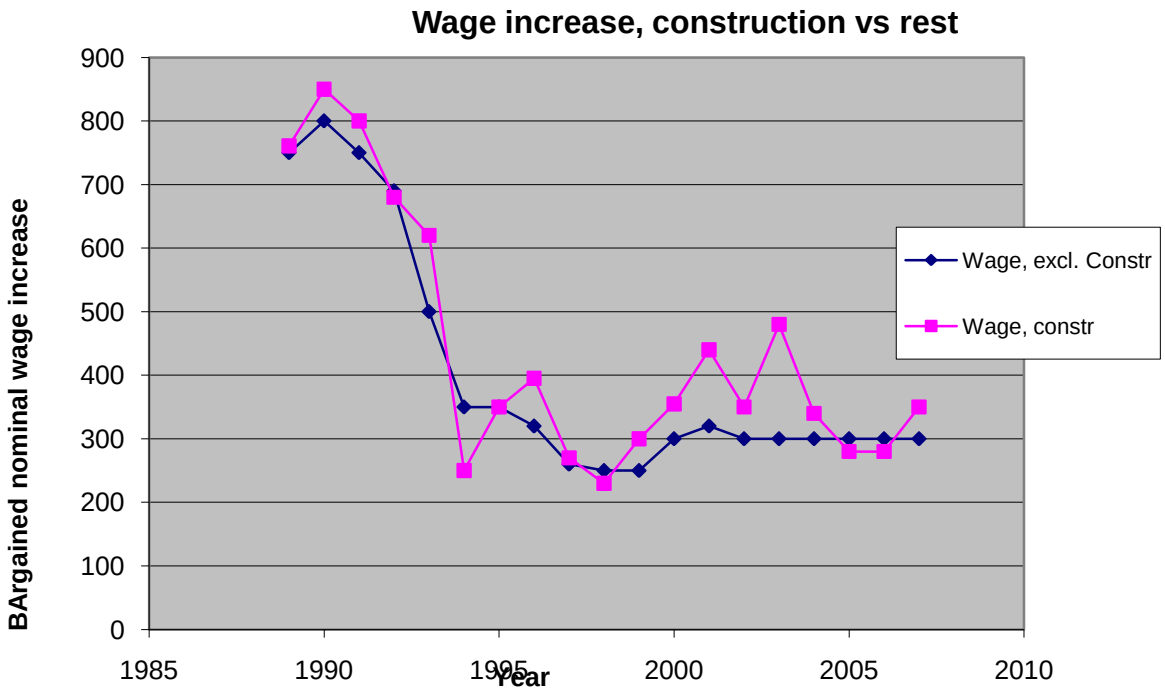
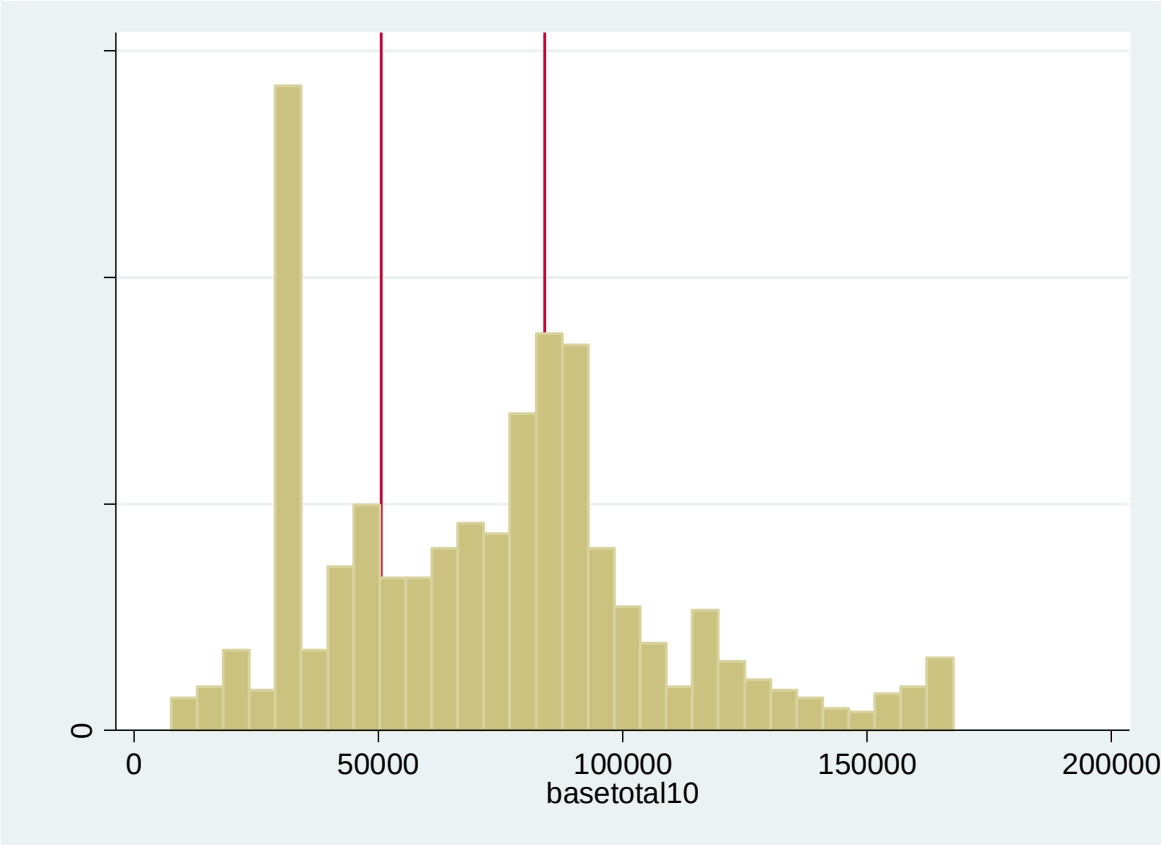


Figure 5: Wages in construction versus wages in other industries



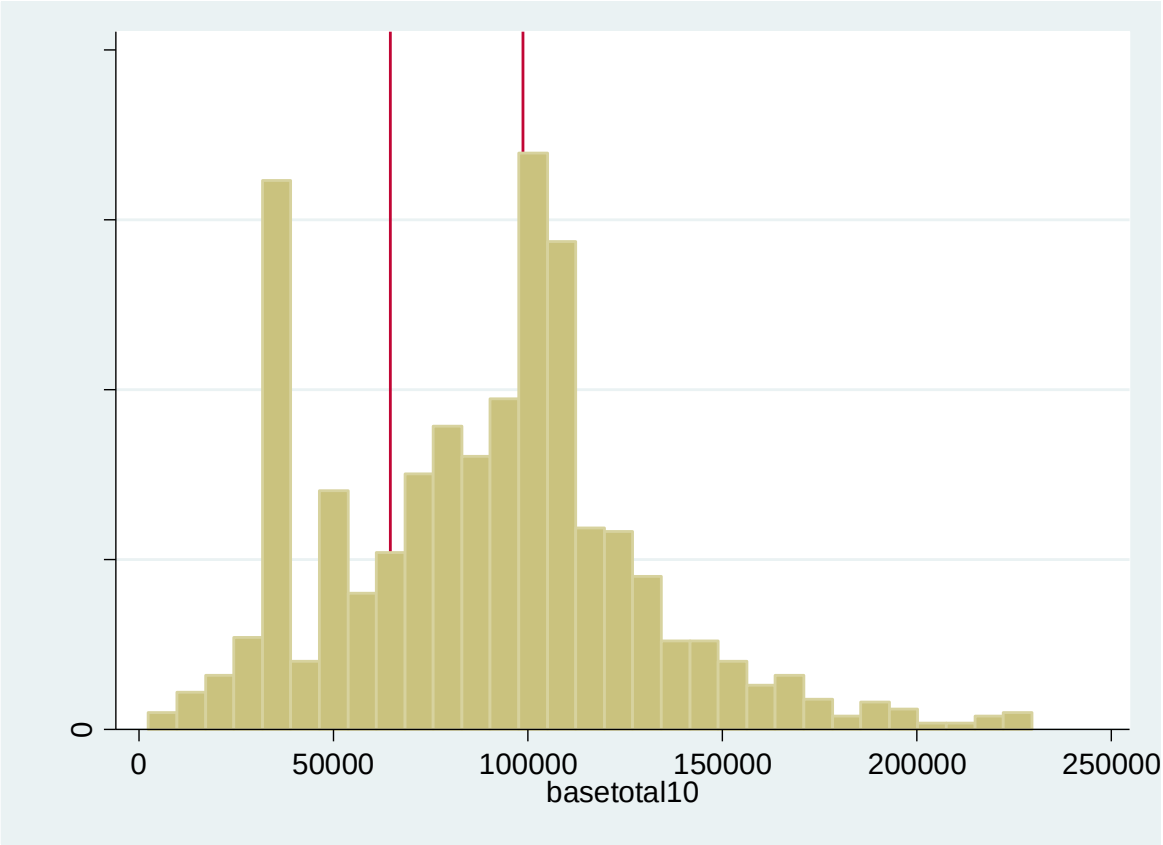
Source: Database on Collective Agreements of the Spanish Ministry of Labor 1990-2009. Sample of collective agreements at the province-industry level. Wage increase computed by the Ministry after adjusting by realized inflation.

Figure A.1: Collective agreement and actual wages



Distribution of male monthly earnings in Barcelona in 1995 (in cents of euros) Ages 18-35, laborers. First line: bargained wages in *the retail* sector. Second: bargained wages in *construction* sector.

Figure A.2: Collective agreement and actual wages



Distribution of male monthly earnings in Barcelona in 2000 (cents of euros) Ages 18-35, laborers. First line: bargained wages in the retail sector
Second: bargained wages in construction

Source: Spanish Employment Survey. Sample of native young men, ages 16-21. Wage information from Social Security Records, unemployment rate computed from EPA. Other covariates (not shown): age effects. In column 2, mother's education level and family size (5 dummies).

Table 1: Evolution of schooling attainment of male natives at age 25

Year of birth	Basic	Vocational training	Upper secondary	College
1971	47.6	20.82	15.17	16.41
1972	45.52	20.54	15.25	18.7
1973	45.46	20.7	15.63	18.22
1974	42.53	21.9	15.09	20.48
1975	38.63	21.74	18,00	21.63
1976	38.28	23.31	16.51	21.89
1977	36.25	23.42	19.3	21.03
1978	37.23	20.85	17.91	24.01
1979	38.66	21.29	17.53	22.52
1980	37.83	24,00	18.02	20.16
1981	37.78	25.4	16.91	19.91
1982	38.35	24.74	17.78	19.12
1983	37.63	25.57	15.45	21.34
1984	40.02	25.00	15.13	19.85

Source: EPA, 1992-2009 waves (excluding third quarter). Sample of males age 25 each year. Basic schooling includes individuals who dropped before finishing compulsory education. For definitions of upper secondary and vocational training, see Table A.1.

Table 2: The evolution of the ratio of skilled-to unskilled wages observed at age 17

Calendar year	Cohort turning 17	Wun(16-45)/Wmed(25-45)	Wmed(16-45)/Wsk(25-45)
1986	1969	0.766	0.645
1987	1970	0.763	0.642
1988	1971	0.758	0.632
1989	1972	0.746	0.605
1990	1973	0.749	0.591
1991	1974	0.746	0.590
1992	1975	0.752	0.579
1993	1976	0.725	0.590
1994	1977	0.710	0.577
1995	1978	0.697	0.569
1996	1979	0.693	0.562
1997	1980	0.702	0.567
1998	1981	0.712	0.563
1999	1982	0.726	0.560
2000	1983	0.739	0.562
2001	1984	0.743	0.563
2002	1985	0.742	0.564
2003	1986	0.740	0.567
2004	1987	0.738	0.561
2005	1988	0.741	0.563
2006	1989	0.756	0.569
2007	1990	0.769	0.565

Source: Longitudinal Social Security Records

Wun(16-45)/Wmed(25-45): Ratio of the wages of unskilled workers (average 16-45) to mid-skill levels

Wmed(16-45)/Wsk(25-45): Ratio of wages of mid skill workers to high skill workers

Table 3: The response of schooling attainment at age 25 to return to skill at age 17 –males

	Basic schooling	Vocational training	Upper secondary or higher
Panel A: Full sample (covariates: province and year dummies)			
Wage unsk./Wage medskill at 17	.012	-.0166	.0057
	(.011)	(.0087)*	(.014)
Wage med sk./Wage high skill at 17	.0036	.007	-.011
	(.0058)	(.007)	(.008)
Uunskilled/Uskilled at 17	.002	-.0007	-.0015
	(.0016)	(.001)	(.0022)
Number of observations		46135	
Panel B: Coresidents (covariates: former plus family size and parental backgound)			
Wage unsk./Wage medskill at 17	.018	-.023	.006
	(.011)*	(.010)**	(.014)
Wage med sk./Wage high skill at 17	.009	.008	-.017
	(.006)	(.008)	(.08)**
Unemployment rate (unskilled/skilled)	.0016	.0002	-.0018
	(.0019)	(.0014)	(.0023)
Number of observations:		38982	
Panel C: Coresidents (covariates: former plus province-level trends)			
Wage unsk./Wage medskill at age 17	.017	-.029	.013
	(.013)	(.012)**	(.017)
Wage med sk./Wage high skill at age 17	.013	.003	-.017
	(.008)	(.008)	(.09)*
Unemployment rate (unskilled/skilled)	.0015	0	-.0015
	(.002)	(.0013)	(.0025)

Source: own computations using the Spanish Employment Survey (EPA, 1995-2009) merged with wages in the Registry of Social Security records (years 1987-2001). Estimation method: Multinomial Logit. The coefficients shown are marginal effects of an increase in 10 percentage points in the ratio of wages detailed in each row on the probability of achieving the educational outcome shown in the relevant column. Marginal effects evaluated for a young adult interviewed in Madrid, born in 1974 and, in Panels B and C, living with both parents and whose mother has completed high school. All specifications include province and year dummies. Standard errors clustered at the province level

Table 4: Actual wages and wages in collective agreements

Dependent variable:	Ratio of unskilled to mid-skill wages			Ratio of mid- to high skill wages	
	(1)	(2)	(3)	(4)	(5)
1. Wage laborers /Wage mid-skill (service+construction+retail+metal+rest)	--	.137 (.061)	.132 (.07)	--	-.109 (.031)
2. Wage mid-skill /Wage top skill	--	--	-.0467 (.064)	.073 (.044)	.029 (.049)
3. Laborers in construction	.0187 (.0057)				
4. Laborers in services to industries	-.0016 (.0030)				
5. Laborers in retail	.0030 (.003)				
6. Laborers in metal	-.0041 (.0055)				
7. Laborers, rest of industries	.0122 (.0069)				
Constant	.559 (.089)	.519 (.048)	.559 (.058)	.535 (.027)	.639 (.054)
Number of observations:	365	365	274	275	275

Each unit observation is a province-year unit. The dependent variable is the ratio of unskilled wages (laborers, according to the Social Security classification) and mid-skill levels (groups 3-8, in that same category). Covariates are bargained wages for the skill and industry level shown in each covariate. All specifications include year and province dummies. Standard errors clustered at the province level.

Table 5A: The response of the schooling attainment of males to the return to skill at age 17 -measured using collective agreements

	Primary education	Vocational training	Upper secondary or higher
Panel A: Full sample (province and year dummies)	(1)	(2)	(3)
1. Wage laborers /Wage mid-skill at age 17	.055	.010	-.065
(service+construction+retail+metal+rest)	(.015)**	(.020)	(.0247)**
2. Wage mid-skill /Wage top skill at age 17	.001	.036	-.0375
(service+construction+retail+metal+rest)	(.010)	(.0151)**	(.0153)**
Number of observations:		25419	
Panel B:Coresidents (covariates: former plus education of mother)			
3. Wage laborers /Wage mid-skill at age 17	.017	.0166	-.0338
	(.0069)**	(.029)	(.0169)**
4. Wage mid-skill /Wage top skill at age 17	.003	.0268	-.0303
	(.005)	(.009)**	(.010)**
Number of observations:		21014	
Panel C: Coresidents (covariates:former plus provincial trends)			
5. Wage laborers /Wage mid-skill at age 17	.040	.020	-.060
	(.018)**	(.022)	(.030)**
6. Wage mid-skill /Wage top skill at age 17	.0035	.015	-.017
	(.015)	(.023)	(.027)

Source: own computations using the Spanish Employment Survey (EPA, 2001-2009) merged with wages in the Registry of collective agreements (1993-2001)
Estimation method: Multinomial Logit. The coefficients shown are marginal effects of an increase in 10 percentage points in the ratio of bargained wages in each row on the probability of achieving the educational outcome shown in the relevant column.
The responses are evaluated for a young adult interviewed in Madrid, born in 1974 and, in Panels B and C living with both parents and whose mother has high school. All specifications include province and year dummies, as well as the ratio of the unemployment rate of unskilled to skilled workers in the province.
Standard errors clustered at the province level.

Table 5B: The response of the schooling attainment at age 25 to the unemployment-adjusted return to skill at age 17 (males)

	Primary education	Vocational training	Upper secondary or higher
Panel A: Full sample (province and year dummies)	(1)	(2)	(3)
1. Wage laborers*(1-Uunsk) /Wage mid-skill *(1-Umidsk)	.0244	.0227	-.0472
at age 17	(.008)**	(.0136)	(.0175)**
2. Wage mid-skill*(1-Umidsk) /Wage top skill*(1-Utopsk)	.0078	.0206	-.0285
at age 17	(.0049)	(.008)**	(.011)**
Number of observations:		20112	
Panel B:Coresidents (covariates: former plus education of mother)			
3. Wage laborers*(1-Uunsk) /Wage mid-skill *(1-Umidsk)	.0234	.019	-.0426
at age 17	(.008)**	(.012)	(.0177)**
4. Wage mid-skill*(1-Umidsk) /Wage top skill*(1-Utopsk)	.006	.016	-.023
at age 17	(.007)	(.007)**	(.011)**
Number of observations:		16955	
Panel C: Coresidents (covariates:former plus provincial trends)			
5. Wage laborers*(1-Uunsk) /Wage mid-skill *(1-Umidsk)	.0244	.0180	-.043
at age 17	(.010)**	(.010)	(.0171)**
6. Wage mid-skill*(1-Umidsk) /Wage top skill*(1-Utopsk)	.0042	.006	-.010
at age 17	(.0067)	(.0067)	(.0099)

Source: own computations using the Spanish Employment Survey (EPA, waves 2001-2009) merged with wages in the Registry of collective agreements (1993-2001)

Estimation method: Multinomial Logit. The coefficients shown are marginal effects of an increase in 10 percentage points in the ratio of bargained wages detailed in each row on the probability of achieving the educational outcome shown in the relevant column. Marginal effects evaluated for a young adult interviewed in Madrid, born in 1974 and, in Panels B and C, living with both parents and whose mother has high school degree. All specifications include the provincial ratio of the unemployment rate of youth with basic school relative to mid skill (voc. training and upper secondary) as well as the ratio of unemployment among mid-skill and college youth. They also include year and time dummies. Standard errors clustered at the province level.

Table 6: The response of schooling attainment of females to the return to skill at age 17 -measured using collective agreements

	Primary education	Vocational training	Upper secondary or higher
Panel A: Full sample (province and year dummies)	(1)	(2)	(3)
1. Wage laborers /Wage mid-skill at age 17	-.0236	.006	.0174
(service+construction+retail+metal+rest)	(.0161)	(.013)	(.0226)
2. Wage mid-skill /Wage top skill at age 17	.0042	.005	-.009
(service+construction+retail+metal+rest)	(.018)	(.007)	(.021)
Number of observations:		23532	
Panel B:Coresidents (covariates: former plus education of mother)			
3. Wage laborers /Wage mid-skill at age 17	-.003	.0057	-.0023
(service+construction+retail+metal+rest)	(.0043)	(.0092)	(.0115)
4. Wage mid-skill /Wage top skill at age 17	.00036	.0099	-.0096
(service+construction+retail+metal+rest)	(.0045)	(.0048)**	(.0081)
Panel C:Coresidents (covariates: former plus province trends)			
3. Wage laborers /Wage mid-skill at age 17	-.003	.0057	-.0023
(service+construction+retail+metal+rest)	(.0043)	(.0092)	(.0115)
4. Wage mid-skill /Wage top skill at age 17	-.0005	.0073	-.0068
(service+construction+retail+metal+rest)	(.0045)	(.0045)*	(.0057)
Number of observations:		17647	

See notes to Table 5B

Table 7: The magnitude of the impacts: attainment of cohorts 1978 on with 1978 (males)

	Schooling attainment of cohort			Schooling of cohort 1984 with returns of		
	1978	1984	Difference:	1978	1984	Difference:
	(1)	(2)	(3) = (2) - (1)	(4)	(5)	(6) = (5) - (4)
Panel A: Full sample						
1. Primary school	33.2	36.0	2.8	34.2	36.0	1.8
2. Vocational training	22.1	23.0	.9	23.4	23.0	-.4
3. Upper secondary (or higher)	44.6	40.9	-3.7	42.4	40.9	-1.5
Panel B: Sample of coresidents						
1. Primary school	29.8	33.2	3.4	31.2	33.2	2.0
2. Vocational training	22.6	23.8	1.2	24.1	23.8	-.3
3. Upper secondary (or higher)	47.5	43.0	-4.5	44.8	43.0	-1.8

Source: combined sample of the Spanish Employment Survey (years 2001-2009) and the Registry of collective agreements.
Each entry in Panel A (B) contains the percentage of males attaining that schooling level by age 25 in the sample used in Table 5A Panel A (B)

Table 8: The response of enrolment (ages 16-18) to changes in the perceived wage structure.

Dependent variable:	1 if enrolled in school, ages 16 - 18; 0 otherwise			
	Full sample	Coresident	Full sample	Coresident
Estimation method:	OLS		Probit	
	(1)	(2)	(3)	(4)
1. Wage laborers /Wage mid-skill	-.0075	-.0059	-.0052	-.0021
(service+construction+retail+metal+rest)	(.0039)*	(.0036)*	(.0036)	(.0036)
2. Unemployment in the province	-.019	.018	-.022	.0069
	(.034)	(.029)	(.038)	(.0298)
3. Mother completed basic school		-.22		-.232
		(.01)		(.011)
4. Mother completed high school		-.07		-.086
		(.008)		(.012)
5. Mother completed college		.087		.166
		(.008)		(.017)
6. Only father present in household		-.006		-.024
		(.022)		(.019)
7. Only mother present in household		-.088		-.110
		(.019)		(.018)
8. Constant	.873	.964		
	(.038)	(.047)		
Province dummies?	yes	yes	yes	yes
Year dummies?	yes	yes	yes	yes
Number of observations	88352	84306	88352	84306

Source: Spanish Employment Survey (EPA): waves 1993-2001 merged with wage information from the Registry of Collective Agreements -sample of provincial agreements.
Sample of young males, ages 16-18. Coefficients in columns 3 and 4 are marginal effects of an increase in the ratio of unskilled wages to med-skill of 10% for a young adult living in Madrid and born in 1976 and, in columns 2 and 4 living with both parents in a household with four members where the mother has a high school degree.

Table A.1: The correspondance between schooling systems, before and after 1999 law

	14/1970 Act, changed in 1990 Pre-1990 system			14/1990 Act (first cohort fully affected: 1983) Post-1999 system		
Ages	Degree	Academic track	Vocational track	Degree	Academic track	Vocational trac
23	College	3rd cycle		College	3rd cycle	
22						
21		2nd cycle			2nd cycle	
20						
19		1rst cycle	3rd grade		1rst cycle	2nd grade
18						
17	Pre-University	1		Upper secondary	2	
16	Secondary education	3	2nd grade		1	1st grade
15		2	1st grade	Compulsory sec. School	2nd cycle	
14		1				
13	Primary education	8			1st cycle	
12		7		Primary education	3rd cycle	
11		6				
10		5				
9		4			2nd cycle	
8		3				
7		2			1st cycle	
6		1				

Table A.2. Correspondence skill groups-schooling group

	Skill groups Social Security definition	Our notation	Schooling
1	College graduates	High-skill	College
2	2-year college degree		
3	Managers	Mid-skill	Vocational training/upper secondary
4	Clerical workers, no college degree		
5	Clerical workers, rest		
6	Supporting clerical staff 1		
7	Supporting clerical staff 2		
8	Craftsmen, 1		
9	Craftsmen, 2		
10	Laborers	Unskilled	Basic schooling

Table A.3. The determinants of wage growth in collective agreements: lagged unemployment rate

	Dependent variable: yearly wage growth in the agreement (percentage points*100)			
	Construction	Retail	Metal	Rest of industries
	(1)	(2)	(3)	(4)
Covariates: One-year lagged unemployment rate:				
1. Urate 16-25 years old	-239.56	-18	9.981	92.00
	(184.17)	(148.70)	(181.079)	(150.16)
2. Urate 26-35 years old	-10.22	112	-130.88	-9.722
	(298.77)	(238)	(305.715)	(241.36)
3.Urate 36-45 years old	-600.41	-684.09	62.004	-346.67
	(343.5)*	(276.11)**	(336.82)	(276.00)
4. Urate 46-55 years	-755.62	-107.47	-358.558	-404.47
	(312.9)**	(250.37)	(308.055)	(254.13)
Number of observations	323	342	329	350
R-squared	.337	.31	.312	.336

Sample: Merged data set of Spanish Employment Survey and Registry of Collective Agreements

The measure of unemployment rate refers to adults with education at the primary level of less and varies between 0 and 1.

Wage growth is measured in percentage points multiplied by 100, ie, 1000 reflects a 10% wage increase.

The estimation method: weighted least squares, where weights are the number of workers in the province

The unit of observation is the year-province. Sample 1995-1999. Additional regressors are province and year dummies.