Has the Housing Boom Decreased School Enrolments in Spain?

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Abstract

This paper evaluates the impact of the housing boom on post-compulsory education enrolments in Spain. Using data from the Spanish Labour Force Survey, I identify the effect of the housing boom on dropouts through the demand for construction workers across Spanish regions. Findings highlight the probability of dropout increases less for children affected by the housing boom than for those non-affected. However, children's responses depend on their gender and parental education. For instance, schooling attainment of children with highly educated parents does not respond to the housing boom, whereas the response of children with low educated parents varies by gender. The probability of dropout increases significantly less for females affected by the housing boom than for those non-affected if their fathers are low skilled, but non-significant effects are observed for males. These results point out two divergent effects of the demand for construction workers and the increase in their wages on the probability of dropout. On the one hand, it decreases males skill premium leading to a decrease in enrolments. On the other hand, it improves the economic status of low skilled parents and hence, encourages their childrens demand for post-compulsory education.

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1 Introduction

This paper analyses the effects of the housing boom on post-compulsory educational decisions in Spain. The housing boom intensified the demand for construction workers, generally low skilled, and provoked an increase in their wages.[1] According to basic human capital theory (Ben-Porath, 1967), the rise in unskilled wages worsens the skill premium and decreases post-compulsory education enrolments. However, it also improves the economic situation of families with children at the margin of the dropout decision which encourages the demand of schooling.

Dropouts in Spain have been historically high and hence, understanding teenagers' educational decisions is of extreme importance. At the start of the Great Depression in 2008, 32% of the 18 to 24 year olds had left education without acquiring any title of post compulsory studies in Spain while the average for the EU 27 was at 15%.[2]Although the level of schooling in Spain improved during the 80s and early 90s, it stagnated in the late 90s and remained low until the start of the Great Depression. For instance, the dropout rate decreased from 40% in 1992 to a rate of 30% in 1997 and remained fairly stable until 2008.[3]

Simultaneous to the stagnation in educational achievements, Spain experienced a long period of economic growth with a GDP average yearly growth of 3.75% from 1999 to 2007.[4] The main feature of this period is a permanent rise in house prices and the consequent gain in importance of the construction sector. Figure 4 illustrates that the GDP share of the construction sector rose from approximately 7% in 1995 to a peak of 11% in 2007. Furthermore, in 1995 approximately 9% of the labour force worked in the construction sector reaching the 13% in 2007 and the wage gap between average wages and construction workers' wages halved over a 10 year period, from a 19.3% gap in 1995 to a 8.3% gap in 2007.

During the period of the study, 1999 to 2007, regional yearly average growth of the share of employment in the construction sector ranges from 3% in the Basque Country or Extremadura, regions non-affected by the housing boom, to 12% in Murcia, the most affected region.[5] Therefore, using quarterly micro data from the Spanish Labour Force Survey (LFS), I identify the effect of the housing boom on dropouts through the demand for construction workers across Spanish regions. The Spanish LFS provides personal and household information of over 8000 16 to 19 year old individuals per quarter.

The theoretical framework developed in Acemoglu and Pischke (2001) is the basis of my empirical results. Acemoglu and Pischke (2001) develop a two period model of intra-household investments where parents behave as a benevolent dictator and decide the investment in schooling that maximises life-time utility of the household. It predicts that the skill premium is the only determinant of

[1]According to the weighted information obtained from the Spanish Labour Force Survey, an average of 70% of construction workers during the housing boom had not achieved any title of post-compulsory studies

[2]Data extracted from Eurostat.

[3]See Figure 1 and Figure 2 in the appendix for the evolution of dropout rates in Spain and in the EU 12.

[4]Information obtained from the Spanish National Statistics Institute

[5]See Table 5.

schooling decisions whenever the family is not income constrained and that whenever families are at the low tail of the income and ability distribution, an increase in income encourages the demand for schooling.

Main findings highlight the probability of dropout increases less for children affected by the housing boom than for those non-affected. In fact, an increase in the share of labour force in the construction sector, decreases the probability of dropout for children living in affected regions compared to children living in non-affected regions. However, children's responses vary by gender and with parents' level of education. The probability of dropout for females affected by the housing boom significantly decreases if their parents are low skilled, but non-significant effects are observed for males. Furthermore, the dropout decision of children with highly educated parents does not significantly respond to the housing boom.

These results are perfectly in line with Acemoglu and Pischke (2001) and point out two divergent effects of the demand for construction workers and the increase in their wages on the probability of dropout. On the one hand, the housing boom decreases males skill premium but does not influence women's. Given that only 5% of construction workers are females, their skill premium does not vary with wage rises in the construction sector.[6] The decrease in males skill premium, however, leads to a decrease in enrolments. On the other hand, the rise in unskilled wages improves the economic status of low skilled parents and hence, encourages their childrens' demand for post-compulsory education. Consequently, females of low skilled families exposed to the housing boom reduce their dropout whereas for males, the described effects offset each other, and educational attainments do not respond to the housing boom. Furthermore, unskilled wages do not determine neither the skill premium nor parental economic status of children with high skilled parents so that their educational attainments are unaffected.

Lastly, I conduct a multinomial analysis on the decision of dropping out from secondary school, enrolling in high school or enrolling in vocational studies. The high school educational decisions of children with unskilled parents do not significantly respond to the housing boom. However, females with high skilled families react to the housing boom by increasing their vocational studies in detriment of the high school track. Although, further investigations are needed, the increasing demand of female labour force in the "Financial intermediation, real state and renting activities" sector is likely to be behind the increase in female enrolment in vocational studies .

2 Literature Review

Ben-Porath (1967) and Becker and Tomes (1986) are two basic theoretical models of education decision that serve as the basis of much of the literature on determinants of schooling. According to Ben-Porath (1967), an individual invests in education if the future returns from this investment is greater that its costs. The salary of the individual once he starts working after having acquired a

[6] Information obtained from the weighted Spanish LFS data.

certain level of education are the returns to schooling and more educated individuals receive higher wages. The salary forgone while continuing in education, school fees and the effort of studying are the costs of investing in education. Becker and Tomes (1986) propose a model of intra-household decision where it is altruist parents that decide to invest on the education of their children. Costs of education depend on a genetically transmitted ability and, similarly to Ben-Porath (1967), costs of education and future returns determine parental investments. To frame my empirical results, I follow the model of Acemoglu and Pischke (2001), described in the next section, that is an extension of Becker and Tomes (1986).

The empirical literature on the determinants of schooling is extensive. Therefore, I concentrate my attention on previous empirical research dealing with the effect that family and economic background and labour market conditions has on children education.

Haveman and Wolfe (1995) review previous literature on the determinants of children attainment's in the US and conclude that there is a general agreement that children from low income and low educated families have lower educational attainments and that this effect is higher than labour market incentives or opportunities. There is also an extensive literature for the UK dealing with the effect of economic and family background on children attainments leading to symilar conclusions (See for example Micklewright, 1989; Bradley and Lenton, 2007; Leslie and Drinkwater (1999); Ermisch and Francesconi (2001); Chevalier et al. (2005)).

The basic paper studying the determinants of the 16/17 year old educational choices in Spain is Petrongolo and San Segundo (2002) that uses micro-data from the Spanish Labour Force Survey from 1987, 1991 and 1996 and suggest that parental education is the main determinant of school enrolment. Using the same dataset, Albert (2000) analysed the demand for higher education concluding that gender, socio-economic status and education are essential determinants in the decision to enrol in university studies. Peraita and Pastor (2000) uses the 1985 Living and Working Conditions Survey and also finds a negative relationship between income and parental education and primary school dropouts in Spain.

Relative wages and level of unemployment are the two main labour market conditions that have been studies in the literature of the determinants of post-compulsory education decisions. Unemployment rates measure the cyclicality of the economy so that numerous scholars have devoted attention to its effects on schooling decisions finding counter-cyclicality of education. According to the basic models of human capital investment, wages at different skill levels represent the return to education or skill premium and repressent the opportunity cost of studying. Alterations in educational decisions would therefore be expected whenever wages vary.

Card and Lemieux (2001), using aggregated US data, find that local unemployment rate has a positive effect on high school completion rates. Furthermore, they find that changes in the return to college, measured as difference in wages between high school graduates and college graduates, have a significant effect in college entry. Using the Current Population Survey from 1968 to 1988, Dellas and Sakellaris (2003) claim that schooling has a counter cyclical behaviour while Betts and

McFarland (1995) found that unemployment increases the demand for state college.

For the UK, Rice (1999) studies the educational decision of 16/17 year old individuals and finds that labour market conditions measured as short run fluctuations of the unemployment rates mainly affects males with low GCSE scores. In a more recent study Meschi et al. (2011), using data from the Longitudinal Study of Young People in England, estimates a nested logit to analyse post-compulsory schooling decisions and does also find a positive effect of unemployment on males choices but find no effect of local market wages. Rice et al. (2010) analyse the effect of the introduction of the minimum wage in the UK in 1999 and concludes that it affects post-compulsory schooling decisions of areas where the minimum wage is high relative to local earnings although it does not have an overall significant effect.

For Spain, the already mentioned study Petrongolo and San Segundo (2002) find that the demand for education is positively related to youth unemployment while negatively to adult. Albert (2000) finds that the higher the unemployment rates the higher the university enrolments. Given that the Spanish Labour Force Survey does not provide the income of the respondents, there is little evidence on the effect of relative wages on schooling decisions. One of the few recent exceptions, Lacuesta et al. (2012), analyse changes in educational attainments of 25 year old individuals to changes in expected wages for unskilled, mid-skilled and high skilled workers. They conclude that expected relative wage of unskilled workers affects positively the drop out rate mainly for males and that this increase in drop out is at the expenses of high school and not vocational studies. Lopez-Mayan (2010) develops an structural model on schooling decisions and analyse the dropout responses to changes in relative wages. She finds that changes in vocational wages have the highest effects in deceasing the dropout rate.

The nature of Black et al. (2005) and Aparicio (2010) is somewhat similar to my study in that both analyse the effect that an economic shock that increases unskilled wages has on the post-compulsory education decisions. Both papers aim at testing the main prediction of basic human capital theory: the demand for education depends on the returns to schooling. Black et al. (2005) analyse the effect of the coal boom in the US and find that its effect on the increase of unskilled wages decreases high school enrolments. Aparicio (2010) test the effect of the housing boom on the differential response for males and females. She claims that the housing boom is a temporary shock that affects the employment perspectives of low educated males so that it significantly affected their school dropout decision compared to females. In contrast to Aparicio (2010), my analysis aims at disentangling the overall effect of the housing boom on post-compulsory education.

Finally, an interesting work in progress, Felgueroso et al. (2011), claims that the increase in dropout rates for males and decrease for females in Spain is due to the implementation of a new education system, LOGSE. However, I account for the possible effect of LOGSE in my analysis not finding significant effects.

3 Theoretical Framework

This section presents the two period model of investment in schooling developed by Acemoglu and Pischke (2001) to frame my empirical results. It is a two period model of intra-household investments where an individual, parent, behaves as a benevolent dictator and decides the investment in schooling that maximises life-time utility of the household.[7] In the *first period*, the family decision maker, parent, decides whether to consume, c, save, s, or invest in the education of their children, h where h takes value 0 or 1.[8] The decision maker dies at the end of the first period. In the *second period*, children obtain a wage of w_s if they acquired education in the previous period ($h = 1$) so that they are skilled or obtain a wage w_u if they are unskilled ($h = 0$). Family life-time utility is:

$$U_{hh} = lnc + \beta ln\hat{c}$$

where $\hat{c}$ represents children utility and β parental altruism towards children future consumption. The cost of schooling in the first period is e^{θ_i} and θ_i has a distribution $G_q(\theta)$ where q represents the income or ability quartile of the family. The the income of the family is denoted by y. With no credit constraints, parents invest in education in the first period as long as:[9]

$$\theta \leq \bar{\theta} = ln[w_s - w_u] \tag{1}$$

Therefore, the skill premium, $w_s - w_u$, is the main determinant of children's education and it encourages investment education if there are not borrowing and lending constraints

However, in reality, market imperfection arise so that Acemoglu and Pischke (2001) have also considered the behaviour of credit constrained families. Impeding negative savings, the constraints change as follows

$$c + e^{\theta_i} h + s \leq y_i \tag{2}$$

$$\hat{c} = s + w_u + (w_s - w_u)h \tag{3}$$

$$s \geq 0 \tag{4}$$

Whenever $y_i - h * e^{\theta_i} > w_s$, Constraint (3) does not bind so that the credit market constraint does not affect family decisions. For this solution to arise the following condition ought to hold:

$$y \geq \bar{y} = w_s + e^{\theta_i} = 2w_s - w_u$$

[7] In this model education is solely and investment good.

[8] In the original paper education, h, is denoted as e.

[9] Note that assuming that β is equal to 1 and not taking into account the interest rates, the family budget constraint:

$$c + \hat{c} \leq y_i - e^{\theta_i} h + (1 - h)w_u + h(w_s)$$

.

As in the case of unconstrained credit market, families with positive savings in the first period would decide upon the education investment of their children just on the basis of the size of the skill premium. These families are rich enough and/or are in a relative high quartile of the ability distribution so that the cost of educating their children is also relatively low. The fraction of these families investing in education, $G_r(\hat{\theta}) = G_r(ln[w_s - w_u])$, is hence independent of income.

Lets now consider families with income $y < w_u$ so that it is not optimal to save in the first period. For such families, the life time utilitiy of investing in the human capital of their children is $U(h = 1) = ln(y - e^{\theta_i}) + \beta ln w_s$ and the life time utility of not investing in it is $U(e = 0) = lny + \beta ln w_u$. "Poor" families would therefore choose to educate their children if the utility of educating them is higher than the utility of not educating them, that is if the following condition holds:

$$\theta_i \leq \theta* = ln\Big[y\big(\frac{w_s - w_u}{w_s}\big)^{\beta}\Big] \tag{5}$$

So that the cost of education of relatively poor families, $G_p(\theta^*)$, not only depends on the skill premium but also on the income of the family.

Empirical Implications

The housing boom led to an increase in the demand of construction workers and to an improvement in their wages. [10] According to the model proposed, an increase in wages in the construction sector has two main implications. On the one hand, given that construction workers are mainly unskilled, the increase in their wages leads to a decrease in the skill premium. From Equations (1) and (5), a decrease in the skill premium discourages children education. On the other hand, the income of families at the lower tail of the income and ability distribution rise with a rise in the unskilled wages. According to Equation (5), with an increase in family income, children education becomes more likely .

Therefore, a priori, the expected effect of the housing boom on the decision of dropping out from high school is ambiguous and heterogeneous. Given that it lowers the skill premium, higher dropout should be observed in those regions affected by the housing boom. However, the housing boom improves the economic situation of households that are marginal for the educational decision and therefore offsets the negative effects on education and encourages the investment.

[10] See LaCuesta et al. (2012) or Bonhomme and Hospido (2012) that illustrate a countercyclical evolution of males earning inequalities and argue the construction sector to be the main cause.

4 Data and Methods

4.1 Sample Selection and Descriptive Statistics

I use individual data from the Spanish LFS that is a continuous household survey conducted on a representative sample of individuals. It started in 1964 on yearly basis and it is released on quarterly basis since 1976. The Spanish LFS is conducted on a sample of 65,000 households per quarter which encloses approximately 200,000 individuals. Although each individual is interviewed during 5 consecutive quarters, the National Institute of Statistics does not provide with information to link individuals across quarters meaning that the longitudinal aspects of the Spanish LFS cannot be exploited.

The Spanish National Institute of Statistics releases the LFS coding the age of the respondents in year bands and therefore I cannot exactly identify their age. The final sample consists of 16 to 19 year old individuals that live in one of the 17 Spanish regions from 1999 to 2007. I exclude individuals living in the autonomous cities of Ceuta and Melilla due to the lack of reliable information on weighted labour market variables. An average of 8713 16 to 19 year individuals are surveyed each quarter and the resulting sample size, after pooling observations for every quarter are 257926 children. Out of the total sample, 74330 live in a region where the importance of the construction sector did not vary significantly throughout the period of my study (low growth), 79749 in one where the construction sector had a medium gain in its importance (medium growth) and 103847 in one with a high increase in the proportion of the construction sector (high growth).

The first column of Table 5 reports the yearly growth of the share of the labour force working in the construction sector in the Spanish regions, which ranges from an average growth of 3% to 12% during the 1999-2007 period. According to the average yearly growth of the share of employment in the construction sector during the 1999-2007 period, I classify Spanish regions. The share of labour force employed in the construction sector had an average yearly growth of less than 4.5% in low growth regions, between 7 and 7.5% in medium growth regions and more than 8% in high growth regions. Although Aparicio (2010) measures the housing boom as share of construction in the GDP, I have two main reasons for measuring the housing boom by share of the labour force employed in the construction sector. On the one hand, employment is available on quarterly basis and GDP on yearly basis. On the other hand, GDP does not account for labour force mobility. Although a low level of labour mobility prevails in Spain (see Bentolila and Jimeno, 1998), construction workers usually commute on either daily or weekly basis to the changing placements of the building works. While GDP is measured at the region where the works take place, employment is measured at the region where the worker lives and where it is more likely that he or she has conducted his high school studies.

Youth levels of education and the evolution over the past decades are heterogeneous among Spanish autonomous regions. Columns 3 to 5 of Table 5 present the proportion of 17 year old students that remain in education on average from 1999 to 2007. Disparities are visible, although

an average of 75% of 17 year old individuals remained yearly in education, the distribution ranges from an average of 62 % in Baleares to an average of 92.7% in the Basque Country. On average, a higher fraction of 17 year old individuals stay in education in regions with a low growth of the share of labour force employed in the construction sector than in regions with a medium or high growth.

From 1999 to 2003, two education systems with different compulsory schooling finishing age, LGE and LOGSE, coexisted. The education system in Spain "Ley General de Educacin (LGE)" from 1970 was not modified until 20 years later, 1990, when "Ley General del Sistema Educativo (LOGSE)" was approved. The implementation of LOGSE started in the academic year 1992/1993 and did not finish until 2003. Therefore, during the first four years of this study, 1999-2003, children could be enroled in any of the two systems. The implementation of LOGSE was progressive and lasted for 10 years, with each region following a different pace in its implementation.

The main difference between both systems is the number of years of compulsory education. While compulsory education lasted until age of 14 with LGE, LOGSE extends the minimum period of study to 16 years old. Furthermore, the structure of the vocational studies path was modified. In order to classify students attainments, the convection is to define as drop outs both types of students, those that left school at 14 years old under LGE or at 16 years old under LOGSE. For the empirical analysis, I define a dropout as an individual that left the education with a maximum attainment of compulsory studies.[11] Dropout is a binary variable taking the value of 1 for those individuals that report at the time of the interview not to have followed any regulated studies during the four weeks previous to the interview neither to be a student on holiday. It takes the value of 0 for any other 16 to 19 year old student that after finishing post-compulsory education decided to continue to either high school or vocational studies.[12]

Table 1 presents summary statistics of individual, household characteristics and macroeconomic variables at the autonomous region level. The first column presents the statistics for children of low growth regions, the second children of medium growth regions and the third of high growth. On average, children that live in regions where the construction sector had a high average growth are more likely to leave education without obtaining any post-compulsory studies than children of regions where it had a medium or low average growth rate: 19% of the children in the low growth regions are dropouts, 27% in the medium and 31% in the high. The distribution of males and females is similar across groups with 51% and there are significant differences in the proportion of foreign children, while a 3% of the children are foreign in medium regions just 2% and 1% in high and low, respectively.

Parental information is only available if children live in the family household and just information on family members that live with them reported. However, given that 95% of children in the sample live with their mother this does not represent a relevant isstue for the analysis. There are some remarkable disparities in household characteristics among the three groups. Children of high growth

[11] For ease of exposition, I denote as dropout what it is commonly referred to early leaver

[12] As proved by several robustness checks, different definitions of the dependent variable do not change the results of the next section.

regions are likely to have more siblings living in the same household than their low and medium growth counterparts and their parents are likely to be younger and less educated. 36% of mothers and 34% of fathers have at most primary education in low and medium growth regions versus 42% and 38% in high, whereas 15% of mothers and 17% of fathers have a maximum education achievement of tertiary education versus 12% and 15%, respectively. Parental employment shows systematic differences across groups with considerably more mothers being employed in low and medium growth regions (46% and 47%) than in high regions (42%). While maternal employment could be a sign of traditional families being prevalent in high regions paternal employment is also considerably high in low and medium regions (74 and 75% versus 71% in high). Furthermore, the proportion of observed children that have at least one family member in their household (parents or siblings) working in the construction sector is 16% in low and high growth regions and 18% in medium.

Finally, I report region level variables. I obtain the variation in value added from the regional accounts provided by the Spanish National Institute of Statistics. The yearly average growth of the value addded is 4% in medium and high growth regions and 3% in low regions. The proportion of workers in the construction sector is constructed quarterly as a share of all the workers in each region.[13]. On average, a similar share of workers is observed in medium and high growth regions (12%) and just a 1% point lower in low (11%). Also from the weighted micro data of the Spanish LFS, I obtain quarterly unemployment levels and cohort sizes. Low and high growth regions have similar unemployment rates, a 25% for 16 to 24 year old individuals and respectively 11 and 12%, for adults, while medium growth regions display much lower average unemployment levels, 19% for 16 to 19 year old and 8% for adults. There are however not differences in sizes of 16 to 19 year old cohorts that represent 5% of the population. The last variable reported at the region level is the measure of proportion of 17 year old students being part of the new education system (LOGSE) in 1999. It is provided by the Spanish Ministry of Education and suggests that medium growth communitites adopted much faster the new education system versus low and high growth regions : 81% of the students were part of LOGSE in medium growth regions versus 68 and 62% in low and high regions, respectively.

[13]The main reason for choosing NUTS 1(regions) territorial division is that weighted information of a lower level of aggregation of territories is not representative of the population.

Table 1: Summary Statistics 1999-2007

	Low Growth	Medium Growth	High Growth
Individual and Household Characteristics			
Dropout	0.19	0.27	0.31
Males	0.51	0.51	0.51
Foreign	0.01	0.03	0.02
Family members in Construction	0.16	0.18	0.16
Siblings			
n^o Sisters	0.55 (0.69)	0.60 (0.74)	0.64 (0.75)
n^o Sisters 15 or under	0.21 (0.45)	0.25 (0.51)	0.27 (0.52)
n^o Sisters 16-19	0.10 (0.31)	0.10 (0.32)	0.10 (0.32)
n^o Sisters over 19	0.25 (0.51)	0.25 (0.51)	0.27 (0.53)
Sister dropout	0.05	0.08	0.10
n^o Brothers	0.61 (0.72)	0.67 (0.78)	0.72 (0.81)
n^o Brothers 15 or under	0.22 (0.46)	0.27 (0.53)	0.29 (0.54)
n^o Brothers 16-19	0.10 (0.32)	0.11 (0.33)	0.11 (0.33)
n^o Brothers over 19	0.29 (0.55)	0.29 (0.55)	0.32 (0.59)
Brother dropout	0.11	0.15	0.18
Mother			
Mother not in hh	0.05	0.06	0.05
Age Mother	43.92 (5.70)	43.83 (5.74)	43.74 (5.82)
Mother in Employemnt	0.46	0.47	0.41
At most Primary Education	0.36	0.37	0.42
Lower Secondary Education	0.28	0.27	0.28
Upper Secondary Education	0.16	0.16	0.13
Tertiary Education	0.16	0.14	0.13
Father			
Father not in hh	0.13	0.15	0.14
Age Father	46.74 (6.16)	46.69 (6.05)	46.62 (6.24)
Father in Employemnt	0.75	0.75	0.71
At most Primary Education	0.34	0.34	0.38
Lower Secondary Education	0.22	0.21	0.22
Upper Secondary Education	0.14	0.13	0.11
Tertiary Education	0.18	0.17	0.15
Autonomous Communities Specific Characteristics			
Yearly Variation Added Value	0.03 (0.01)	0.04 (0.01)	0.04 (0.01)
Share Active in No-Construction	0.77 (0.05)	0.79 (0.04)	0.74 (0.06)
Share of Employment in Construction	0.12 (0.02)	0.12 (0.02)	0.13 (0.02)
Unemployment Rate over 25	0.11(0.04)	0.08 (0.02)	0.12 (0.06)
Unemployment Rate 16-24	0.25 (0.06)	0.19 (0.04)	0.25 (0.08)
Share Population of Age 16-19	0.05 (0.01)	0.05 (0.01)	0.05 (0.01)
Share in 3 Bachillerato in 1999	0.68 (0.28)	0.81 (0.18)	0.62 (0.19)
Observations	74330	79749	103847

4.2 Econometric Method

I model the dropout decision of 16 to 19 year old individuals as follows:

$$y_{ict} = \lambda_t + \alpha_c + \beta_1 C_{ct} + \beta_2 m_c + \beta_3 h_c + \beta_4 C_{ct} * m_c + \beta_5 C_{ct} * h_c + x_{ict}\beta + \xi_{ict} \quad (6)$$

where the dependent variable, y_{ict}, represents the schooling outcome for individual i in region c at time t. It takes the value of 1 if individual i reports not to be in education (or holidays from education) at the time of the interview and the maximum level of studies is lower secondary school. y_{ic} takes the value of 0 for individuals that after completing lower secondary education, decided to continue with post-compulsory studies. [14]

C_{ct} represents the share of the labour force employed in the construction sector in region c at time t; [15] h_c (m_c) is a dummy variable that takes the value of 1 if region c experienced a high (medium) growth of the construction sector during the period of the study and takes the value of 0 otherwise; and $C_{ct} * m_c$ ($C_{ct} * h_c$) is the interaction between the dummy for region with high (medium) growth and the share of the labour force in construction activities.

x_{ict} includes individual, household and regional explanatory variables so as to control for potential group differences present over time. These variables are sex, nationality, dummies for younger and older brothers and sisters and whether they are early leavers , dummy for family members in the construction sector, age and square age of the father, whether parents live in the same household that the 16 to 19 year old individuals and if they do, dummies for their education and employment status, macro economic variables such as yearly variation of the value added to account for cyclical changes in the economy, cohort size, share of students that in 1999 were in LOGSE and adult and young unemployment rate; and ξ_{ict} is an i.i.d error term. Unobserved time or region effects are captured by λ_t that are year and quarter dummies and α_c represents autonomous regions fixed effects.

The effect of the interaction term on the probability of dropout captures the impact of the housing boom on the dropout of 16 to 19 year old individuals from 1999 to 2007 in Spain. The two period human capital investment model presented in previous section and extracted from Acemoglu and Pischke (2001) predicts two main determinants of the size and sign of the marginal effects of the interaction terms. On the one hand, the skill premium or children opportunity costs of studying in terms of earnings forgone. On the other hand, family income whenever the family is at the low quartile of the distribution in family income and/or family abilities.

The housing boom led to an increase in the demand for low skilled workers and relative increase of unskilled salaries. The increase of unskilled salaries with respect to medium and high skilled wages

[14] The results presented in next section hold for wider definitions of the dependent variable.

[15] An average of 3% of the construction workers are between 16 and 19 years old during the housing boom so that I dismiss any potential endogeneity issue arising from the relationship between dropouts and increase in the share of construction in the labour force.

caused a decrease in the skill premium presumably encouraging higher school dropout. However, the increase in low skilled wages could possibly have a positive effect on the economic situation of unskilled parents encouraging the education of their children. Therefore, the effect of the housing boom on education decision is ambiguous. The sign of marginal effect of the interaction terms determine whether it is skill premium or family economic situation that had an stronger effect in Spain during the 1999-2007 period. A positive sign would denote a supremacy of the wages forgone over family financial status and a negative sign the inverse.

The key identification assumptions for the estimates to represent the expected effect is not other contemporaneous shocks apart from the housing boom affected differently the education decision in the three groups of regions. Although at the time of the housing boom changes in other economic sectors took place, those changes are not significantly different among the three groups. In the appendix are numerous robustness check to assure that the estimates are valid.

5 Empirical Evidence

5.1 Basic Results

Findings highlight the probability of dropout increases less for children affected by the housing boom than for those non-affected. The first column of Table 2 reports the average marginal effects for the full sample of 16 to 19 year old children.[16] Results show that a 1% points increase in the share of employment in construction, rises the probability of drop out by 1% points less for children highly affected by the housing boom than for children non-affected. Therefore, children in high growth regions reacted to the labour demand shock by decreasing their school leaving probabilities relatively to children in low growth regions. Similar sign but not significant effect arise for the dropout response of children of medium-affected regions.

Although children responses vary with the intensity of the housing boom, the average marginal effect of an increase in the share of labour force in construction has an overall non-significant but positive effect in the dropout decision. Furthermore, results show that children living in affected regions have a probability of dropout 10% points higher than children from non-affected regions.

According to Acemoglu and Pischke (2001), these results shed light to stronger effects on children dropout decisions of parental economic situation than of variations in the skill premium. Findings are consistent, for instance, with Haveman and Wolfe (1995), Meschi et al. (2011) or Petrongolo and San Segundo (2002), which point out a greater relevance of the effect of parental economic status than of labour market circumstances on children educational choices.

Table 6 displays average marginal effects on dropout choices of family background and regional variables. Estimates are consistent with previous findings in, for instance, Petrongolo and San Segundo (2002), Aparicio (2010) or Lacuesta et al. (2012). The probability of dropout is significantly

[16] Equation 6 is estimated with a logit model but similar estimations results arise with the probit and linear probability models.

higher for males, for foreigns, for children with family members working in the construction sector, and if children have either younger siblings or siblings who are dropouts. Parental education and father's employment deter children's dropout, whereas non-significant, although positive, effects are observed for maternal employment. Finally, none of the macroeconomic variables evaluated have an effect on the probability of dropout although the signs of the unemployment rates coincide with Petrongolo and San Segundo (2012), a positive effect for adult unemployment and negative for youth unemployment.

Table 2: Logit Interaction Terms

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
Marginal Effects									
medium	0.021	0.039	0.007	0.048**	0.092***	-0.008	-0.012	-0.036	0.013
	(0.017)	(0.028)	(0.022)	(0.021)	(0.034)	(0.035)	(0.020)	(0.030)	(0.020)
high	0.103***	0.122**	0.075**	0.156***	0.188***	0.116**	0.008	0.012	0.007
	(0.034)	(0.048)	(0.036)	(0.042)	(0.059)	(0.052)	(0.030)	(0.045)	(0.030)
Employment in	0.121	0.247	-0.032	-0.063	0.110	-0.225	0.381**	0.254	0.427***
Construction	(0.216)	(0.313)	(0.249)	(0.284)	(0.418)	(0.359)	(0.160)	(0.265)	(0.150)
ME Interactions									
medium*cons	-0.365	0.104	-0.795*	-0.214	0.585	-0.982	-0.278	-0.533	0.005
	(0.453)	(0.691)	(0.473)	(0.635)	(0.950)	(0.750)	(0.448)	(0.718)	(0.430)
high*cons	-1.020***	-0.696	-1.268***	-0.790	0.029	-1.601***	-0.501	-0.767	-0.151
	(0.364)	(0.664)	(0.320)	(0.534)	(0.941)	(0.502)	(0.427)	(0.633)	(0.407)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023

*p<0.1, **p<0.05, *** p<0.01.

I cluster the standard errors at a province level (there are 52 provinces in Spain).

Average Marginal Effects Reported. Marginal Effect of the interaction term for the high construction regions are:

$$\frac{\delta(p_i|c=high)}{\delta C} - \frac{\delta(p_i|c=low)}{\delta C} = \left(\frac{e^{x'\beta}}{1+e^{x'\beta}}|c=_{low}\right)\beta_1 - \left(\left(\frac{e^{x'\beta}}{1+e^{x'\beta}}|c=_{high}\right)\beta_1 + \left(\frac{e^{x'\beta}}{1+e^{x'\beta}}|c=_{high}\right)\beta_5\right)$$

5.2 Heterogeneous Responses

5.2.1 By gender

Heterogeneity in male and female's dropout responses to the housing boom arise due to the low proportion of women employed in the construction sector. Given that only 5% of construction workers are females, their skill premium does not vary with construction wage rises, whereas males' skill premium decreases.

The probability of dropout rises significantly less for females affected by the housing boom than for unaffected females. However, non-significant effects are observed for males. Second column of Table 2 reports average marginal effects on males' dropout decision, whereas the third column reports those on females'. Results show that a 1% points increase in the proportion of employment

in construction, rises the probability of dropout of females of highly affected regions by 1.3% points less than of females of unaffected regions.

Consistently with previous results, the probability of dropout of children living in highly affected regions is higher than those of unaffected regions, 12% points higher for males and 8% points higher for females. Not observed significant effect arises for children of medium with respect to low regions. Insignificant but positive effect for males and negative for females of the share of employment in the construction sector on the dropout probability is consistent with the preliminary results from Felgueroso et al. (2011).

The divergent effects of the increase in parental income and the decrease in skill premium on the probability of dropout offset each other for males. Female's skill premium is, in contrast, not influenced by construction wages so that the effect of the housing boom on their dropout is negative, solely influenced by the increase in parental income.

Gender differences in dropout responses are common in the literature and are in line with Aparicio (2010)'s claim that the housing boom rose male's dropout rates more than women's due to the effect the housing boom had on the increase in males' skill premium. Furthermore, Lacuesta et al. (2012) finds heterogeneity in gender educational responses with respect to wages. According to their study, females are less responsive to an increase in unskilled wages.

5.2.2 By family background

Acemoglu and Pischke (2001)'s model suggests that schooling responses differ on the basis of parental economic and social status. Chevalier et al. (2005) find that father's income and father's education are correlated determinants of the dropout decision of 16 year olds in the UK, whereas this correlation does not arise with mother's education. Therefore, and due to the lack of income information, I re-estimate Equation 6 after classifying children by father's education in two groups: children of dropout fathers (low educated parents) and children with fathers with a title of post compulsory education (high educated fathers).[17]

Findings highlight that schooling attainments of children with highly educated parents do not respond to the housing boom, whereas the response of children with low educated fathers varies by gender. The probability of dropout increase significantly less for females affected by the housing boom than for those non-affected if their fathers are low skilled, but non-significant effects are observed for males. Columns 4 to 6 of Table 2 report average marginal effects on the probability of dropout of children with low educated fathers, while columns 7 to 9 those of children of high educated fathers. A 1% points increase in the share of employment in the construction sector increases by 1.6% points less the probability of dropout of females with low educated fathers living in highly affected regions than of those living in non-affected regions.

The probability of dropout significantly increases for males of medium-affected regions and for

[17]Information on parental education is not available for children that are not living with their father or either have left the family house.

children of highly affected regions regardless of their gender, if their parents are low educated. On the contrary, children with highly educated fathers do not exhibit significant regional effects on the probability of dropout. Furthermore, non-significant responses arise from an increase in the share of employment in construction for children with low educated fathers, regardless of their gender, and for males with high educated fathers. However, females with high educated fathers increase their dropout probability with an increase in the share of employment in the construction sector.

Although no information on income is available, children's heterogeneous dropout responses by parental background sheds light on the effect of the housing boom on dropout choices through parental income. The housing boom does not have an effect on either parental income or skill premium of children with high skilled (and probably high income) families. However, both parental income and males skill premium of children with low skilled (and probably low income) families are significantly affected by the housing boom. Furthermore, although interest rates decreased during the period of the study leading to lower credit constraints, this decrease homogeneously affected the Spanish territory. Therefore, lower interest rates cannot be the cause of the observed differential dropout responses across regions.

5.3 Robustness Checks

Disparities in economic activities among regions do not only rest on the construction sector. The Spanish LFS reports 10 economic sectors for the principal activity of the local unit in which each respondent is employed. Table 7 reports average proportion of employees in each sector and average growth from 1999 to 2007 across regions.

"Wholesale and retail trade, repair of vehicles and personal household goods, hotels and restaurants" sector has the highest relevance across regions although it represents a higher share of workers in regions highly afffected by the housing boom. Tourism in highly affected regions explains such differences. The second most important sector is "Public administration, education and health and social work" which represents approximately 19% of employment in low affected regions and 17% in medium and highly affected. "Financial intermediation, real state and renting activities" sector experienced a substantial growth across all regions as a consequence of the housing boom. It represents 4% points higher share of the employment on average in the medium affected regions (a share of 13%) due to its importance in the Canarian Islands. Furthermore, "Agriculture, hunting, forestry and fishing" decreased on average 5%points across all regions . Finally, employment in industry, specially "Manufacturing of food, textile, leather wood and paper" decreased substantially across regions with an approximate decrease of 5% points in medium and highly affected regions.

Therefore, demand factors other than the increase in the construction sector could drive post-compulsory education decisions. Table 8 in the appendix reports the elasticity of the share of employment in construction with respect to each of the other 9 sectors. There are four sectors that report significant differences in sizes and signs of the elasticities in low, medium and highly affected regions: "Agriculture, hunting, forestry and fishing", "Manufacturing of food, textil, leather wood

and paper" , "Wholesale and retail trade, repair of vehicles and personal household goods, hotels and restaurants", and "Financial intermediation, real state and renting activities".

In order to assure that the results obtained are robust and previous sections' results are not due to any other labour demand differences across regions, I re-estimate Equation 6 substituting the construction sector variable (C_{ct}) by the four above mentioned sectors. Table 9 in the appendix reports insignificant effects of the interaction terms on the probability of dropout for all sectors except "Agriculture, forestry and fishing" sector. Therefore, I re-estimate Equation 6 using the share in the agriculture sector and its interactions with the dummies for medium and highly affected regions as regressors. Results of Table 8 show similar effects of the housing boom to those reported in Section 5.1. Therefore, findings highlight the construction sector and not changes in the labour demands of any other sector determines the 16 to 19 year old individuals post-compulsory study decisions.

To guarantee that the regional classification into high, medium and low groups do not determine the results obtained, I report the marginal effects obtained from four slightly diverse classifications in Table 11 in the appendix. For a final verification I re-define my dependent variable including as non-dropouts all the 16 to 19 year old individuals, whether they had not yet taken the decision of continuing with education (i.e. children that are 16 to 19 year old but still following compulsory studies). The results, in Table 12 in the appendix, are similar to those of Table 2.

5.4 High School and Vocational Studies

In this section I further analyse the educational decision of 16 to 19 year old individuals by estimating a multinomial logit on the probability of dropping out from secondary school, enrolling in high school or enrolling in vocational studies.

Table 3 presents the average marginal effects that the variables of interest have on the likelihood that 16 to 19 year old individuals enrol in either high school studies (at the top) or vocational studies (at the bottom). The probability of enrolling in high school studies decreases significantly if a male lives in a medium instead of a low growth community. Furthermore, the effect appears to be stronger for children of low educated fathers (it decreases the probability of enrolling in high school by 19%). The probability of following high school studies does also considerably decrease for females with high educated fathers in medium versus low growth regions, by almost 6%. The opposite occurs with the probability of conducting vocational studies. Living in a medium growth region increases the probability of enrolling in vocational studies by an overall of 7% with respect to children living in low growth regions. Furthermore, this effect is mainly present in males with low education parents.

Employment in the construction sector seems to increase the probability of enrolling in high school and decrease the probability of conducting vocational studies, however, the effect is insignificant regardless of the sex of the child or education of the parents. Furthermore, the housing boom appears not to have an effect on the probability of choosing any particular post-compulsory study for

children with low skilled fathers, contrasting with the observed effect on the probability of dropout. However, females with high skilled fathers decrease their probability of studying vocational studies in medium and high intensity regions by less than the decrease in low intensity regions. The opposite occurs with the probability of continuing to the high school track. This result goes in consonance with Lacuesta et al. (2012) that analyse the effect of relative wages on the different schooling responses and find a significant increase of the choice of vocational studies for women if the ratio of mid-skilled wages over high skilled wages increases.

Table 3: Multinomial-Logit

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
Pr(High School)									
Marginal Effects									
medium	-0.085***	-0.127***	-0.040	-0.117***	-0.189***	-0.021	-0.036	-0.017	-0.056**
	(0.022)	(0.034)	(0.026)	(0.030)	(0.044)	(0.045)	(0.023)	(0.039)	(0.022)
high	-0.050	-0.053	-0.042	-0.088	-0.096	-0.074	0.019	0.030	0.006
	(0.039)	(0.055)	(0.044)	(0.049)	(0.065)	(0.066)	(0.033)	(0.059)	(0.029)
Employment	0.177	0.047	0.338	0.304	0.189	0.422	0.046	-0.072	0.245
Construction	(0.278)	(0.343)	(0.322)	(0.335)	(0.375)	(0.426)	(0.272)	(0.480)	(0.307)
ME Interactions									
medium*cons	-0.347	-0.409	-0.351	-0.416	-0.835	0.078	-0.447	0.472	-1.361**
	(0.507)	(0.753)	(0.560)	(0.818)	(1.122)	(0.890)	(0.513)	(0.845)	(0.613)
high*cons	0.225	0.068	0.349	0.015	-0.675	0.864	0.068	1.123	-1.034*
	(0.456)	(0.729)	(0.393)	(0.677)	(1.006)	(0.659)	(0.540)	(0.832)	(0.579)
Pr(Vocational)									
Marginal Effects									
medium	0.065***	0.088***	0.036**	0.069***	0.099***	0.028	0.048***	0.048*	0.045*
	(0.014)	(0.018)	(0.018)	(0.022)	(0.029)	(0.033)	(0.012)	(0.028)	(0.023)
high	-0.051	-0.065	-0.036	-0.066	-0.086	-0.050	-0.027	-0.042	-0.012
	(0.025)	(0.028)	(0.030)	(0.033)	(0.035)	(0.044)	(0.022)	(0.038)	(0.027)
Employment in	-0.320	-0.308	-0.337	-0.272	-0.308	-0.248	-0.438	-0.200	-0.677
Construction	(0.166)	(0.227)	(0.183)	(0.214)	(0.297)	(0.307)	(0.212)	(0.356)	(0.276)
ME Interactions									
medium*cons	0.711*	0.317	1.121***	0.610	0.267	0.850	0.721**	0.014	1.367**
	(0.365)	(0.463)	(0.420)	(0.541)	(0.719)	(0.674)	(0.364)	(0.734)	(0.547)
high*cons	0.715**	0.580	0.800**	0.617	0.547	0.530	0.412	-0.405	1.181**
	(0.312)	(0.411)	(0.371)	(0.461)	(0.573)	(0.651)	(0.346)	(0.614)	(0.484)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023

*p<0.1, **p<0.05, *** p<0.01

According to the model proposed, it is the variation in the skill premium that determines schooling decisions of economically unconstrained families. With respect to the choices of either

vocational or high school studies, the skill premium could be understood as the ratio of high skill versus medium skilled wages (Lacuesta et al., 2012). A sensible explanation for the effect of the housing boom in the post-compulsory decision of females with high skilled fathers is that the rise in the construction sector had a positive effect in the demand and wages of medium skilled versus high skilled female workers. Having a closer look at Tables 7 and 8, the only sector that significantly increases more for females in medium and high growth regions and that has a higher and positive elasticity with respect to changes in the construction sector is "Financial intermediation, real state and renting activities ". That in such sector workers are mainly females with vocational studies is a plausible explanation for the above findings. However, Lacuesta et al. (2012) reports the evolution of skilled to unskilled wages during the past decades and during the period of my study, 1999-2007, and they remained fairly stable just experiencing a slight decrease. Therefore, further analysis ought to be conducted so as to reach conclusive results.

6 Conclusion

The housing boom in Spain lasted for almost 10 years having important effects on post-compulsory education decisions. The boom in house prices intensified the demand for construction workers, generally unskilled, and increased their wages. Two are the divergent effects of the demand for construction workers and the increase in their wages on the probability of dropout. On the one hand, it decreases males skill premium which, according to basic human capital theory, increases the opportunity costs of studying and leads to a decrease in enrolments. On the other hand, it improves the economic status of low skilled parents and hence, encourages the demand for post-compulsory education of children's at the margin of the dropout decision.

Using data from the Spanish Labour Force Survey, I identify the effect of the housing boom on dropouts through the demand for construction workers across Spanish regions. From 1999 to 2007, regional yearly average growth of the share of employment in the construction sector ranges from 3% in regions non-affected by the housing boom, to 12% in the most affected region. I classify Spanish regions in three groups, highly affected, medium affected and non-affected, according to the growth in the employment in construction during the housing boom.

Findings highlight the probability of dropout increases less for 16 to 19 year old individuals affected by the housing boom than for those non-affected. Overall, results shed light on the prevalence of parental income effect of the housing boom on the dropout decisions. However, children responses were heterogeneous by gender and parental education. The probability of dropout for females affected by the housing boom significantly decreases if their parents are low skilled, but non-significant effects are observed for males. A 1% points increase in the share of employment in the construction sector increases by 1.6% points less the probability of dropout of females with low educated fathers living in highly affected regions than of those living in non-affected regions. Finally, the dropout decision of children with highly educated parents does not significantly respond

to the housing boom.

Results are compatible with Acemoglu and Pischke (2001)'s model. Educational outcomes for children of unskilled and low income parents increase with skill premium and parental income. The housing boom on the one hand, decreases males skill premium but does not influence women's, and on the other hand, increases parental income. Therefore, both contrasting effects offset each other for males, whereas parental income decreases females probability of dropout. Given that high skilled and high income parents are not likely to be credit constraint, children educational decisions are independent of their income. Furthermore, unskilled wages do not determine their skill premium so that their educational attainments of children with high skilled and high income parents are not affected by the housing boom.

Results are robust to different specifications, definitions of dropout and regional classifications. Furthermore, numerous sectorial analysis dismiss labour demands in alternative sectors causing the observed results.

I further analyse children post-compulsory educational choices conducting a multinomial analysis on the decision of dropping out from secondary school, enrolling in high school or enrolling in vocational studies. Overall, the housing boom does not significantly affect high school choices. However, responses again vary by gender and parental education. Although, the housing boom does not significantly affect high school choices for children with unskilled parents, females with high skilled families react to the housing boom by increasing their vocational studies in detriment of the high school track. Although, further investigations are needed, the increasing demand of female labour force in the "Financial intermediation, real state and renting activities" sector is likely to be behind the increase in female enrolment in vocational studies .

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Figure 1: Early Leavers 18-24. Spain vs EU 12

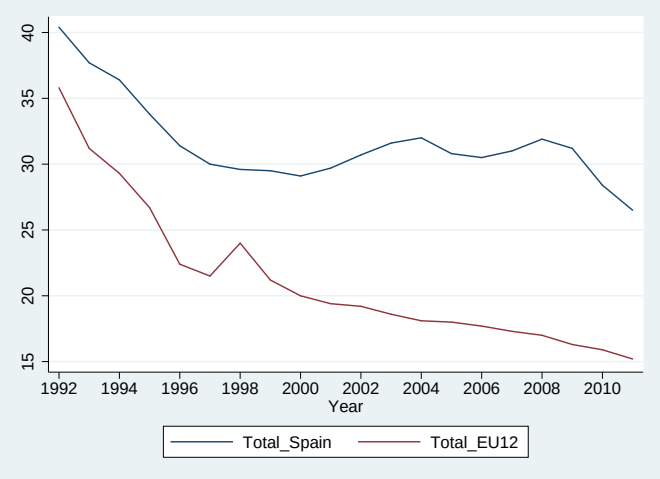

Figure 2: Early Leavers 18-24. Spain by Sex

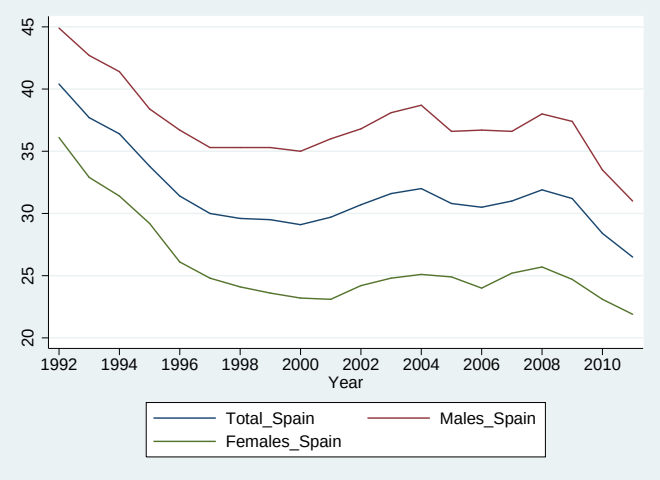

Figure 3: Schooling of 17 year olds Spain

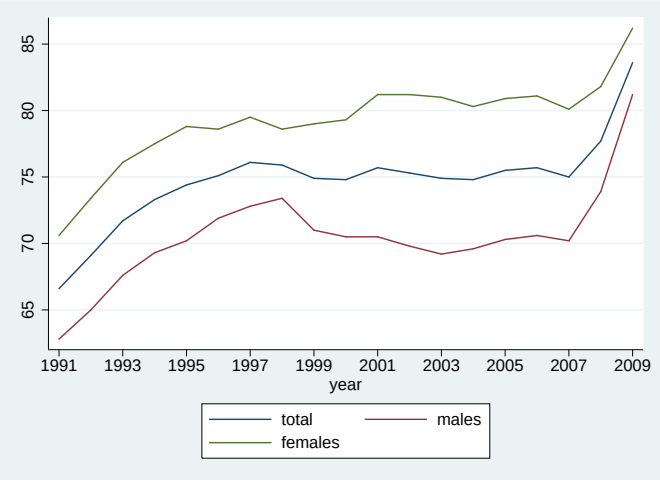

Figure 4: Construction. Share of the Employment and Value Added

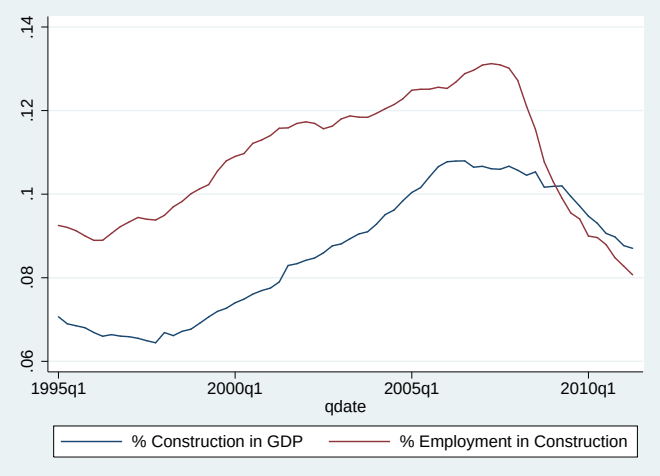

Table 4: Proportion of salary in Construction over average salary

Community	Change Wage 1995-2007	Wage 1995	Wage 2007
Spain	12.26%	81.66%	91.68%
Low Intensity			
Extremadura	19.75%	73.36%	87.85%
País Vasco	12.83%	84.27%	95.08%
Cantabria	23.36%	77.78%	95.95%
Galicia	32.28%	71.77%	94.93%
Asturias	22.96%	81.58%	100.32%
C. León	36.70%	68.52%	93.67%
Medium Intensity			
Madrid	1.06%	89.09%	90.03%
Canarias	10.90%	82.01%	90.94%
C. La Mancha	17.67%	78.55%	92.43%
Cataluña	4.99%	90.16%	94.66%
Navarra	20.86%	82.80%	100.07%
High Intensity			
Baleares	23.14%	73.66%	90.70%
Andalucía	28.25%	76.44%	98.04%
Rioja	9.14%	89.56%	97.75%
C. Valenciana	5.84%	88.03%	93.17%
Aragón	18.04%	84.73%	100.02%
Murcia	14.20%	83.87%	95.79%

Table 5: Construction Growth and Education

Region	**Employment in Construction**		**17 year old in Education**		
	Growth	Std. dev.	Total	Males	Females
Low Growth					
Extremadura	2.98%	0.65%	73.44%	66.03%	81.39%
PaísVasco	2.65%	0.64%	92.66%	92.19%	93.17%
Cantabria	5.17%	0.66%	81.57%	76.2%	87.24%
Galicia	3.86%	0.55%	80.51%	74.9%	86.43%
Asturias	4.58%	0.56%	87.28%	84.18%	90.53%
C. León	4.38%	0.59%	86.97%	82.63%	91.54%
Medium Growth					
Madrid	7.22%	0.90%	79.99%	76.42%	83.71%
Canarias	7.18%	1.00%	72.41%	67.96%	77.03%
C. LaMancha	7.24%	0.93%	71.19%	63.31%	79.56%
Cataluña	7.49%	0.99%	70.39%	66.04%	74.96%
Navarra	7.33%	1.20%	82.56%	80.27%	85.01%
High Growth					
Andalucía	8.39%	1.27%	71.67%	66.37%	77.27%
Baleares	8.42%	1.47%	62.42%	57.31%	67.82%
Rioja	8.43%	1.33%	77.31%	71.62%	83.38%
Aragón	8.83%	1.00%	81.04%	76.29%	86.06%
C. Valenciana	9.47%	1.29%	68.83%	61.2%	76.9%
Murcia	11.97%	2.45%	71.22%	65.51%	77.29%

Source Spanish LFS and Spanish Ministry of Education (MEC)

Table 6: Marginal Effects Logit

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
Male	0.128***			0.171***			0.049***		
	(0.004)			(0.006)			(0.004)		
Foreign	0.113***	0.121***	0.085***	0.111***	0.080***	0.118***	0.132***	0.162***	0.061***
	(0.009)	(0.014)	(0.008)	(0.019)	(0.024)	(0.020)	(0.014)	(0.024)	(0.008)
Family members	0.043***	0.056***	0.030***	0.053***	0.068***	0.037***	0.020***	0.028***	0.012**
in Construction	(0.004)	(0.006)	(0.005)	(0.006)	(0.008)	(0.007)	(0.005)	(0.009)	(0.005)
Sister $\leq$ age 15	0.029***	0.033***	0.026***	0.038***	0.039***	0.035***	-0.003	-0.006	-0.002
	(0.003)	(0.005)	(0.004)	(0.005)	(0.008)	(0.006)	(0.005)	(0.007)	(0.005)
Sister $\geq$ age 16	-0.034***	-0.021***	-0.052***	-0.038***	-0.029***	-0.052***	-0.005	0.003	-0.015***
	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.011)	(0.004)	(0.006)	(0.004)
Sister dropout	0.266***	0.243***	0.225***	0.311***	0.282***	0.268***	0.172***	0.158***	0.095***
	(0.008)	(0.009)	(0.009)	(0.011)	(0.013)	(0.012)	(0.021)	(0.029)	(0.008)
Brother $\leq$ age 16	0.028***	0.030***	0.026***	0.034***	0.033***	0.034***	0.001	0.001	0.002
	(0.003)	(0.006)	(0.004)	(0.005)	(0.009)	(0.006)	(0.003)	(0.004)	(0.004)
Brother $\geq$ age 16	-0.060***	-0.067***	-0.053***	-0.069***	-0.082***	-0.055***	-0.015***	-0.021***	-0.009*
	(0.004)	(0.007)	(0.005)	(0.007)	(0.010)	(0.008)	(0.003)	(0.005)	(0.005)
Brother dropout	0.245***	0.285***	0.165***	0.281***	0.317***	0.198***	0.157***	0.213***	0.061***
	(0.007)	(0.010)	(0.006)	(0.009)	(0.011)	(0.008)	(0.014)	(0.021)	(0.007)
Mum Employed	-0.002	-0.003	0.001	-0.004	-0.008	-0.001	0.005	0.000	0.009**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)	(0.003)	(0.006)	(0.004)
Mum Low 2^{ari} Ed.	-0.062***	-0.062***	-0.055***	-0.069***	-0.066***	-0.068***	-0.037***	-0.046***	-0.017***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.009)	(0.007)	(0.006)	(0.011)	(0.005)
Mum Up 2^{ari} Ed.	-0.148***	-0.164***	-0.139***	-0.160***	-0.179***	-0.154***	-0.077***	-0.092***	-0.050***
	(0.007)	(0.009)	(0.008)	(0.009)	(0.012)	(0.015)	(0.006)	(0.009)	(0.006)
Mum 3^{ari} Ed.	-0.202***	-0.235***	-0.203***	-0.230***	-0.271***	-0.237***	-0.093***	-0.113***	-0.066***
	(0.006)	(0.008)	(0.011)	(0.011)	(0.015)	(0.026)	(0.006)	(0.010)	(0.007)
Mum not in hh	0.087***	0.045***	0.081***	0.069***	0.081***	0.048***	-0.007	-0.011	-0.001
	(0.011)	(0.012)	(0.009)	(0.015)	(0.022)	(0.017)	(0.014)	(0.022)	(0.010)
Dad's age	-0.010***	-0.011***	-0.009***	-0.008***	-0.009***	-0.006***	-0.004***	-0.004***	-0.003***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
Dad Employed	-0.069***	-0.071***	-0.063***	-0.085***	-0.087***	-0.075***	-0.026***	-0.026***	-0.022***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.008)	(0.006)	(0.007)	(0.010)	(0.007)
Dad Low 2^{ari} Ed.	-0.039***	-0.051***	-0.031***	-0.050***	-0.067***	-0.034***			
	(0.004)	(0.007)	(0.005)	(0.006)	(0.010)	(0.005)			
Dad Up 2^{ari} Ed.	-0.114***	-0.145***	-0.101***						0.007*
	(0.005)	(0.007)	(0.009)						(0.004)
Dad 3^{ari} Ed.	-0.140***	-0.182***	-0.121***						
	(0.005)	(0.008)	(0.010)						
Dad not in hh	-0.326***	-0.389***	-0.610***						
	(0.006)	(0.008)	(0.073)						
Yearly var GDP	-0.195	-0.135	-0.267	-0.319	-0.165	-0.512	0.169	0.011	0.285
	(0.243)	(0.309)	(0.277)	(0.327)	(0.457)	(0.383)	(0.196)	(0.261)	(0.260)
UR over 25	0.147	0.238	0.041	0.211	0.362	0.010	-0.022	0.151	-0.204
	(0.137)	(0.146)	(0.161)	(0.202)	(0.222)	(0.244)	(0.118)	(0.173)	(0.149)
UR 16-24	-0.056	-0.093	-0.007	-0.023	-0.092	0.055	-0.010	-0.024	0.002
	(0.052)	(0.075)	(0.064)	(0.089)	(0.100)	(0.112)	(0.050)	(0.086)	(0.055)
Population	0.245	-1.034	1.794	0.253	-2.083	2.761*	0.382	0.586	0.183
age 16-19	(1.080)	(1.329)	(1.124)	(1.506)	(1.880)	(1.595)	(0.793)	(1.078)	(0.945)
Students in	-0.034	-0.062	-0.006	-0.042	-0.086	-0.002	-0.002	0.022	-0.035
3 Bach. in 1999	(0.046)	(0.069)	(0.038)	(0.058)	(0.095)	(0.042)	(0.039)	(0.040)	(0.052)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023

*p<0.1, **p<0.05, *** p<0.01

I cluster the standard errors at a province level (there are 52 provinces in Spain).

Table 7: Employment by Economic Sector 1999-2007

Region	**Agri.**		**Industry**		**Cons.**			**Services**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Average Share of Employment in Each Sector										
Low Intensity	8.44%	6.15%	8.08%	5.90%	11.61%	20.94%	5.24%	8.59%	18.63%	6.42%
Extremadura	13.35%	5.12%	4.53%	1.23%	14.71%	22.22%	3.57%	6.55%	23.15%	5.58%
País Vasco	1.64%	4.05%	13.00%	10.15%	9.02%	19.83%	5.75%	11.24%	17.81%	7.49%
Cantabria	6.16%	5.64%	8.45%	5.76%	13.05%	22.58%	5.60%	8.30%	17.26%	7.20%
Galicia	12.92%	8.17%	5.17%	5.51%	11.86%	20.93%	4.76%	7.64%	16.86%	6.18%
Asturias	6.97%	4.28%	11.79%	3.26%	11.29%	22.73%	6.25%	8.54%	18.03%	6.85%
C. León	4.71%	2.96%	2.47%	1.04%	14.54%	32.67%	7.09%	8.69%	18.76%	7.06%
Medium Intensity	2.96%	6.80%	6.16%	6.07%	11.38%	21.24%	7.09%	13.32%	17.19%	7.79%
Madrid	9.08%	7.14%	6.47%	5.17%	12.40%	20.43%	5.43%	8.00%	20.24%	5.64%
Canarias	0.83%	4.50%	4.57%	4.93%	10.11%	19.12%	8.77%	18.58%	18.83%	9.75%
C. La Mancha	9.52%	9.08%	6.36%	3.58%	15.29%	19.94%	4.76%	6.92%	19.01%	5.54%
Cataluña	2.55%	9.09%	8.24%	8.41%	10.85%	20.70%	6.42%	11.90%	14.92%	6.92%
Navarra	5.93%	8.05%	8.02%	11.85%	10.29%	17.85%	4.54%	8.86%	18.01%	6.60%
High Intensity	7.52%	6.44%	5.68%	4.44%	13.20%	24.50%	5.05%	9.08%	16.96%	7.14%
Baleares	2.09%	4.47%	2.61%	2.47%	15.06%	33.62%	7.65%	9.22%	14.48%	8.32%
Andalucísa	9.92%	4.16%	4.22%	3.06%	13.84%	24.17%	4.98%	8.79%	19.53%	7.33%
Rioja	8.16%	14.36%	9.71%	5.49%	10.86%	19.07%	3.44%	8.03%	15.43%	5.43%
C. Valenciana	4.18%	9.52%	7.66%	5.19%	12.86%	24.80%	4.81%	9.74%	13.97%	7.26%
Aragón	6.99%	6.19%	7.45%	10.35%	9.91%	20.22%	5.17%	9.50%	17.80%	6.42%
Murcia	12.21%	7.02%	5.75%	4.12%	13.54%	23.13%	4.38%	7.88%	16.13%	5.84%
Average Yearly Growth of Employment in Each Sector										
Low Intensity	-6.59%	-1.01%	-1.42%	-1.10%	0.81%	0.35%	0.47%	3.81%	1.61%	0.64%
Extremadura	-3.14%	1.02%	1.53%	3.53%	-0.23%	-1.91%	1.13%	4.38%	2.82%	0.31%
Paíss Vasco	-1.30%	-3.03%	-3.73%	0.25%	0.19%	0.50%	0.24%	3.74%	2.41%	-1.33%
Cantabria	-8.72%	-3.40%	-0.68%	-2.63%	0.46%	0.89%	1.15%	7.04%	2.26%	3.77%
Galicia	-8.46%	0.27%	2.71%	-0.74%	1.29%	1.19%	0.33%	4.22%	2.34%	1.66%
Asturias	-8.03%	-0.06%	-2.83%	0.08%	1.40%	1.07%	1.85%	6.19%	-0.03%	4.80%
C.León	-4.49%	-0.33%	0.99%	-2.07%	1.56%	0.12%	1.43%	2.95%	0.48%	0.82%
Medium Intensity	-5.03%	-4.85%	-2.68%	-2.86%	2.75%	-0.02%	-0.33%	3.35%	-0.06%	2.31%
Madrid	5.73%	-4.17%	-4.62%	-4.94%	2.17%	0.69%	-1.30%	2.93%	-1.34%	3.79%
Canarias	-6.31%	-5.07%	2.05%	3.76%	2.25%	-0.16%	0.78%	3.43%	0.17%	1.80%
C.La Mancha	-5.32%	-4.07%	1.54%	-2.81%	2.51%	-1.09%	2.45%	4.76%	1.93%	2.26%
Cataluña	-4.32%	-4.55%	-2.26%	-1.05%	3.70%	-0.28%	0.97%	3.72%	0.62%	1.28%
Navarra	-5.92%	-0.82%	-0.21%	-3.34%	4.04%	1.62%	0.98%	2.72%	0.31%	7.72%
High Intensity	-4.43%	-4.73%	-0.44%	-2.85%	3.83%	-0.39%	-0.36%	2.97%	-0.37%	3.86%
Baleares	-0.32%	-4.84%	-2.29%	5.23%	3.42%	-1.78%	-0.94%	4.32%	0.45%	6.95%
Andalucísa	-4.71%	-4.66%	-1.28%	-3.06%	3.16%	-0.18%	0.70%	3.95%	-0.42%	3.04%
Rioja	-6.27%	-5.17%	-0.07%	3.33%	3.73%	-0.32%	9.31%	3.81%	3.50%	12.08%
C.Valenciana	-3.73%	-4.39%	0.15%	-3.18%	4.47%	0.16%	-1.31%	1.41%	-0.34%	4.17%
Aragón	-3.06%	-4.25%	1.48%	-3.07%	5.01%	-0.35%	1.68%	2.82%	0.73%	3.17%
Murcia	-3.76%	-3.43%	1.84%	0.70%	6.15%	-1.64%	-0.20%	5.44%	-1.75%	7.35%

(1) Agriculture, hunting, forestry and fishing; (2) Manufacturing of food, textil, leather wood and paper; (3) Mining and quarring, refined petroleum products, manufacture of chemicals, rubber, plastic and metals and electricity, gas and water supply; (4) Manufacture of machinery, electric and transport equipmentand other manufature industries; (5) Construction; (6) Wholesale and retail trade, repair of vehicles and personal household goods, hotels and restaurants (7) Transport, storage and communication; (8) Finantial intermediation, real state and renting activities; (9) Public administration, education, health and social work (10) Other region, social and personal service activities, private households with employees and extra-territorial organisation and bodies

In order to have a better understanding of sector elasticities I estimate the following equation independently for each of the 9 sectors of activity:

$$C_{gt} = \alpha_g + \lambda_t + \beta S_{gt} + \epsilon_{gt} \tag{7}$$

where C_{gt} represents proportion of employment in the construction sector, S_{gt} proportion of employment in each of the other sectors, α_g are dummies for the autonomous regions and λ_t dummies for year and quarter. The above equation is estimated independently for high, medium and low regions to asses how sector elasticities differ among them.

Table 8: Elasticities of share of Construction

	Total			**Males**			**Females**		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
(1)	-0.1	-0.54***	-0.76**	-0.11	-0.45***	-0.66***	-0.06*	-0.39*	-0.37**
	(0.05	(0.1	(0.19	(0.06	(0.05	(0.15	(0.03	(0.15	(0.11
(2)	0.18	-0.64***	-0.72*	0.1	-0.42*	-0.81*	0.11	-0.35**	-0.35*
	(0.1	(0.05	(0.3	(0.09	(0.17	(0.33	(0.09	(0.08	(0.16
(3)	-0.02	-0.58**	-0.2	-0.02	-0.36*	0.08	0.28	-0.16	0.29
	(0.11	(0.2	(0.21	(0.08	(0.15	(0.18	(0.16	(0.37	(0.46
(4)	-0.38**	-0.53**	-0.44	-0.28**	-0.44***	-0.39	0.03	-0.47***	0.47
	(0.1	(0.12	(0.29	(0.08	(0.09	(0.22	(0.16	(0.08	(0.36
(6)	-0.05	-0.12	-0.53*	-0.18*	-0.34**	-0.65**	0.04	0.15	-0.19**
	(0.06	(0.23	(0.21	(0.07	(0.11	(0.16	(0.05	(0.12	(0.06
(7)	-0.07	-0.31	-0.17	-0.04	-0.18	0.01	0.07	0.16	0.11
	(0.2	(0.21	(0.2	(0.15	(0.15	(0.12	(0.13	(0.45	(0.42
(8)	0.01	0.54*	0.70**	0.01	0.48*	0.32	-0.01	0.32	0.61**
	(0.11	(0.2	(0.26	(0.09	(0.2	(0.28	(0.09	(0.15	(0.21
(9)	-0.03	0.18	-0.22	-0.09	-0.2	-0.42	-0.02	-0.04	-0.24
	(0.06	(0.24	(0.37	(0.08	(0.25	(0.3	(0.04	(0.11	(0.26
(10)	0.14	0.52**	0.61	-0.09	0.34**	0.57*	0.07*	0.27**	0.33
	(0.11	(0.12	(0.31	(0.2	(0.11	(0.23	(0.03	(0.09	(0.18
Observations	216	180	216	216	180	216	216	180	216

(1) Agriculture, hunting, forestry and fishing; (2) Manufacturing of food, textil, leather wood and paper; (3) Mining and quarring, refined petroleum products, manufacture of chemicals, rubber, plastic and metals and electricity, gas and water supply; (4) Manufacture of machinery, electric and transport equipment and other manufature industries; (5) Construction; (6) Wholesale and retail trade, repair of vehicles and personal household goods, hotels and restaurants (7) Transport, storage and communication; (8) Finantial intermediation, real state and renting activities; (9) Public administration, education, health and social work; (10) Other region, social and personal service activities, private households with employees and extra-territorial organisation and bodies

Table 9 reports four different marginal effects of the logit estimates of Equation 6 where I replace the variable C_{ct}, share of construction sector, with other four relevant sectors.

Table 9: Other Sectors

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
Employment in Manufacturing of food...									
medium*food	-0.085	-0.423	0.485	0.311	0.177	0.602	-0.680	-0.557	-0.701
	(0.540)	(1.003)	(0.586)	(0.736)	(1.265)	(0.760)	(0.686)	(1.153)	(0.439)
high* food	0.462	0.023	1.126**	0.665	0.237	1.270	-0.594	-0.471	-0.592
	(0.577)	(1.064)	(0.560)	(0.911)	(1.413)	(0.877)	(0.698)	(1.191)	(0.538)
Employment in Agriculture									
medium*agri	0.633*	0.544	0.721	1.048**	0.816*	1.192*	0.074	0.393	-0.295
	(0.350)	(0.411)	(0.461)	(0.412)	(0.481)	(0.649)	(0.348)	(0.424)	(0.425)
high*agri	0.514**	0.280	0.727**	0.573	0.049	1.047**	0.115	0.289	-0.053
	(0.261)	(0.314)	(0.287)	(0.359)	(0.405)	(0.474)	(0.227)	(0.362)	(0.232)
Employment in Wholesale and retail trade...									
medium*sale	0.317	0.705*	-0.092	0.139	0.426	-0.132	0.856**	1.379**	0.336
	(0.385)	(0.427)	(0.546)	(0.454)	(0.632)	(0.711)	(0.361)	(0.583)	(0.453)
high*sale	0.311	0.427	0.133	-0.065	0.095	-0.206	0.252	0.353	0.211
	(0.335)	(0.375)	(0.422)	(0.395)	(0.576)	(0.491)	(0.313)	(0.475)	(0.342)
Employment in Finance...									
medium*finance	-0.080	0.115	-0.318	-0.303	0.040	-0.549	0.475	0.239	0.627**
	(0.439)	(0.555)	(0.520)	(0.572)	(0.661)	(0.806)	(0.363)	(0.574)	(0.320)
high*finance	-0.546	-0.180	-0.911*	-0.459	0.207	-1.051	0.021	-0.456	0.408
	(0.431)	(0.598)	(0.519)	(0.588)	(0.760)	(0.798)	(0.342)	(0.603)	(0.367)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023

*p<0.1, **p<0.05, *** p<0.01

The above positive marginal effects for the agriculture sector leads to two different further robustness checks. The first 3 lines report the marginal effects of logit estimates of Equation 6 with share of the employment in agriculture and its interaction with both medium and high dummy variables as extra regressors. Columns 4 to 6 report the marginal effects of the interactions without including the interaction terms for the share of agriculture.

Table 10: Robustness Check Agriculture

	All Parents			All Parents		
	All	Males	Females	All	Males	Females
med*cons	-0.105	0.258	-0.431	-0.607	-0.245	-0.939**
	(0.481)	(0.789)	(0.507)	(0.436)	(0.700)	(0.451)
high*cons	-1.030**	-0.921	-1.046**	-1.119***	-0.856	-1.314***
	(0.416)	(0.714)	(0.419)	(0.366)	(0.672)	(0.316)
med*agri	0.883**	0.945*	0.817			
	(0.398)	(0.531)	(0.511)			
high*agri	0.219	0.019	0.432			
	(0.299)	(0.373)	(0.313)			
Observations	257926	131134	126792	257926	131134	126792

*p<0.1, **p<0.05, *** p<0.01

Table 11: Regions

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
Classification 1									
med*cons	-0.547	-0.346	-0.711	-0.793	-0.212	-1.365	-0.369	-0.762	0.030
	(0.561)	(0.753)	(0.617)	(0.714)	(0.967)	(0.869)	(0.513)	(0.837)	(0.399)
high*cons	-0.659*	-0.272	-0.994***	-0.312	0.498	-1.071*	-0.389	-0.546	-0.137
	(0.394)	(0.686)	(0.355)	(0.576)	(0.962)	(0.581)	(0.395)	(0.601)	(0.392)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023
Classification 2									
med*cons	-0.380	-0.018	-0.717	-0.611	0.117	-1.368	-0.205	-0.557	0.148
	(0.588)	(0.745)	(0.647)	(0.740)	(0.973)	(0.907)	(0.543)	(0.919)	(0.401)
high*cons	-0.996***	-0.612	-1.289***	-0.775	0.079	-1.655***	-0.391	-0.659	-0.037
	(0.374)	(0.674)	(0.321)	(0.553)	(0.972)	(0.496)	(0.418)	(0.632)	(0.397)
Observations	223710	113615	110095	127845	65312	62533	64673	33007	31666
Classification 3									
med*cons	-0.447	-0.066	-0.791**	-0.128	0.612	-0.791	-0.430	-0.677	-0.089
	(0.393)	(0.673)	(0.389)	(0.552)	(0.924)	(0.611)	(0.393)	(0.624)	(0.397)
high*cons	-1.009**	-0.706	-1.235***	-0.865	-0.055	-1.653***	-0.309	-0.396	-0.153
	(0.446)	(0.763)	(0.358)	(0.681)	(1.126)	(0.556)	(0.430)	(0.583)	(0.441)
Observations	257926	131134	126792	145687	74550	71137	75802	38779	37023
Classification 4									
high*cons	-1.081***	-0.781	-1.281***	-0.947*	-0.186	-1.701***	-0.371	-0.593	-0.039
	(0.344)	(0.630)	(0.323)	(0.517)	(0.908)	(0.508)	(0.404)	(0.639)	(0.377)
Observations	178177	90511	87666	102291	52058	50233	51863	26664	25199

*p<0.1, **p<0.05, *** p<0.01

There are 3 regions, Rioja, Navarra and Cataluña that could be either considered medium or high growth regions. In the general analysis, I classify La Rioja as high and Navarra and Cataluña as medium. The first check, classification 1 in Table 11,estimates the basic model considering La Rioja medium growth and Navarra and Catalua high growth regions. Classification 2, excludes the three regions and in Classification 3 I consider all high growth regions except of Valencia, Murcia and Aragón medium growth. Finally, in the last classification, I exclude regions that are medium growth in the baseline model.

Table 12: Robustness Check on definition of dependent variable

	All Parents			Low Educated Parents			High Educated Parents		
	All	Males	Females	All	Males	Females	All	Males	Females
med*cons	-0.432	-0.197	-0.641	-0.429	0.031	-0.864	-0.258	-0.472	0.017
	(0.388)	(0.548)	(0.433)	(0.545)	(0.776)	(0.689)	(0.377)	(0.591)	(0.361)
high*cons	-0.990***	-0.903*	-1.002***	-0.891**	-0.387	-1.378***	-0.446	-0.704	-0.096
	(0.308)	(0.518)	(0.316)	(0.447)	(0.732)	(0.500)	(0.361)	(0.518)	(0.335)
Observations	313667	161070	152597	179485	92429	87056	89002	46440	42562

*p<0.1, **p<0.05, *** p<0.01

The baseline here is defined as all 16-19 year old that did not dropout