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ABSTRACT

The Regional Anatomy of School Dropouts in Spain: The Role of the Industry Structure of Local Labour Markets

A number of studies have examined the impact of local labor market conditions on school dropout. However, none of them have considered the role of the industry structure. We construct data for a panel of Spanish regions and identify the effect of local labor markets using a variation of the share of employment by industry across regions and over time. In order to control for the huge structural and conjunctural heterogeneity across Spanish regions in the school dropout rate, we use a fixed-effects model with region specific slopes. We run separate regressions for boys and girls. We find a sizable impact of the industry structure and observe that in markets with a higher share low-skill employment the school dropout rate is significantly larger, though the industries affecting boys and girls are different. Our results suggest that the supply of skilled employment in the economy may allow to keep an important share of school dropouts in the school.

JEL Classification: J21, J24

Keywords: educational attainment, Spain, labour market, youth employment, skills

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1. Introduction

Previous research analyzing the determinants of school dropouts has mainly focused on individual characteristics, families and schools. However, studies analyzing the role of exogenous factors as the labor market are much less abundant. The scant empirical literature in this issue show that labor market conditions is at least as important as other individual/sociologic factors more traditionally considered in explaining the school dropout behavior. Human capital theory predicts that investment in education is countercyclical, i.e. increases (decreases) with economic downturns (upturns).[1] Whether it is true that the lack of interest towards school, school disaffection and complex personal/family situations might be in many cases the underlying reason behind the dropout propensities, as the human capital theory predicts, economic favorable conditions in the labor market might be the triggering event that push some students to take the final decision of dropping out from school. Some empirical studies suggest that the relationship between school dropout and the business cycle holds for both secondary and higher education. However, empirical evidence is not unequivocal and not all findings go in the same direction. Some studies do find a clear negative relationship between unemployment and school dropout: Rees and Mocan (1997) and Dellas and Koubi (2003) in the US, Clark (2011) in the UK, and Reiling and Strøm (2015) in Norway. On the contrary, some other studies do find that this relationship is weak: Petrongolo and San Segundo (2002) in Spain. Or it is also found to exist a statistically significant positive link for boys but not significant for girls: Jonshon (2013) in the US.

All the analyses cited above use the overall unemployment rate or youth unemployment as an indicator of the labor market conditions. While this measure is a good proxy of the economic activity, it does not reflect the peculiarities of the local labor market that may determine the sensitivity of school dropout to the business cycle. School dropouts that

[1] The incentive to acquire education is likely to be countercyclical for a variety of reasons. First, the expected real wage is procyclical (Solon et al., 1994) and thus income foregone due to the pursuit of educational endeavors is lower during recessions.

enter in the labor market are generally employed in low-skill jobs, which means that the sensitivity of school dropout decisions to a positive shock in labor demand will differ depending on the skill composition of the employment, which is mainly determined by the industry structure, in local labor markets. We claim that the unemployment rate is not able to capture all these peculiarities regarding the industry composition of these local labour markets, therefore, is not able to predict accurately the school dropout behavior in the event of an economic (down)upturn.

For instance, we can compare Ireland and Spain as two paradigmatic examples that substantiate our claim. Between 2000 and 2007, Spain experienced the most important economic boom of its recent history. This boom was driven by the construction industry, which is characterized by employing mainly low-skill workers men. During that period, this industry employed more than 20 percent of the male workforce.[2] Although there is no empirical evidence on that, many analysts point at this phenomenon as the responsible of the dramatic increase in the school drop-out rate among male teenagers.[3] On the contrary, the economic upturn experienced by the Irish economy during the 1990s, was driven by the technological sector, which is characterized by employing skilled workers. During that period this sector employed 20 percent of the Irish labor force. This phenomenon not only did not raise the school dropout rate but encouraged the demand for higher education in technological fields (Wickham and Boucher, 2004). This is an example of how an economic boom may have a different impact on the school dropout behavior depending on the skill composition of the labor force employed in the industry driving this boom. In this context, the unemployment rate is not able to capture this differential impact. Surprisingly, despite the industry structure of an economy can determine the direction of the impact of the business cycle on school dropout, literature analyzing this link is virtually inexistent.

[2] In Spain, only a bit less of the 1.5 percent of the female workforce was employed in the construction industry.
[3] Aparicio-Fenoll (2016) observed that he Spanish housing boom significantly decreased the returns to education for men while it hardly affected those for women.

Another relevant and persistent issue regards the important gap in the school dropout rate between boys and girls and the gender composition of youth employment. In the event of an economic upturn, responses to investment in human capital differ between boys and girls, since generally, employment prospects are also different across genders. Boys who dropout from school are more likely to be employed in more physically demanding jobs as the ones in the construction industry, while girls are more likely to be employed in low-skill services such as retail, commerce or those associated to the tourism industry. Indeed, the gender gap in the school dropout rate reached its maximum during the years of the boom in the construction industry

The interest by policy makers on the issue of school failure stems from the fact that as the literature shows, dropouts has negative consequences for both individuals and society. Indeed, these are the two dimensions from which the problems derived from the dropout behavior are usually treated. From an individual point of view, students who do not complete secondary education face bleak prospects throughout their life-cycle. From a labor market perspective, dropouts are mostly at risk, respect to their non-dropout counterparts, i.e. higher unemployment and lower income (e.g., Psacharopoulos and Layard, 1979), lower health status (e.g., Groot and Maassen van den Brink, 2007); and maybe one of the most worrisome consequences, a generational one, they have lower educated children (e.g., Bowles, 1972). From a social point of view, there exist a cost for society in the sense that school dropouts are more likely to engage in antisocial behaviors or criminal activities (e.g., Lochner and Moretti, 2004), lower social cohesion (e.g., Milligan et al., 2004) or lower rate of economic growth in the economy (Hanushek and Wößmann, 2007). Finally, there are other social costs due to lower tax revenues, higher unemployment allowances or higher health costs.[4] We find our results are useful for policy makers in order to assess the impact of economic (down)upturns on education decisions and for determining how many resources should be allocated in the public

[4] See Psacharopoulos (2007) for an extensive overview.

education system. In addition, understanding the link between the local industry structure and school dropout is also crucial in order to design policies aimed at reducing school dropouts.

In this paper, we study not only how the business cycle impacts the school drop-out behaviour, but for the first time, how this decision is influenced by the industry composition of the local labour markets. To do so, we construct panel data comprising aggregated information from Spanish regions covering the period 2002-2013. Our data not only accounts for movements in the regional GDP per capita, as the main economic indicator, but also for the distribution of employment by gender across the different industries in the Spanish regions and some educational policy variables, as the public investment in public and private education.

In order to estimate the causal impact of the industry structure on school dropouts, we use panel data models with region fixed-effects and specific region slopes. With this model, we not only control for the unobserved heterogeneity in the school dropout behaviour across regions that is constant over time, but also with time varying unobserved heterogeneity that may violate the strict exogeneity assumption in conventional fixed-effects models. The consideration of region specific slopes also allows us to control for the potential existence of common trends between the school dropout rate and the explanatory variables that may lead to spurious relationships.

Our econometric estimates indicate that the composition of the industry is important not only in explaining the dropout behaviour during our sample period for both boys and girls. The dropout rate tends to be higher, in regions high a higher share of employment in low-skill industries, such as construction in the case of boys, and commerce, restoration, and

services associated to the touristic industry for the case of girls. Finally, an increase in the demand for skilled industries tend to reduce the dropout rate for both boys and girls.

The paper is structured as follows. In section 2, we overview the existing literature. In section 3, we give some insights about the persistence of the school dropout problem in Spain. In section 4 the dataset is presented. In Section 5, we describe the empirical model and comment the main econometric results. Finally, in section 6 we conclude and discuss the main implications of our results.

2. Overview of the literature

For the shake of brevity, in this section we only overview the literature linking school dropout and the labor market. Most of the existing empirical studies confirm the countercyclical nature of school dropouts predicted by the human capital theory. As we already noted above, although favorable labor market conditions are important in explaining the school dropout behavior, studies analyzing this link are not abundant, and most of them focus in the US and the UK. Eckstein and Wolpin (1999), using the NLSY79 observed that an important share of the American youths who drop out of high school where working while in school. However, they conclude that a policy intervention prohibiting working while in school would not reduce dropouts. In the descriptive analysis, they also reported that among a sample of youths who had not graduated from high-school, 14% said that they were "offered a good job, chose to work". Using a survey to 9,000 Spanish students in secondary education, Diaz-Serrano (2018) observed that 50% of the students in the last year of compulsory secondary education would immediately dropout from school if the where offered a long-term job. More interestingly, even among students in the last year of high-school (pre-university), this percentage was exactly the same.

Rees and Mocan (1997) use a panel of districts in New York State and conclude that there is a negative relationship between the overall unemployment rate and the proportion of

high-school students who drop out of school in a given year. They highlight that controlling for unobserved district characteristics was essential to reach this conclusion. Using panel data aggregated at age cohort level, Dellas and Koubi (2003) find the same result for high-school and college education in the US. However, Johnson (2013) found that enrollment in college education is countercyclical for females and acyclical for males. In contrast with the previous studies mentioned above, which use aggregated data, he used US nationwide individual data (CPS). Using also US census data, Warren and Lee (2003) do not find a link between labor market conditions for individuals aged 16 to 19 and high-school dropouts.

Out of the US context, Rice (1999) and Clark (2011), find a positive link in the UK between youth unemployment and the enrollment rate in post-compulsory secondary education and college education. The firsts used microdata, while the second resorted to aggregated regional panel data. Also using the latter type of data, Reiling and Strøm (2015) obtain the same result for Norway. For the Spanish case, the early paper by Peraita and Pastor (2000) explores the determinants of primary school dropouts focusing on the role played by family background and economic conditions. They find that the unemployment rate negatively affects the probability of dropping out of primary school. Also, using Spanish data, the influence of labor market conditions on the demand for post-compulsory education (ages 16 to 18) is studied in Petrongolo and San Segundo (2002). They find that the youth unemployment rate exerts a positive influence on the probability of staying-on while the general unemployment rate had a negative impact on that probability. All the literature review in this section is summarized in table 1.

[Table 1, around here]

3. The persistent problem of school dropout in Spain

Drop-out in secondary education has become a policy priority for the EU. This was one of the main policy issues of the EU in 2000 in the so called "Lisboan Agenda", where the EU established the objective to reduce the school drop-out rate to 10% 2010. In 2000, the drop-out rate in the EU was about 17,3%, while in Spain this figure was of 28,8%. Ten years after, the goals stated in the "Lisboan Agenda" where not achieved in some of EU countries, among them Spain. Therefore, the challenges of the "Horizon 2020" for the EU set in 2010, considered again the reduction of school dropouts, this time up to 15% in Spain. However, nowadays the dropout rate in Spain is still of 20%, 5% above the objective agreed in the EU for 2020. Whether it is true that between 2004 and 2015, the dropout rate in Spain has fallen in more than 10 percentage points, in 2015 Spain was still leading the ranking in dropout rate in the EU. Whereas in countries like Portugal, that were leading this ranking at the beginning of this century, nowadays is in the fifth position with a school dropout rate of 13% (Figure 1). These figures indicate that in Spain, school failure is more worrisome than in the other EU countries, since in Spain the school dropout rate is not only the highest in the EU, but also decrease much slower than in other countries

[Figure 1, around]

Another characteristic feature of the Spanish education system is that is extremely heterogeneous across regions, and this heterogeneity regards not only school dropout but also PISA scores. In 2004, the Spanish Southern regions (Andalusia, Extremadura, Castilla-La Mancha and Murcia) and the Islands (Balearic Islands and Canary Islands) had a dropout rate above 35%, some of them indeed above 40%. Even Catalonia, one of the richest regions in Spain, which represents one-fifth of the Spanish GDP, had a school dropout of nearly 35%. In the last decade, the dropout rate has fallen dramatically in most of the Spanish regions. With few exceptions, between 2004 and 2016 most of the Spanish regions reduced the school dropout rate between one-third and one-half. But still, thought at a lower level, this

heterogeneity persists. It is remarkable the fact that in 2016, Spanish regions as Basque Country and Cantabria, reported one of the lowest school dropout rates in the EU, similar to the one observed in countries like Sweden, Netherlands, Ireland or Austria. The Spanish education system is also characterized by having a wide gender gap in the school dropout rate, which is also two times higher than the average gap in the EU. As it is shown in Figure 3, between 2004 and 2016, the school dropout rate for both boys has fallen from 39% to 23%, and from 25% to 15% for girls. This means that between 2004 and 2016 the gender gap has also decreased almost to the half, from 15 to 8 percentage points, however, the gender gap in the dropout rate in Spain is still the highest in the EU.

[Figure 2, around]

[Figure 3 around]

Under this evidence and the peculiarities of the school dropout behavior in Spain, one questions arise: Which part of this regional heterogeneity in the school dropout rate is structural and which is conjunctural?[5] One potential explanation is that the Spanish education system is highly decentralized, both fiscally and politically. Regions has the competence to rule their education system with a very high level of autonomy, one of the highest in the EU. However, if sub-national educational authorities do not perform uniformly, this may generate inequalities in school outcomes.[6] However, as it is shown in Figure 3, this heterogeneity across Spanish regions already existed in 1990, when only one third of the regions had full autonomy on their educational system.[7] This circumstance suggest that this heterogeneity in the school

[5] The school drop-out rate in Spain is two times higher than the average drop-out rate in the EU. This ratio is more or less constant throughout time. The same picture can be drawn regarding the unemployment rate

[6] See Diaz-Serrano and Meix-Llop (2018), for an extensive overview of the role of political and fiscal decentralization in education.

[7] Catalonia, Basque Country, Andalusia, Galicia, Canary Islands and Community of Valencia received full competences in education between 1980 and 1983, while the remaining of the regions did between 1995 and 1997.

dropout rate across regions was already existent before the educational system was decentralized.

We hypothesize that this heterogeneity in the school dropout rate across regions is mainly determined, among other idiosyncratic factors, by the industry structure of local (regional) labor markets, which as it is shown in Figure 4 and 5 is also quite heterogeneous. In these figures, we depict the relationship between aggregated regional school dropout and aggregated regional employment share by industry for boys and girls, respectively. It is important to remark that in order to have a better picture, the employment shares by industry are gender specific. At a first sight, we can observe very clear associations. For boys, we observe a strong positive correlation between the regional school dropout rate and employment in the construction industry, while this link is also strong but negative with energy and manufacturing industries. Correlations with the remaining industries can be negative (medium/high-skill services), but more moderated. For girls, the strongest positive association is observed with low-skill services (commerce, restoration and tourism industry), while correlation with the remaining industries can be negative but weaker (energy, manufacturing and medium/high-skilled services), or virtually inexistent (agriculture and construction). Despite this graphical associations are very clear in some cases at a first sight, the true direction and magnitude of these links between the industry composition and school drop-out will be assessed through our econometric model.

[Figure 4, around here]

[Figure 5, around here]

4. The data

To carry out our empirical analysis, we construct a panel of data aggregated at a regional level covering the period 2002-2013. Our data contains various policy and economic variables

collected from different sources. Early school dropout rate is our outcome variable and is taken from Eurostat. The definition of this variable is standardized for all EU countries and is defined as the share of individuals aged 18-24 that did not complete compulsory education or do not possess further education to compulsory education. Our main interest consists in evaluating the role the industry structure in Spanish regions on aggregated regional levels of school dropouts, therefore we include a set of variables picking up the share of employment by industry overall employment in the region. Since que carry out separate estimates for boys and girls, we consider female and male employment. In order to control for fluctuations in the business cycle and the level of wealth of the regions, we include the regional level of GDP per capita. Regional employment share by industry is taken from the Spanish Labor Force Survey (EPA), while the regional GDP is taken from the Spanish National Accounts, both provided by the Spanish Statistics Bureau (INE).

In order to capture the role of decentralization, i.e. the degree of autonomy of Spanish regions to decide about their education system, we also consider some policy variables aggregated at a regional level, which are taken from the Spanish Ministry of Education. These variables are the regional level of public spending in education as a percentage of the regional GDP and the public spending in private education as a % of total spending in education. Both types of expenditure are decided by each regional government. Finally, we also consider the yearly average temperature of the region and population density. In Table 2, we show a description of the variables used in the analysis. Men are more likely to be employed Manufacturing (16.3%), low-skill services (22.6), Construction (17.2%) and other services (17%). However, 70% of women are employed in low-skill services (29,2%) and other services (41%).

[Table 2, around here]

To have an idea on the high level of heterogeneity across Spanish regions, we can have a second look to Figure 5 and 6. In agriculture, regions as Basque Country and Madrid represents less of 3% of the employment, while in Murcia and Extremadura this percentage is around 15%. Manufacturing is also one the industries where we can observe a high level of heterogeneity across regions. In Navarra, Basque Country or Rioja, this industry employs more than 25% of the workforce, while in Balearic Islands, Canary Islands, Extremadura and Andalusia this percentage is bellow 10%. An analogous situation, involving the same regions, can be observed regarding low-skill services with an employment share than ranges from 20% to 40%.

5. Econometric analysis

5.1. Empirical model

To carry out our empirical model, we use a linear model with region fixed-effects and region-specific slopes. This model has the interesting feature of controlling not only for unobserved heterogeneity across regions which is time invariant, but also for time-varying unobserved heterogeneity. We find necessary the inclusion of region specific slopes because of two reasons. On the one hand, in many cases, conventional fixed-effects models may fail because strict exogeneity is violated due to the existence of unobserved effects that change over time, which are not captured through fixed-effects.[8] On the other hand, the inclusion of region specific slopes allows to control for the existence of common trends between the covariates and the outcome that might cause the existence of a spurious relationship. This type of model is especially suitable for the type of data we use here, since employment variables tend to display a cyclical behavior. Although this is a common problem in many situations, it is seldomly accounted for. This model reads as follows:

[8] This problem is recognized in Heckman & Hotz (1989), Polachek and Kim (1994) or Winship and Morgan (1999), among others.

$$y_{it} = X_{it}\beta + \delta_i f(t) + u_i + \sum_{t=1}^{T} \gamma_T d_T + \varepsilon_{it}; \qquad t = 1,...,T; \qquad i = 1,..,N \tag{1}$$

where y_{it} are the school dropouts in region i at year t. The individual-specific trends $f(t)$ controls for an additional source of heterogeneity, where the function $f(t)$ either linear or polynomial. The parameters δ_i are the average growth rate over a period, while holding the explanatory variables fixed. This equation (1) is referred to a random growth model (Heckman and Hotz, 1989). General conditions to estimate equation (1) can be found in Wooldridge (2002). In equation (1) we also consider year fixed-effects in other to pick-up temporal global effects that are not picked up by our covariates and the set of the regional effects, either fixed or time-varying, considered in the model.

5.2. Results

In Table 3 we report the results of the estimates of equation (1). Although we present all the results together, we run a separate regression for each industry and gender, that is, the coefficient associated to the employment share in each industry comes from a different regression. We report our results in this way because our estimates produce a considerable amount of numbers. In table 3, we show the results coming from conventional fixed-effects models (columns 1, 2, 5 and 6), with additional region-specific linear trends (columns 3, 4, 7 and 8), and year dummies (columns 2, 4, 6 and 8). In each regression, we include each set of variables sequentially. First, we estimate a parsimonious model with just the employment share of the corresponding industry, population density and the annual average temperature. In a second stage, we include the remaining of the variables, i.e. GDP pc, total expenditure in education, expenditure in private education, and finally we also include the set of year dummies. For the sake of brevity, we only show the results regarding the models including all

the covariates, with and without year dummies, since after including the year dummies is when we observe the most substantial changes in terms of size and significance in the covariates included in equation (1). First at all, it has to be noted the fact that when we compare the model than only considers region fixed-effects with those that also consider region specific trends, estimated coefficients change substantially. For some variables these changes do not imply statistical significance but also the sign of the coefficient. This result highlights the potential problem of endogeneity arising from not controlling form time-varying unobserved heterogeneity (Heckman & Hotz, 1989; Polachek and Kim, 1994). Having this into account, our comments will be focused on the estimated models including the regional specific trends.

Our results are quite heterogeneous across the board and reveal that the determinants of school dropout differ substantially between genders. The coefficients associated to the variables not related to the industry structure are quite sensitive to the inclusion of the year dummies. The coefficients associated to population density were positive and statistically significant for boys, however, after including the year dummies, this effect vanishes. On the contrary, annual average temperature is able to resist the inclusion of the year dummies and are statistically significant for both boys and girls, however, the direction of the effect differs between genders. In regions with higher average temperature, school dropouts among boys is higher, whereas this effect is negative for girls. After including the year dummies this variable has turned out to be statistically significant for boys at 10% and 5% level of significance in 4 of the 6 estimated models. For girls, the coefficients associated to annual average temperature are statistically significant at 1% level of significance in 5 of the 6 models, and at 5% in one of the models. The positive relationship between temperature and school dropout for boys is in line with what is observed in Graff Zivin and Neidell (2014). These authors find an increase in the temperature tend to increase outdoor leisure and non-leisure activities. The implication of this is that those boys who are more potentially prone to dropout, will effectively dropout in

warmer regions. However, we do not have a plausible explanation for the negative link for girls.[9]

Economic factors are also quite sensitive to the inclusion of the year dummies. For boys, year dummies kill the effect of GDP, while the impact of this variable become negative and statistically significant in all models for girls. That is, in richer regions the dropout rate for girls is significantly smaller. On the contrary, the effect of the policy variables, public total expenditure in education and public expenditure in private education, are not statistically significant before and after including the year dummies. The latter result is very suggestive, since it indicates that in a highly decentralized education system like the Spanish one, regional educational authorities are incapable to have an impact on the educational outcomes of their students, at least as for school dropout is concerned.

We finally comment the results regarding our variables of interest, i.e. the employment share in each industry. Regarding these coefficients, it is worth noting the following. First, the coefficients associated to the industry structure do not change significantly when we include the economic (GDP pc) and policy variables (total public expenditure in education and public expenditure in private education). With few exceptions, the difference in the estimated parameters before and after include the economic variables is fairly small. Second, contrary to what we observe with the other covariates, these estimated coefficients are quite robust to the inclusion of the year dummies. Five of the eight estimated coefficients associated to these variables which were statistically significant before including the year dummies keep their statistical significance after including them. This result confirms the strong effect that some industries exert on the school. The sum of all industry shares is 100 in every region and period, therefore, the interpretation of the coefficients associated to each industry must be done with respect the industries which are left out of the regression. I our case, since we run a separate

[9] For a sample of children in the (NLSY79), Graff Zivin et al. (2017) also observe that short-run increases in the temperature beyond 26ºC (78.8ºF) reduces cognitive performance in math tests, but not in reading.

regression for each industry, the industries of reference for comparison for each industry are all the remaining industries together

Our estimates report quite sizable effects of the employment share in most of the industries on school dropout for both boys and girls, however, only some of them have turned out to be statistically significant. The demand for medium/high-skill services has a negative impact on school dropouts for both boys and girls. This type of services are mainly dominated by health, education and social protection services, which represents more than half of the employment in the skilled services for both men and women. It is also important to remark that the share of employment in education, health and social protection services among women (30%) is two times higher than among men (15%). According to our estimates, a 1% increase in the employment share of skilled services reduces the school dropout rate in -0.25% for girls and -0.37% for boys. Employment in low-skill services is also an important factor in explaining the school dropout behavior of girls. This type of services are mainly associated to commerce, restoration, hostelry and services associated to the touristic industries. This type of services represents almost 1/3 of the feminine employment in Spain. A 1% percent of increase in the employment share of low-skill services increases school dropout among girls in 0.42%. For boys, the most important economic activity influencing the school dropout behavior is the construction industry, a 1% increase of the employment share in this industry increases school dropout in almost 0.4%. According to our estimates, the school dropout rate among girls is also negatively influenced by the employment share in the energy industry. However, since this industry represents less than 1% of the feminine employment, the contribution of this industry to reduce school dropout is anecdotical.

6. Conclusions

In this paper we estimate for the first time the role of industry structure on school dropout. With this aim we construct a regional panel dataset covering the period 2002-2013 containing

information of Spanish regions. Our data contains accurate measures of employment by industry and gender. We use a linear model with region fixed-effects and regional specific slopes that not only allow us to control for time-constant unobserved heterogeneity across regions in regional school dropout, which can be considered as structural, but also for the time varying unobserved heterogeneity, not controlled with our covariates. This empirical strategy allows us to overcome potential problems that may arise if the strict exogeneity assumption sometimes violated in standard fixed effects models appear and that may bias our results. An interesting aspect in our analysis is that although in this type of analyses time dummies tend to capture an important part of the movements in the outcome variable, school dropout in our case, most of the coefficients associated to the industry structure not only resist to the inclusion of region fixed-effect and region-specific slopes but also to the inclusion of the year dummies.

As we hypothesize in this paper, the robustness of the coefficients associated to the employment share by industry, contrary to what we observe with other economic and policy variables, is quite indicative of that the relationship between school dropout and the industry structure of the local labor markets is strong. Unfortunately, to the best of our knowledge, we cannot compare our results with any other previous evidence. The estimates generated by our empirical models suggest an important role of the industry structure in regional labor markets, which report a different impact of school dropout for boys and girls. In regions with a higher prevalence of high-skill services school dropouts for both boys and girls is smaller. In low-skill employment, a rise in the demand in the construction industry increase the dropout rate for boys, while school dropout for girls is more sensitive to movements in low-skill services such as commerce, hostelry or restoration. Estimated effects for these industries are not only statistically significant but also quite sizeable.

Our results are of interest to policy-makers that up to know have not been capable to tackle the persistent problem of school dropout. This takes more relevance if we consider the fact, as our results indicates, that higher expenditures in education do not seem to improve

school dropouts. Our results suggest that for a large number of school-leavers, the non-skilled labour market is more attractive than the classroom. However, we also observe that increasing the supply of skills in the economy, may allow to keep an important share of school dropouts in the school.

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Table 1

Summary of previous literature

Authors	Country	Type of data	Type of estimation	Proxy of bussiness cycle	Dropout	Enrollment rate	Type of education
Rees and Mocan (1997)	New York State (US)	Aggregated at district level	Panel	District average unemployment rate	Negative		High school
Card and Lemioux (2001)	US	Age cohort aggregated	Cross-section	State unemployment rate		Positive (modest)	High school
Warren and Lee (2003)	US	Age cohort aggregated	Cross-section	% youth (16-19) working by area	No effect		High school
Dellas and Koubi (2003)	US	Age cohort aggregated	Cross-section	Unemployment rate by age cohort	Negative	Positive	High school and College
Johnson (2013)	US	Individual (Current Population Survey)	Cross-section	State unemployment rate (20-24, 25-34)		Negative for girls, no impact for boys	College
Rice (1999)	UK	Individual (Youth Cohort Studies)	Cross-section	unemployment rate in local market		Positive	Post-compulsory education
Clark (2011)	UK	Aggregated by region	Panel	Regional youth unemployment		Positive	High school and College
Reiling and Strøm (2015)	Norway	Aggregated by region	Panel	Regional Unemployment	Negative		Upper secondary
Peraita and Pastor (2000)	Spain	Individual (Living Conditions Survey)	Cross-section	Regional Youth unemployment (16-19)	Negative		Primary education
Petrongolo and San Segundo (2002)	Spain	Individual (Labor Force Survey)	Cross-section	Province Youth unemployment (16-18)	Negative		Lower secondary

Table 2

Description of the variables

	Boys		**Girls**	
	Mean	s.d.	Mean	s.d.
Agriculture	7.09	4.31	3.52	2.73
Energy	5.81	4.65	1.44	1.30
Manufacturing	16.31	7.15	8.23	3.85
Construction	17.17	4.23	1.59	0.46
Low skill services (1)	22.63	6.46	29.17	4.96
High skill services (2)	4.84	2.84	2.31	1.31
Public services (3)	9.12	2.76	12.70	2.73
Other services (4)	17.03	2.83	41.03	4.11
Population density	157.55	172.59	157.55	172.59
Average temperature	15.68	2.17	15.68	2.17
GDP pc	23,400	4,606	23,400	4,606
Expenditure in educ. as % GDP (TEE)	3.11	0.75	3.11	0.75
Expenditure in private educ. as % TEE	13.62	6.39	13.62	6.39

(1) Commerce, reparation, transportation and whorehouse, hostelry

(2) Financial, Insurance, real estate, professional and scientific activities, services to firms

(3) Public administration and defense, social security, education, health and social services

(4) Artistic and leisure activities, home production of goods and services, international organizations, other services

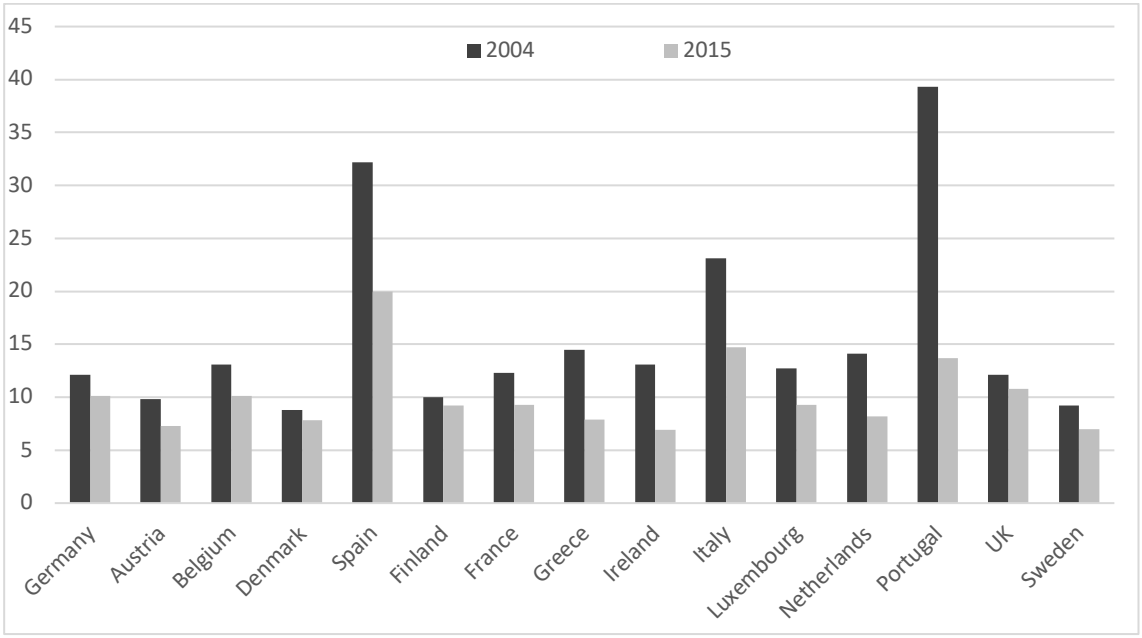
Table 3

Estimates of the determinants of school dropout (regional data)

	Boys				Girls			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture	0.470**	-0.190	-0.422*	-0.246	0.335	0.215	-0.0517	0.224
	(0.232)	(0.226)	(0.238)	(0.245)	(0.206)	(0.251)	(0.340)	(0.353)
Energy	0.163**	-0.0939	-0.224**	0.0532	-0.263	-0.585*	-0.673*	-0.927*
	(0.0772)	(0.106)	(0.109)	(0.208)	(0.234)	(0.306)	(0.348)	(0.555)
Manufacturing	-0.0662	0.157	0.297***	0.0991	0.336*	0.0776	0.252	0.123
	(0.0901)	(0.130)	(0.0994)	(0.182)	(0.175)	(0.198)	(0.203)	(0.231)
Construction	0.638***	0.364***	0.455***	0.394**	0.556	-0.0470	0.117	-0.679
	(0.115)	(0.126)	(0.155)	(0.168)	(0.536)	(0.555)	(0.517)	(0.551)
Low-skill services	-0.313***	-0.131	0.175	-0.112	0.337**	0.323*	0.411***	0.422**
	(0.0810)	(0.149)	(0.114)	(0.198)	(0.154)	(0.178)	(0.155)	(0.182)
Medium/high skill services	-0.480***	-0.398**	-0.490***	-0.376**	-0.393***	-0.193	-0.316**	-0.259*
	(0.137)	(0.172)	(0.114)	(0.184)	(0.113)	(0.147)	(0.135)	(0.152)
GDP per capita	6.91e-07***	1.30e-06***	1.05e-06***	-2.96e-07	2.09e-07	1.78e-07	1.19e-07	-1.69e-06**
	(2.08e-07)	(4.17e-07)	(2.39e-07)	(7.50e-07)	(1.66e-07)	(3.99e-07)	(1.91e-07)	(6.88e-07)
Public Expenditure in education as % GDP	-1.750*	-1.086	2.356**	1.252	0.671	-1.302	2.175**	0.00922
	(1.004)	(1.191)	(1.033)	(1.619)	(0.831)	(1.155)	(0.d)	(1.516)
Public Expenditure in private education as % of total expenditure	-0.809***	-0.0818	0.346	0.300	-0.637***	-0.146	-0.317	-0.289
	(0.180)	(0.195)	(0.323)	(0.323)	(0.136)	(0.194)	(0.290)	(0.297)
Region fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region specific linear trends	No	No	Yes	Yes	No	No	Yes	Yes
Year dummies	No	Yes	No	Yes	No	Yes	No	Yes
R2	0.55	0.73	0.37	0.45	0.28	0.37	0.16	0.26

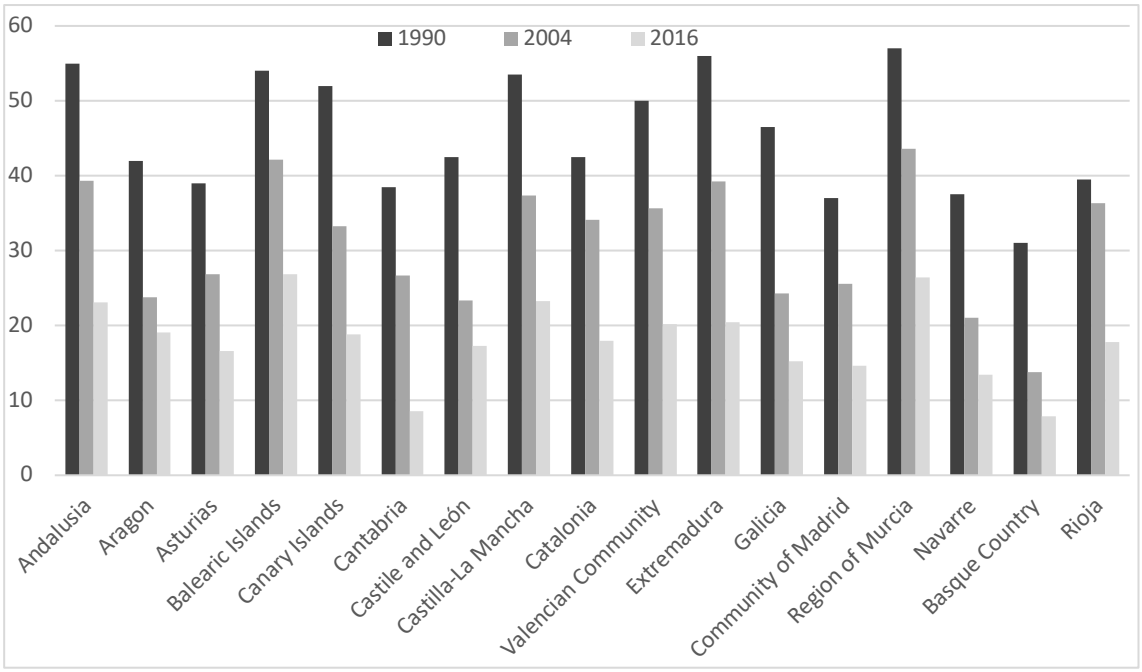
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Figure 1
School Dropouts in the EU



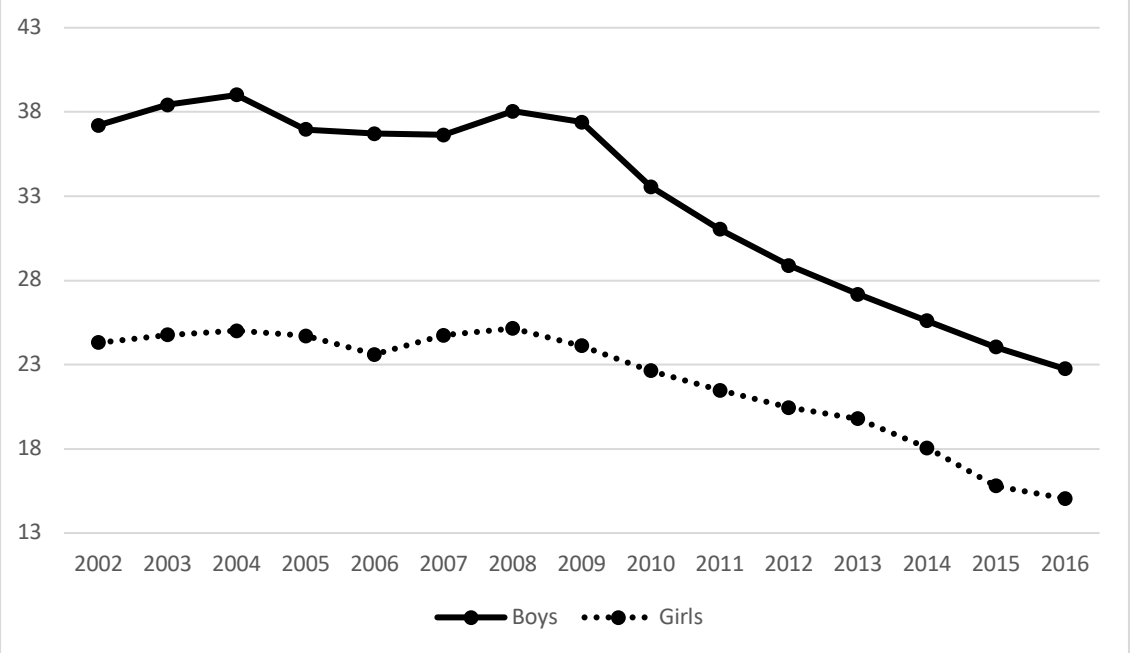
Source: Eurostat

Figure 2
School Dropouts in Spanish Regions



Source: Spanish Labor Force Survey (EPA) and Spanish Ministry of Education

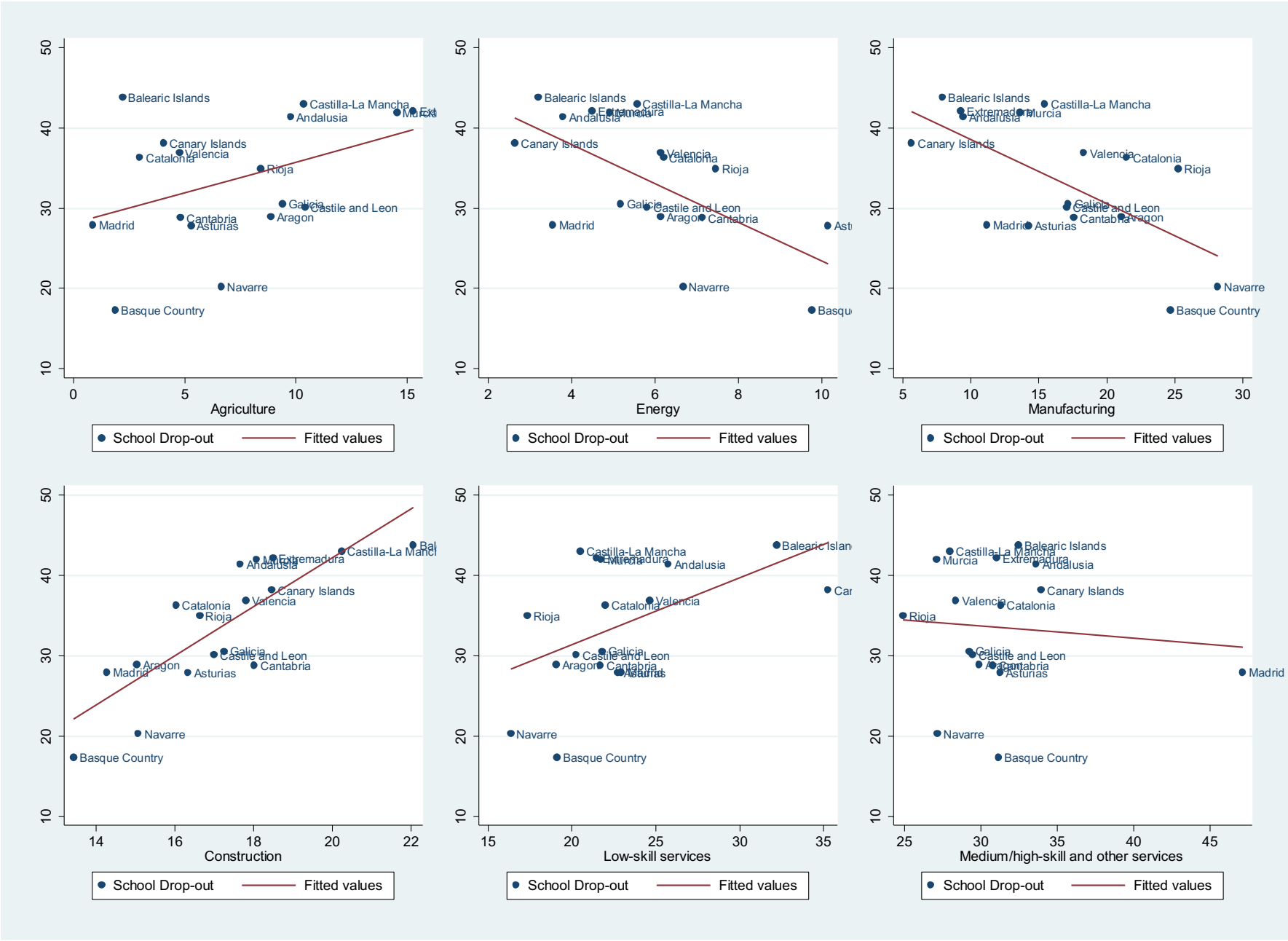
Figure 3
Evolution of school dropouts in Spain



Source: Eurostat

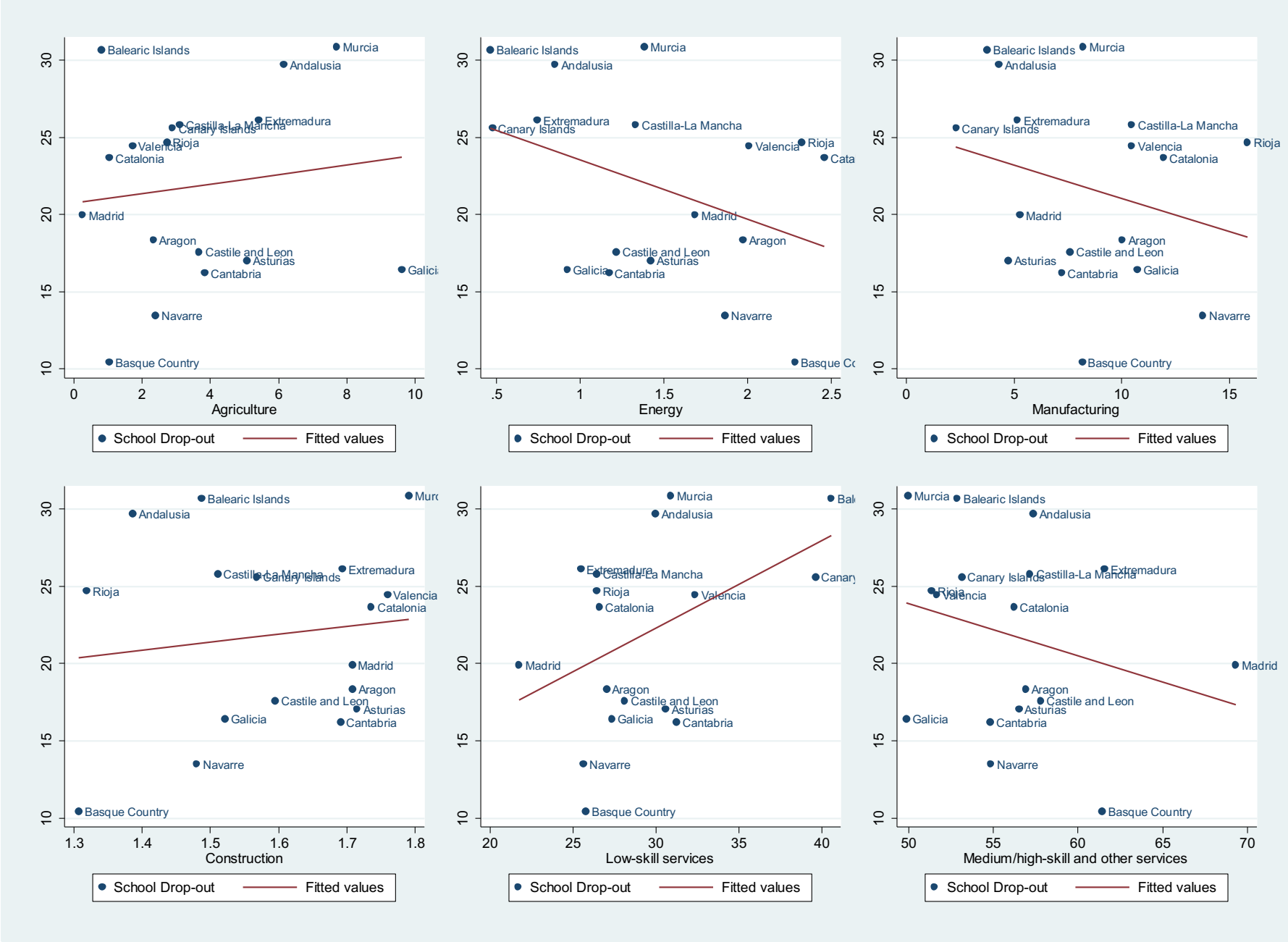
Figure 4

Regional employment share by industry vs. school dropout (Boys)



Source: Employment (Labor Force Survey 2002-2016), school dropout (Eurostat)

Figure 5
Regional employment share by industry vs. school dropout (Girls)



Source: Employment (Labor Force Survey 2002-2016), school dropout (Eurostat)