
Does the Economic Productive Structure Determine Early School Leaving Rates? Evidence from Spanish Regions, 2000-2013

¿Determina la estructura productiva el abandono educativo temprano? Evidencia de las Comunidades Autónomas españolas, 2000-2013

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Resumen: En este trabajo analizamos en qué medida la especialización de las economías regionales en sectores productivos intensivos en mano de obra no cualificada cuentan con tasas de abandono escolar prematuro más elevadas en sus sistemas escolares. Utilizando un panel de datos con las 17 Comunidades Autónomas españolas (2000-2013), encontramos una fuerte evidencia empírica de que aquellas que se especializan en sectores como la industria, la construcción, la agricultura o los servicios (excluidos los servicios del sector público) tienen tasas más altas de abandono escolar, frente a aquellos donde el sector público es más importante. Nuestros resultados com-

plementan los estudios basados en microdatos de los determinantes de las tasas de abandono escolar prematuro, que se centran en las preferencias individuales, el estado civil de los padres y el entorno social. La conclusión que se puede sacar de nuestro estudio es que las políticas educativas dirigidas a reducir las tasas de abandono educativo temprano deben diseñarse considerando la estructura productiva de las regiones donde se implementarán.

Palabras clave: Estructura productiva, Trabajadores no cualificados, Tasas de abandono educativo temprano, Demanda de educación, Datos de panel.

Abstract: In this paper, we analyse to what extent regional economies' specialization in unskilled-intensive productive sectors accounts for higher early school leaving rates in their school systems. Using panel data for 17 Spanish autonomous regions (2000-2013), we find strong empirical evidence to support the fact that regional economies specializing in sectors like the construction industry, agriculture and services (excluding the public sector) have bigger school drop-out rates than those where the public sector is more important. Our results complement those of microdata-based studies of the determinants of early school

leaving rates that focus on individual preferences, the parental status and social framework. The conclusion that can be drawn from our study is that education policies aimed at reducing school drop-out rates should be designed to take the productive structure of the regions where they will be implemented into consideration.

Keywords: Productive structure, Unskilled workers, Early school leaving rates, Education demand, Panel data.

INTRODUCTION

In the literature on human capital, there is a consensus that education is positively correlated with income. This correlation has two different sources. On the one hand, it is widely accepted that higher education levels are associated with lower unemployment rates and higher wages. On the other, wealthier families tend to invest more in education and, consequently, richer economies are likely to have a greater portion of workers with a higher education. Indeed, in Romer (1989), Becker and Tomes (1986) and other studies, it has been proven that human capital is one of the sources of future economic growth. These studies are run using cross-country macroeconomic data and they test whether the GDP is related to several human capital indicators (years of schooling, % of total or working population with secondary school studies, etc.).

However, some regional economies seem to defy this well-accepted result. For instance, in Spain, some regions specializing in tourism can be observed to display a higher per capita GDP and lower unemployment rates, combined simultaneously with higher levels of school-failure and drop-out rates and high ratios of unskilled workers. In contrast, regions with more relevant public and financial sectors achieve better results in these last variables. The Balearic Islands are a clear example of this first scenario. Macro data for the region shows that the per capita GDP has been well above the Spanish average since the eighties, while its education indicators have remained below average throughout the same period. For instance, the data for 2008¹ shows that the Balearic Islands had an 89% school enrolment rate for fifteen-year-old students (as opposed to 99.7%

1 Although data is available for the period 2009-2017, we do not provide it because it is clearly affected by the economic downturn. Source: Spanish Ministry of Education, for further detail see the appendix.

for the whole of Spain), together with a significantly lower rate of 81.7% for sixteen year olds (as opposed to 92.8% for Spain as a whole) and an even lower rate of 63.3% for seventeen year olds (77.8% for Spain), when education is no longer compulsory.

In this paper, we analyse to what extent a region's productive structure explains regional differences in school drop-out rates. The abundant available literature on the subject of drop-out rates suggests that the solution to this issue is multidimensional. It cannot be understood in a contextual vacuum. In fact, in its 2013 report "Reducing early school leaving: key messages and policy support", the European Commission states that early school leaving "is a result of personal, social, economic, educational or family-related reasons".

This paper addresses the issue of early school leaving from a macro-economic perspective in order to shed light on how market conditions (e.g. the productive structure) influences the education demand or social commitment to education. Our approach should be understood as helping to complement the literature that focuses on analysing the provision of education.

We believe the issue to be a relevant one for several reasons. First because, as documented by Serrano (1999), changes in levels of human capital determine regional economies' potential to adapt to new competitive scenarios in a global economy in which the sustainability of regional economies with traditional productive sectors is at risk. An additional problem associated with high school drop-out rates in economies dependent on unskilled-intensive productive sectors is the lack of skilled workers to help develop alternative productive sectors that might foster economic growth, thus reproducing the effects of poverty-traps. More specifically, a region's productive structure and the ratio of skilled/unskilled workers in each of its sectors will have a clear impact on students with a strong preference for immediate earnings and students who are very risk adverse in terms of employment opportunities, despite their low level of training.

Lastly, it is important to add that a person's level of education has several implications on their individual welfare because unskilled labour is associated with low salaries, higher employee turnover rates, an informal sector with a stronger presence and, from a dynamic perspective, lower pensions. In fact, according to the European Commission (2013), early school leaving is linked to unemployment, social exclusion, and poverty.

Our main finding is that we provide strong empirical evidence of higher early school leaving rates in regional economies specializing in sectors like construction and agriculture, as opposed to those in which the public sector has a more important presence. Our results complement those of microdata-based studies of the

determinants of early school leaving rates that focus on individual preferences, the parental status and social framework.

This paper is organized as follows. In the next section, we review the literature on the subject and put forward some arguments relating to early school leaving rates and regional productive structures. In section 3, a presentation is given of the data and, in section 4, we present the results of the econometric analysis for Spain during the period 2000-2013. Finally, our conclusions are given in section 5.

LITERATURE

This paper aims to contribute to literature on school failure and early school leaving by analysing the issue from a macroeconomic perspective as an alternative to most contributions based on a microeconomic approach.

Most literature that uses Spanish data to analyse the determinants of school failure or school drop-out rates is mainly based on analyses of household or student microdata containing information on family income, individual characteristics, socio-economic variables and education levels (see Calero, Choi and Waisgrais, 2010, Casquero and Navarro, 2010, and Fernández and Rodríguez, 2008). Indeed, very often the variables are not validated by theoretical models but instead they are based on *ad hoc* perceptions. The main finding common to most of them is that the parents' socioeconomic status seems to have an effect on school failure. In addition to this, Calero et al. (2010) and Fernández and Rodríguez (2008) find gender differences.

The robustness of these variables is confirmed when the determinants of the education demand is analysed both from a national perspective and an international one. On the one hand, in Spain, Martínez-Grada and Ruiz-Castillo (2002), Petrongolo and San Segundo (2002), Marcenaro and Navarro (2001) and Beneito, Ferri, Moltó and Uriel (2001) provide some evidence that the family background and socioeconomic status do affect the education demand. From an international perspective, numerous contributions can be found that analyse the education demand and role played by family budget constraints from an empirical point of view (see Chevalier and Lanot, 2002; Acemoglu and Pischke, 2000; Becker and Tomes, 1986), together with family characteristics such as the socio-economic status or parents' level of education (see Cameron and Heckman, 1998 and 1999, Ermish and Pronzato, 2010, etc.).

However, none of these contributions take into account regions' productive structures as an explanatory variable. The only variable that might be related to market conditions is the unemployment rate, which is found to have a positive

impact on the education demand, at least in Casquet (2003) and Petrongolo and San Segundo (2002).

However, to our knowledge, only Alegre and Benito (2010) analyse the determinants of school drop-out rates from a macroeconomic perspective, based on a sample of European countries. They conclude that there is no correlation between public expenditure and early school leaving rates. Their results also indicate that vocational education can foster student continuity in schools compared with education systems with a highly academic focus.

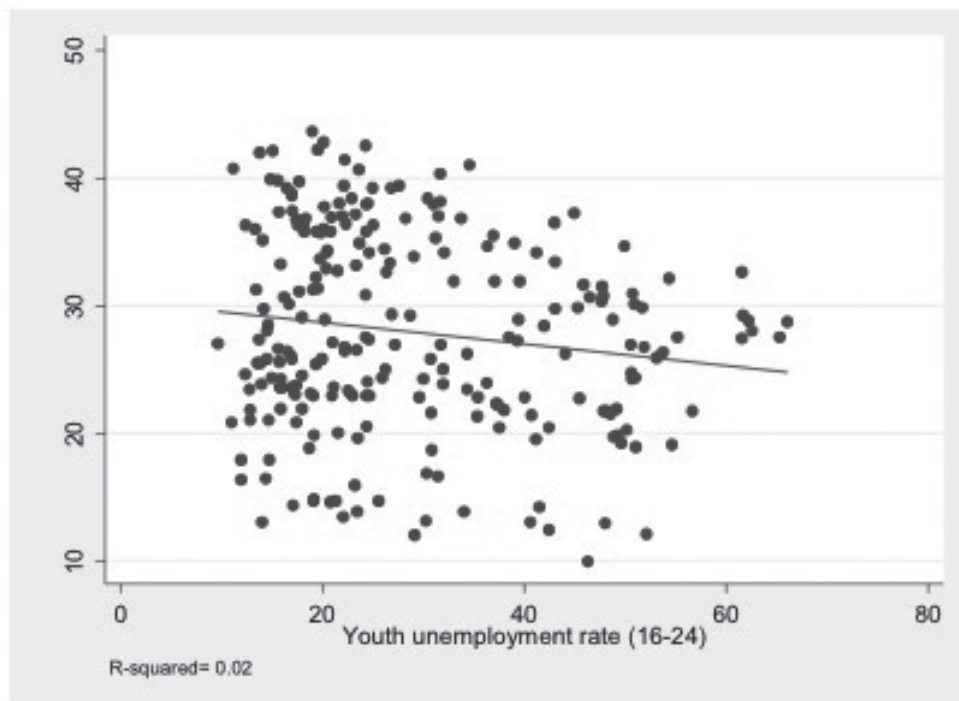
Finally, mention must also be made of other contributions that analyse school failure marginally related to the approach we take. For instance, Felgueroso, Gutiérrez-Domènech and Jiménez Martín (2013) analyse to what extent institutional factors in Spain explain the deceleration in the reduction in school failure rates that had been occurring since the seventies. Last of all, Adame and Salvà (2010) and García, Casal, Merino and Sánchez Gelabert (2011) analyse the determinants of early school leaving, taking a biographical approach to Spanish students, aimed at reconstructing their personal and educational pathways and choice between employment or remaining in education.

We thus believe that the relationship between school drop-out rates and market conditions is a field yet to be explored, deserving more attention from researchers. There are, however, significant difficulties involved in this approach due to a lack of previous results that can be used for comparative purposes and lack of regional data to test all of our hypotheses.

Market conditions and early school leaving rates

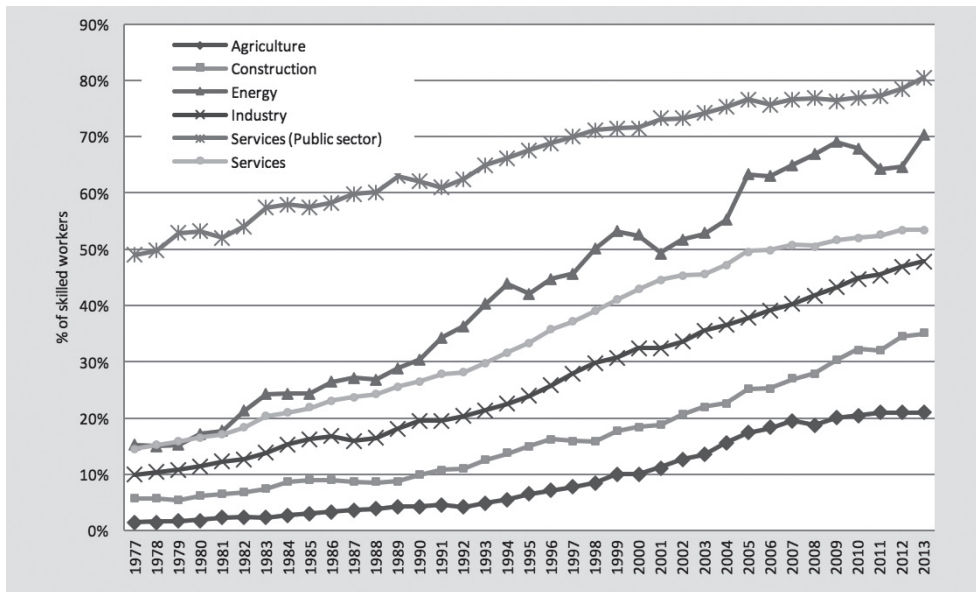
In the previous section, we mentioned several contributions that found a positive relationship between unemployment rates and the education demand. The argument is that, in a framework in which access to the labour market is hard for unskilled workers, they will tend to continue their education in the hope that they will have better opportunities if they are more skilled. This decision is also conditioned by students' preference for an income now or in the future, as well as their degree of risk aversion.

The data in Figure 1 indicates that the youth unemployment rate is negatively correlated with the school drop-out rate. A low youth unemployment rate boosts the opportunity cost of studying and crowds youngsters out of higher education into the labour market.

Figure 1. Early School Leaving rates vs. unemployment rates

Source: Own elaboration using Labour Force Survey (see the appendix for more details)

In addition to this, we know that each of an economy's productive sectors has a different demand for skilled or unskilled workers. For instance, the public and energy sectors are characterized by a higher-than-average share of skilled workers. In contrast, the agricultural and construction sectors have a larger share of unskilled workers, as shown in Figure 2.

Figure 2. Share of skilled workers across productive sectors

Source: Own elaboration using IVIE data on human capital

We argue that regions specializing in sectors with a high level of unskilled labour crowd students out of the education system, leading to higher school drop-out rates and lower numbers of students that complete the non-compulsory stage of secondary education. In contrast, in regions specializing in sectors with a demand for medium or highly skilled workers (with at least compulsory secondary school studies or higher education studies respectively), young students are driven to remain in the education system because they will have no access to employment unless they achieve a minimum level of education. In addition to this, we argue that gender differences may also exist, since the distribution of males and females across productive sectors is uneven.

Our study has several limitations, due to the lack of data. We have to admit that in each sector there is a lot of heterogeneity. On the one hand, the industry sector includes activities which demands high skill workers (like companies producing pharmaceutical products) together with those that basically hire non-qualified workers (like the textile and mining industries). Table 1 uses data from the Wage Structure Survey from 2010 and illustrates this phenomenon. Unfortu-

nately, data of the Wage Structure Survey cannot be used in the estimations because is only conducted every four years at the national level and does not provide data at the regional level. Still, table 1 shows how hospitality has the highest rate of non-qualified workers (aprox. 80%). There are other activities like construction, manufacturing of food, drink, tobacco, textiles, wearing apparel and leather or mining and quarrying that present ratios of workers without post-compulsory studies above 70%. On the other hand, financial services, education and information and communication hire educated workers (more than 80% of the workers have some studies after the compulsory education²). These data, although it cannot be introduced in the empirical analysis, suggest that the composition of the production sector across regions influences the demand of low/high skill workers in those regions and that this may have an effect on students' decisions based on the possibilities that they have to access the labour market according to their skills.

Table 1. Economics activities and workers education

NATIONAL CLASSIFICATION OF ECONOMIC ACTIVITIES	CNACE POST-COMPULSORY STUDIES	
	Without	With
Mining and quarrying	74.28	25.72
Manufacturing of food, drink, tobacco, textiles, wearing apparel and leather	74.35	25.65
Manufacture of wood and paper	70.91	29.09
Printing and reproduction of recorded media	62.4	37.61
Manufacture of coke, chemicals, pharmaceutical products and rubber and plastic products	50.89	49.09
Manufacture of other non-metallic mineral products	70.52	29.49
Manufacture of metals	67.36	32.65
Manufacture of computer, electronic, electrical equipment and machinery and equipment	49.24	50.76
Manufacture of motor vehicles, transport equipment, furniture	61.42	38.59
Electricity, gas, steam and air conditioning supply	23.12	76.88
Water, Sewerage, disposal activities; materials recovery and waste management services	72.3	27.7
Construction	72.79	27.21
Wholesale and retail trade and repair of motor vehicles and motorcycles	58.11	41.89
Retail trade, except of motor vehicles and motorcycles	65.17	34.83
Transport	71.83	28.16
Storage and mailing	58.2	41.81
Hospitality	79.77	20.24

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2. We also computed the same table for the year 2006 with similar results. The information is available upon request.

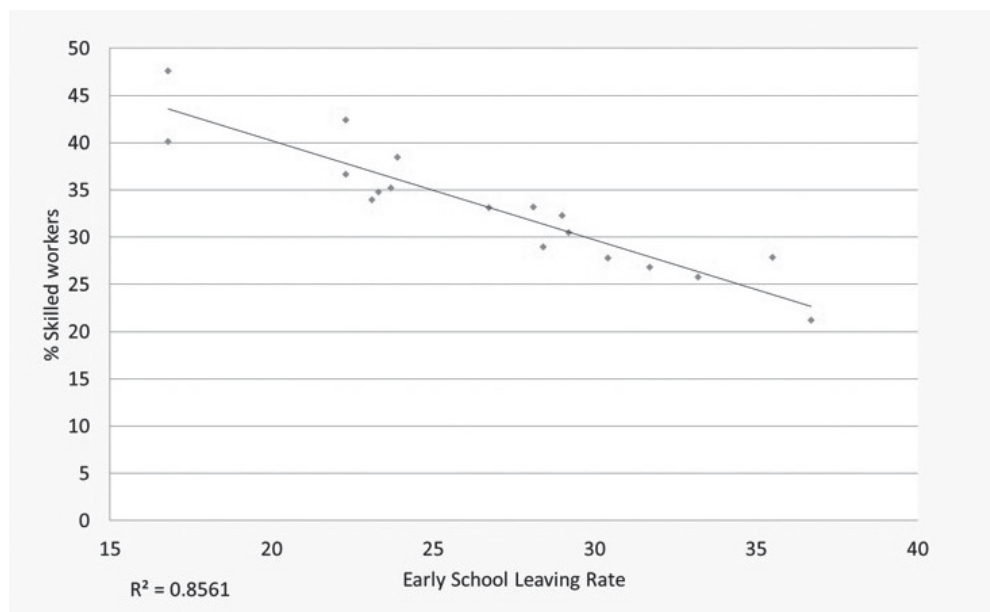
DOES THE ECONOMIC PRODUCTIVE STRUCTURE DETERMINE EARLY SCHOOL LEAVING RATES?

NATIONAL CLASSIFICATION OF ECONOMIC ACTIVITIES	CNACE	POST-COMPULSORY
		STUDIES
Information and communication	16.48	83.52
Financial services	11.36	88.64
Real estate activities	46.21	53.79
Legal and accounting activities, professional activities and technical activities	19.96	80.03
Administrative services	72.48	27.52
Public administration and defence; compulsory social security	39.5	60.49
Education	13.6	86.4
Health system	41.35	58.66
Arts, entertainment and recreation	51	49.01
Other services	56.08	43.93

Source: Own calculations using the microdata of the Wage Structural Survey for 2010

Figure 3 also suggests that the early school leaving rate is negatively associated with the percentage of skilled workers in an economy.

Figure 3. Skilled workers rate and Early School Leaving



Source: Own elaboration using Labour Force Survey (see the appendix for more details)

We intend to contribute to empirical literature on early school leaving by estimating panel data for 17 Spanish regions during the period 2000-2013, using two different definitions of the term productive structure. On the one hand, we estimate the relationship between early school leaving rates and a region's productive structure, considering the labour force's distribution across the economy's productive sectors and several other control variables. On the other hand, the same relationship is estimated based on the distribution of the regional GDP across the region's productive sectors.

Although we find that the economic structure influences early school leaving rates, the available data cannot be disentangled to identify how this occurs. Unfortunately, we cannot shed light on the extent to which regional differences in early school leaving rates are explained by regional differences in school opportunities, or to what extent high unemployment rates in a region are explained by the reticence of firms to operate in places with a lack of medium to highly skilled workers. Finding the answer to these questions goes beyond the scope of this paper although some clues can be found in the literature mentioned in the previous paragraphs.

DATA

The data (see the appendix for a description) was obtained from the Spanish National Institute of Statistics. More specifically, the unemployment rates and data for the distribution of the labour force across productive sectors is taken from the Spanish Labour Force Survey (the EPA according to its Spanish acronym), while the data on the regions' productive structure was obtained from Spain's Regional Accounts (or CRE in Spanish).

Lastly, the data on early school leaving rates is from the Spanish Ministry of Education. The early school leaving rate is defined as the share of 18 to 24 year old persons who have at most lower secondary education and are not in further education and training.

Tables 2 and 3 present the mean values of the variables used in our estimates for each region for the period 2000-2013. Table 2 also shows the per capita GDP (the GDP_{pc} , hereafter).

Table 2. Descriptive statistics (mean values). Early school leaving rates and GDP by region across productive sectors

REGION	EARLY SCHOOL LEAVING (ESL)	ESL MALES	ESL FEMALES	AGRICULTURE	INDUSTRY	CONSTRUCTION	COMMERCE	FINANCE	PUBLICADM.	PER CAPITA GDP
Andalucia	35.57	41.31	29.62	0.06	0.13	0.13	0.26	0.19	0.24	16,132
Aragon	23.40	28.46	18.14	0.05	0.23	0.12	0.24	0.15	0.20	22,970
Asturias	22.26	27.72	16.63	0.02	0.23	0.13	0.24	0.17	0.21	18,845
Balearic Islands	37.98	44.86	30.72	0.01	0.08	0.12	0.41	0.20	0.18	23,344
Canarias	32.44	38.75	26.04	0.01	0.08	0.11	0.38	0.19	0.23	19,135
Cantabria	22.76	28.91	16.37	0.03	0.21	0.13	0.24	0.18	0.20	19,842
Castilla Leon	23.75	30.06	17.14	0.09	0.21	0.14	0.21	0.13	0.23	19,672
Castilla-La Mancha	34.88	43.01	26.19	0.07	0.21	0.12	0.22	0.16	0.23	17,035
Catalonia	30.04	36.06	23.76	0.01	0.23	0.10	0.30	0.19	0.17	25,109
C. Valenciana	31.26	37.41	24.93	0.02	0.19	0.13	0.28	0.19	0.19	19,279
Extremadura	35.06	42.79	26.95	0.08	0.12	0.15	0.21	0.14	0.30	14,254
Galicia	24.26	31.38	16.93	0.05	0.21	0.13	0.24	0.16	0.21	17,926
Madrid	23.40	27.42	19.33	0.00	0.12	0.10	0.34	0.24	0.19	28,360
Murcia	36.86	42.56	30.74	0.06	0.17	0.12	0.26	0.17	0.22	17,636
Navarre	16.96	20.48	13.32	0.03	0.30	0.10	0.22	0.14	0.20	26,393
Basque Country	14.05	17.69	10.26	0.01	0.28	0.10	0.25	0.16	0.19	26,849
Rioja	29.44	34.39	24.23	0.07	0.28	0.11	0.21	0.15	0.18	22,914
Spain	29.36	35.14	23.36	0.03	0.18	0.12	0.28	0.19	0.20	21,221

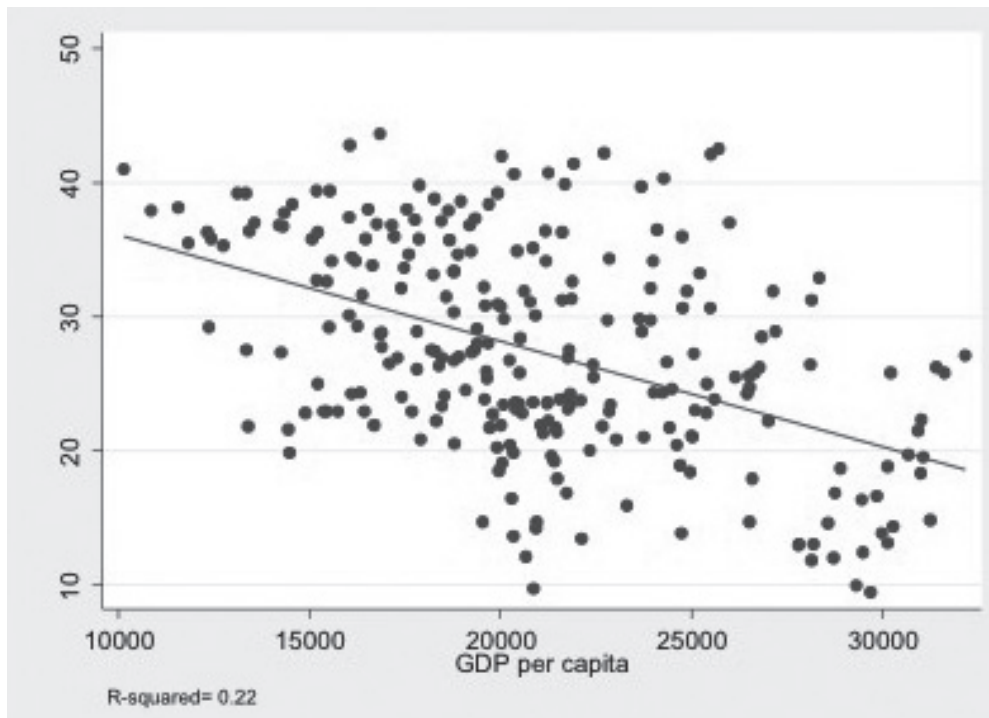
Source: Own elaboration (see the appendix for more details)

The data in the previous table clearly indicates gender differences in early school leaving rates, with higher rates for males in all the regions. It is therefore important to test for gender differences in our estimates.

As expected, the data shows a negative correlation between the GDP_{pc} and early school leaving rate (see Figure 4), albeit with notable differences across the regions. On the one hand, the Balearic Islands stand out as having the highest early

school leaving rate even though this is Spain's 5th richest region (10% above the national average), with a below-average youth unemployment rate. On the other, Asturias has one of the lowest early school leaving rates (only above the Basque Country and Navarre, whose regional governments have a special financing agreement with Central Government), while its GDP_{pc} is 11% below the Spanish average and its youth unemployment rate is above average.

Figure 4. GDP pc versus Early School Leaving rates

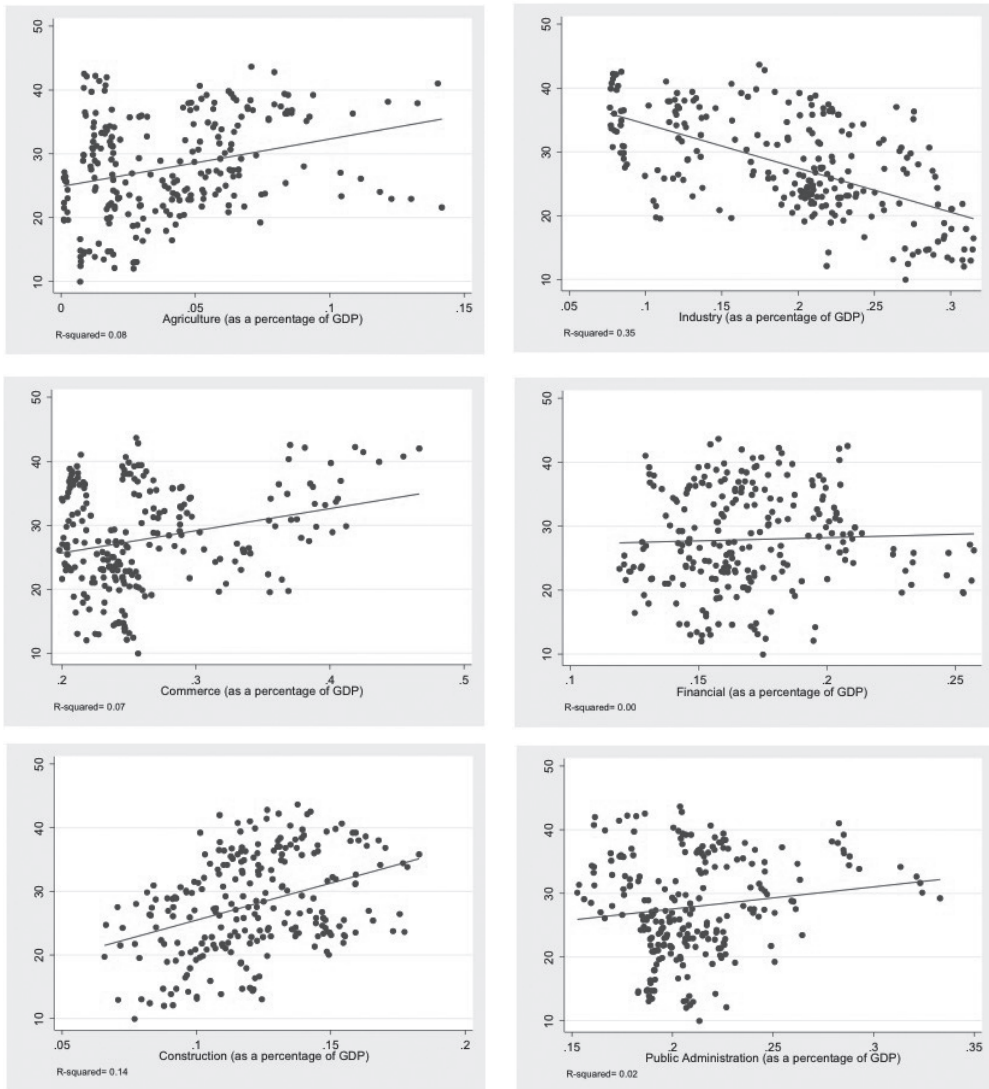


Source: Own elaboration using data from the INE (see the appendix for more details)

We argue that these considerable differences might be explained by differing economic structures. For instance, the Balearic region specializes heavily in tourism (the commercial sector accounts for 41% of the GDP, the highest share in Spain compared to the national average of 28%). In addition to this, in the Balearic Islands, industry represents only 8% of the region's total GDP. In contrast, in Asturias, industry accounts for 23% of the GDP, well above the Spanish average (18%).

In Figure 5, we show the relationship between early school leaving rates and various different productive sectors for all the autonomous regions.

Figure 5. Relationship of the Early School Leaving rates with youth unemployment and GDP for some productive sectors



Source: Own elaboration using data from the INE (see the appendix for more details)

These figures suggest the relationships that we test for in the econometric analysis outlined in the following section: namely, that when agriculture and construction account for a larger share of the GDP, this seems to have a positive correlation with high drop-out rates in schools, whereas when industry accounts for a larger share, the opposite occurs.

We reach similar conclusions when an analysis is made of the distribution of the labour force across productive sectors. Table 3 shows the labour hours per sector as a ratio of the total labour hours in each regional economy. The differences are even bigger when employment in the service sector is compared with employment in industry. This might be due to the fact that some of the subsectors that integrate the service sector, such as tourism and the commercial sector, are generally labour intensive when compared with industry. In the Balearic Islands, 42% of the labour force works in the service sector, while 7% works in industry. That is, 6 times more people are employed in services. Asturias' commercial sector (30%) also accounts for more employment than industry (16%), but in this case the figure is less than double.

Table 3. Descriptive statistics (means). Hours of work in each economic sector (%) and youth unemployment by region

	AGRICULTURE	INDUSTRY	CONSTRUCTION	COMMERCE	FINANCE	PUBLIC ADM.	YOUTH UNEMP. (YU)	YU MALES	YU FEMALES
Andalucia	0.09	0.10	0.13	0.30	0.11	0.27	38.28	35.42	42.18
Aragon	0.08	0.19	0.11	0.27	0.10	0.24	23.34	21.99	25.20
Asturias	0.06	0.16	0.13	0.30	0.11	0.24	31.98	29.69	35.13
Balearic Islands	0.02	0.07	0.16	0.42	0.11	0.22	26.01	25.66	26.50
Canary Islands	0.03	0.06	0.14	0.40	0.12	0.26	35.44	33.77	37.61
Cantabria	0.07	0.16	0.14	0.28	0.10	0.25	27.15	23.87	31.19
Castilla Leon	0.16	0.22	0.14	0.24	0.08	0.24	28.96	24.61	35.00
Castilla-La Mancha	0.09	0.12	0.12	0.25	0.09	0.26	29.22	25.50	34.45
Catalonia	0.03	0.20	0.11	0.32	0.14	0.21	27.26	28.28	26.15
C. Valenciana	0.03	0.19	0.13	0.31	0.11	0.22	30.35	28.78	32.39
Extremadura	0.14	0.09	0.14	0.26	0.08	0.29	36.56	30.90	44.37
Galicia	0.10	0.17	0.12	0.28	0.10	0.24	28.96	25.57	33.63

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	AGRICULTURE	INDUSTRY	CONSTRUCTION	COMMERCE	FINANCE	PUBLIC ADM.	YOUTH UNEMP. (YU)	YU MALES	YU FEMALES
Madrid	0.00	0.10	0.11	0.33	0.19	0.27	26.30	25.80	26.89
Murcia	0.10	0.15	0.13	0.28	0.10	0.24	28.85	26.57	32.06
Navarre	0.06	0.25	0.11	0.23	0.10	0.24	21.81	19.78	24.39
Basque Country	0.02	0.24	0.10	0.28	0.12	0.24	26.89	25.84	28.22
Rioja	0.11	0.24	0.12	0.23	0.09	0.21	25.24	21.60	30.05
Spain	0.05	0.15	0.12	0.30	0.12	0.24	30.66	28.93	32.94

Source: Own elaboration using data from the INE (see the appendix for more details)

Table 3 also shows that differences in the economic structures are associated with different unemployment rates. By way of an example, in the Balearic Islands, the youth unemployment rate is below the national average with quite a small gap between males and females. In contrast, Asturias has an above-average youth unemployment rate (32%), with a larger gap between males and females.

In Table 4, it is shown the share of skilled workers for each region and for each sector in 2000 and 2013. The data comes from the Human Capital Database constructed by the IVIE (see more details in the appendix). Some conclusions can be extracted. First, the education level of the workers increases during that period. Second, Madrid, the Basque Country and Navarra tend to have a higher portion of skilled workers. On the other hand, Extremadura and Castilla la Mancha are the regions with less qualified workers. If we focus in the sectors instead of the regions, the public sector hire the highest portion of skilled workers, followed by the Energy sector. Meanwhile, agriculture basically employs non-qualified workers (followed by construction). A notable difference can be seen in the share of skilled workers in each region's productive sectors. For example, skilled workers make up 73% of the Balearic public sector's labour force in 2013, as opposed to 81% in Asturias. In addition, in the Balearic Islands, skilled workers represent 46.6% of all service sector workers in comparison with 59.1% in Asturias. These differences might be due to the composition of the corresponding subsectors in these regions (i.e. financial versus commercial services) or to the different demand for skilled and unskilled workers in each subsector.

Table 4. Share of skilled workers across productive sectors (%)

SECTOR	AGRICULTURE		CONSTRUCTION		ENERGY		INDUSTRY		SERVICES (PUBLIC SECTOR)		SERVICES	
	AACC / year	2000	2013	2000	2013	2000	2013	2000	2013	2000	2013	2000
Andalucía	7.8	17.2	15.4	30.4	52.6	70.6	23.4	38.9	67.4	74.9	35.7	45.3
Aragón	11.4	26.3	19.9	29.8	36.8	66.4	29.1	50.5	71.6	80.9	44.4	54.3
Asturias	10.6	24.9	24.1	35.2	23.9	64.0	37.1	58.1	72.1	81.4	41.4	59.1
Baleares	7.6	41.8	12.7	21.7	35.8	58.0	21.7	30.7	68.1	73.4	36.5	46.6
Canarias	10.2	31.8	14.0	34.3	36.9	47.7	24.7	43.4	67.5	77.9	35.2	45.5
Cantabria	7.8	15.5	21.3	37.5	44.7	65.6	35.2	52.4	66.5	83.7	43.4	54.2
C. La Mancha	8.6	17.3	11.8	24.0	47.2	55.9	15.4	33.5	64.7	76.0	31.2	46.4
Castilla y León	10.4	26.2	14.4	30.2	35.8	75.6	31.5	50.4	77.2	79.3	40.4	53.5
Cataluña	14.1	21.1	19.7	31.9	65.7	67.8	30.9	43.8	75.4	82.1	46.2	53.5
Extremadura	9.7	12.4	7.8	19.1	55.9	58.4	21.3	30.4	69.0	66.7	31.4	41.7
Galicia	6.6	14.5	12.2	28.3	35.8	73.1	24.8	38.4	70.7	81.9	37.8	50.3
La Rioja	17.8	27.2	13.4	35.7	66.2	69.9	22.8	43.8	73.3	81.8	43.6	56.0
Madrid	39.7	57.6	33.7	58.3	73.4	85.3	46.7	71.3	72.5	85.6	55.7	66.8
Murcia	8.2	18.9	12.1	26.7	66.8	82.0	22.9	42.8	79.3	83.3	35.1	44.7
Navarra	16.2	26.0	24.3	31.8	77.6	56.5	33.9	48.7	78.9	82.3	47.8	60.2
País Vasco	32.9	24.7	26.2	39.8	80.2	81.1	45.4	60.9	77.0	88.4	51.0	61.6
C. Valenciana	10.9	18.4	16.8	40.4	47.6	71.9	22.6	37.3	72.0	85.6	37.3	50.7
ESPAÑA	10.0	21.0	18.4	35.0	52.4	70.3	30.7	46.9	71.6	80.5	42.8	53.5

Source: Own calculations using Human Capital database from IVIE

Unfortunately, although it would be interesting to use data for skilled and unskilled workers broken down at a subsector level, this information is not available. The same applies to employment across productive subsectors. This lack of data limits the scope of our analysis.

ESTIMATES

The estimates were run using balanced panel data for 17 Spanish autonomous regions for the period 2000-2013³ (2012 if the explanatory variable is the distribution of employed workers across each region's productive sectors). Using panel data increases the number of observations and ensures more accurate results. In addition, it allows us to control for the region-specific effects of unobserved heterogeneity (this means that there is no need to include variables in the regression that are region specific and constant over time). We exclude Ceuta and Melilla because the information is incomplete and inaccurate for some years and variables.

In our estimates, we opt for the most prudent criterion, assuming a correlation between the unobserved effect and explanatory variables, and a fixed effects estimator is used, which means that all our estimates are consistent and unbiased. Under the assumption of no correlation between the specific effect and remaining independent variables, the random effects estimator is consistent (asymptotically normally distributed as N grows with a fixed T) and efficient. However, the estimator is biased if unobserved heterogeneity is dependent on the explanatory variables. In our case, the Hausman test indicates that there are significant differences between the coefficients of the fixed and random effects estimators, making the former the best option. For further details on the properties of the two estimators, see chapter 14 of Wooldridge (2009).

We present the results for both the ordinary standard errors and robust standard errors (the coefficients do not change but their significance does). We use them to make valid statistical inferences about our coefficients, even though our data is not identically distributed.

The results shown in Tables 5 and 6 must be interpreted taking into account several factors.

First, Table 5 shows the estimates of an OLS procedure to find each productive sector's contribution to the regional GDP (the explanatory variable), while Table 6 shows each productive sector's labour hours as a ratio of the regional economy's total figure. Second, the results in columns (4) to (6) of Tables 3 and 4 show the estimates when robust errors are taken into consideration. Finally, a regression is estimated for the whole sample (columns 1, 4) and then separately estimated, taking the drop-rates for males (columns 2, 5) and females (columns 3, 6).

3 The INE does not provide data about our main variables before 2000. In addition to that, 2013 was the last year with data available on these variables when the first version of the paper was written.

An explanatory variable with a positive sign indicates that the higher (lower) sector X's share of the total GDP is, the more likelihood there will be of higher (lower) early school leaving rates, in comparison with the public sector.

Table 5. Fixed effects regression of productive sectors on ESL

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	EARLY S. LEAVING (ESL)	MALE ESL	FEMALE ESL	ESL	MALE ESL	FEMALE ESL
Agriculture/GDP	61.44*** (18.16)	81.41*** (24.00)	40.28* (20.59)	61.44 (39.87)	81.41** (38.25)	40.28 (46.12)
Industry/GDP	-36.49 (24.66)	-34.42 (32.58)	-42.45 (27.95)	-36.49 (28.23)	-34.42 (28.64)	-42.45 (36.80)
Construction/GDP	90.70*** (18.32)	124.3*** (24.20)	53.48** (20.76)	90.70*** (27.01)	124.3*** (34.14)	53.48* (27.50)
Commerce/GDP	7.778 (27.37)	15.14 (36.16)	-0.586 (31.02)	7.778 (32.18)	15.14 (45.34)	-0.586 (42.21)
Finances/GDP	-106.5*** (37.65)	-153.2*** (49.74)	-61.24 (42.67)	-106.5* (57.87)	-153.2** (64.50)	-61.24 (61.30)
Constant	37.50* (19.74)	44.03* (26.08)	32.49 (22.38)	37.50 (26.13)	44.03 (30.44)	32.49 (30.27)
Observations	238	238	238	238	238	238
R-squared	0.566	0.589	0.274	0.566	0.589	0.274
N. Regions	17	17	17	17	17	17
Period	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013
F	56.36	61.88	16.29	23.64	31.05	7.833

Standard errors in parentheses. The weight of the Public Administration in the GDP is the reference value.

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

Based on the above, the coefficients for the agricultural and construction sectors in column 1 of Table 5 can be seen to be significant and to display a positive sign, thus indicating that the bigger these sectors are, the higher the early school leaving rates, in comparison with the public sector. In contrast, the financial sector is significant but displays a negative sign, suggesting that the bigger this sector is, the lower the early school leaving rate.

Some changes occur if robust standard errors are considered when the estimates are run. In this case (column 4), the variable for the agricultural sector is not significant while the financial and construction sectors are still significant and they maintain their initial signs.

What is more, our estimates (see columns 2, 3, 5 and 6 of Table 5) suggest that gender differences exist. On the one hand, the type of productive structure seems to have a greater impact on drop-out rates in the case of males, as suggested by the fact that the coefficients are lower for females. We also observe that the coefficient associated with the financial sector is not significant for females, although it is when males alone are considered. These results do not change when estimates based on robust standard errors are considered, although the confidence intervals are longer and the significance of some coefficients is lower.

Table 6. Fixed effects regression of employment in productive sectors on ESL

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	EARLY S. LEAVING (EL)	MALE ESL	FEMALE ESL	ESL	MALE ESL	FEMALE ESL
Agriculture employment (over total employment)	48.38** (21.79)	64.02** (28.97)	34.33 (23.87)	48.38 (35.11)	64.02 (39.65)	34.33 (36.73)
Industry employment (over total employment)	33.63 (25.96)	69.32** (34.51)	-6.125 (28.44)	33.63 (38.08)	69.32 (48.79)	-6.125 (40.27)
Construction employment (over total employment)	104.6*** (15.64)	136.6*** (20.79)	70.74*** (17.13)	104.6*** (24.92)	136.6*** (33.91)	70.74** (26.60)
Commerce employment (over total employment)	82.87** (37.61)	85.72* (49.99)	84.56** (41.20)	82.87* (46.61)	85.72 (56.93)	84.56 (64.58)
Finance employment (over total employment)	40.35 (37.33)	78.19 (49.62)	-2.707 (40.89)	40.35 (60.23)	78.19 (78.48)	-2.707 (52.16)
Constant	-22.31 (20.56)	-32.09 (27.33)	-12.77 (22.52)	-22.31 (29.64)	-32.09 (37.65)	-12.77 (33.78)
Observations	221	221	221	221	221	221
R-squared	0.418	0.435	0.208	0.418	0.435	0.208
N. Regions	17	17	17	17	17	17
Period	2000- 2012	2000- 2012	2000- 2012	2000- 2012	2000- 2012	2000- 2012
F	28.60	30.67	10.44	25.31	13.56	9.381

Standard errors in parentheses. Hours of work in the Public Administration is the reference value.

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

The results of Table 6 suggest that there are slight changes when the distribution of the labour force across productive sectors is used as the explanatory variable. The main change is the fact that the variable associated with the financial sector is not significant in any of the estimates, while the coefficient associated with the service sector is positive and significant, suggesting again that this sector has a tendency to hire unskilled workers when compared with the public sector. The results do not change if the estimates are based on robust standard errors, except for the variable associated with the agricultural sector.

As for gender differences, these are found when robust standard errors are not considered (columns 2 and 3), because the agricultural and industrial sectors are significant for males but not for females. However, once robust standard errors are imposed, the gender differences are statistically irrelevant.

CONCLUSIONS

In this paper we estimate the relationship between early school leaving rates and explanatory variables associated with Spanish regions' productive structures.

We argue that regions specializing in sectors with a large share of unskilled workers crowd students out of the education system, leading to higher school drop-out rates. In contrast, in regions specializing in industrial sectors that require medium and highly skilled workers (with at least compulsory secondary school studies or a higher education qualification), young students tend to remain in the education system because they will have few chances of entering the labour market unless they achieve a certain minimum level of education.

There is strong empirical support to back up our arguments because our estimates indicate that early school leaving rates are positively associated with the agricultural, construction and service sectors, whose workforces are largely unskilled. On the other hand, a negative relationship was found between early school leaving rates and the variable representing the financial sector.

Our results suggest that education policies aimed at reducing early school leaving rates should be designed to take the productive structure of the regions in which they are going to be implemented into consideration. Nationwide policies can be expected to fail.

It is important to stress that although our initial results are interesting, we think that further research should be done. In particular, an analysis should be made of the determinants of gender differences, trying to disentangle whether the observed results are due to gender differences in access to the labour market by subsectors. Secondly, attempts must be made to work on data for the productive

sectors and their composition of skilled/unskilled workers, broken down at a sub-sector level. Unfortunately, this data is not yet available.

Fecha de recepción del original: 14 de junio 2015

Fecha de aceptación de la versión definitiva: 1 de octubre 2018

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APPENDIX. DATA

We use data from different sources. Most of the variables are from the Spanish National Institute of Statistics (INE), in particular the Spanish Labour Force Survey (EPA) and Spain's Regional Accounts (CRE).

Conducted since 1964, the EPA⁴ is a quarterly survey based on a sample of between 65,000 and 180,000 people. It is a highly representative sample, with detailed information on the labour market. This makes it a primary source in studies of the labour force. Unemployment rates and employment across productive sectors is also given in the EPA.

The data on the regions' productive structure was obtained from Spain's Regional Accounts (CRE). The INE uses the 1995 European System of Accounts (ESA) to obtain macroeconomic variables for Spain and its regions.

Our variable of interest, the early school leaving rate, is also provided by the EPA and it is available from the Spanish Ministry of Education. The Early School Leaving rate is measured by the share of 18 to 24 years old persons who have achieved at most lower secondary education and are not in further education and training. This is also the definition used by Eurostat.

Finally, the data on human capital is provided by IVIE⁵. This provides information on the level of education of all workers across the productive sectors for each Spanish autonomous region. Unfortunately, the IVIE and INE classifications of the productive sectors are slightly different. We construct data on skilled workers across the productive sectors, considering skilled workers to be ones with a higher education or higher vocational (FP2) studies. Unskilled workers are considered to be those without studies, with primary or compulsory secondary school studies.

4 More info at: http://ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736176918&menu=metodologia&idp=1254735976595

5 Fundación Bancaja and Ivie (Instituto Valenciano de Investigaciones Económicas). Capital Humano en España y su distribución provincial. Enero de 2014. Database available at: <http://www.ivie.es/es/banco/caphum/series.php>

DOES THE ECONOMIC PRODUCTIVE STRUCTURE DETERMINE EARLY SCHOOL LEAVING RATES?

VARIABLE NAME	SOURCE	DATA BASE	MORE INFO AT
Early School Leaving rates (ESL)	Spanish Ministry of Education	Labour Force Survey (EPA)	http://ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736176918&menu=metodologia&idp=1254735976595
Unemployment rate	INE	EPA	
Employment by sector	INE	EPA	
Gross domestic product (GDP)	INE	Regional Accounts	http://www.ine.es/dyngs/INEbase/en/operacion.htm?c=Estadistica_C&cid=1254736167628&menu=metodologia&idp=1254735576581
Productive sectors	INE	Regional Accounts	
Education of the workers	IVIE	Human capital	http://www.ivie.es/es/banco/caphum/series.php

