The effects of Spanish educational policies on school failure rates at the regional level

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Abstract

This paper undertakes a regional analysis of the effects of educational policies implemented in Spain between 1992 and 2003 on the rates of academic failure in schools. Specifically, we consider the incidence of expenditure per pupil, class-size and pupil-teacher ratio on regional dropout rates at the end of compulsory education, the percentage of students required to repeat one academic year or more, and the percentage of students who failed the university entrance examinations. Our results indicate that educational policies addressed to give further attention on pupils (reducing class-size or the pupil-teacher ratio) have higher effects on dropout and repetition rates than expenditure per pupil.

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1. Introduction

A number of recent studies have singled out serious problems of the Spanish educational system, especially those related to students' low performance compared to most European Union and OECD countries. Thus, in international comparisons, Spain has higher levels of school failure and school dropout, lower levels of skills and results in tests as well as in graduation in secondary education (OECD, 2004, 2006; MEC, 2006).

In order to improve students' performance governments have approved and implemented a great number of educational laws (we believe that there has been a period of over-legislation with six organic laws since 1985). These reforms from central government (the one with responsibilities on defining the educational system) universalized and expanded the length of compulsory education (from 14 to 16 years old) and reform the educational system to increase its quality. However, effects on students' performance are not satisfactory. In addition, these reforms have been accompanied by an intensive process of decentralization of administrative competences to regional governments (or Autonomous Communities, ACs), which in 2003 administered most of the educational budget (around 90%).

Performance problems are not equally distributed between the 17 ACs (MEC, 2006). Among other factors, observed differences are explained by specific characteristics of each AC (level of economic development, labour market characteristics, rural/urban distribution, rates of immigration, etc.) However, regional governments' educational policy might also have an incidence on educational results.

Therefore, the main goal of the present study is to examine the effects of educational policy instruments on educational performance at a regional level to find out which seem to be more effective. Specifically, we consider the effects of three policy instruments (expenditure per pupil, class-size and pupil-teacher ratio) on three

educational outcomes related to academic failure: regional dropout rates at the end of compulsory education (at age 16), the percentage of students required to repeat one academic year or more (at age 15), and the percentage of students who failed the university entrance examinations (at age 18).

As Hanushek (2003) shows, empirical evidence is not conclusive about the effectiveness of educational policies (including the three policies considered in this paper) on student performance. The reasons for this are twofold: first, the results are highly sensitive to the variables considered as well as to the econometric method implemented; second, policy effectiveness depends on local particularities (in terms of legislation, administration, etc.).

It should be stressed that this study is carried out in a period of disruption for Spanish education as, in the first half of 2006, a new law governing the educational system (with the exception of the universities, which are to be reformed during 2007) was passed. As indicated before, this coincided with the publication of international indicators revealing Spain's poor educational standing among fellow European Union and OECD countries with also significant differences between Spain's ACs. This is the first study to examine such data at the regional level in order to analyze the effects of those educational policy instruments on school failure. Likewise, we should highlight the fact that the paper generates a new variable for the regional expenditure per pupil.

In conducting the empirical analysis, a misspecification bias appears when omitting regional characteristics that are related to either educational policies or environmental features. The latter is exacerbated when working with aggregated samples and can produce misleading results because of the aggregation bias (Hanushek, 2003). Our aim is to avoid the omission of key environmental and regional variables and so we estimate panel data fixed effects in order that we might partially capture unobserved heterogeneity. Specifically, we use a generalized linear model as dependent variables range between 0-1. In addition, the analysis takes into consideration the endogeneity problem that may arise between educational outcomes and instruments.

Our results show to the presence of small statistically significant effects of increasing regional expenditure in education on reducing dropout at secondary or university

entrance exams; however, rather relevant significant effects arise from reducing class-size or pupil-teacher ratio on diminishing dropout rates at secondary education. However, these two instruments also increase repetition rates. The consequences for policymakers are quite simple: educational policies addressed to give further attention on pupils (reducing class-size or the pupil-teacher ratio) have higher effects on dropout and repetition rates than expenditure.

This paper is structured as follows. The next section describes the Spanish decentralization process on educational provision. Section 3 presents the data, while section 4 describes the econometric strategy adopted in undertaking the empirical analysis. Section 5 shows our results and the final section draws some conclusions from these findings.

2. Spanish decentralization and regional educational provision

We have chosen to conduct the analysis at the regional level so as to identify regional differences in school failure rates but, more importantly, because responsibility for education in Spain was gradually transferred from central to regional governments during the period under analysis (1992-2003). Thus, although there is a common legal framework for the whole country, governments of regions or 'Autonomous Communities' (AC) are also allowed to legislate on certain matters of education. In addition, these governments administer most of the educational budget: overall central and regional government expenditure, in 2003, ACs spent 95.4% while this percentage was only 60.2% in 1992.

This high degree of decentralization has not only occurred in education but in the majority of social policies, the administration of which has been transferred to the regional governments (see Arze, Martinez-Vazquez and McNab, 2005). However, the process has been very uneven, with some AC governments acquiring authority for social policies at the beginning of the 1980s while others had to wait until the end of the 1990s. In the case of education, until administrative responsibility was transferred to the regional governments, the Ministry of Education and Science (MEC – the central authority) retained responsibility over regional educational policy. Among the 17 ACs,

only seven (Andalusia, Canary Islands, Catalonia, Valencia, Galicia, Navarre and the Basque Country) had some responsibility for education at the beginning of the period, whilst responsibility in this area was transferred from the central government to the remaining ACs between 1997 and 1999 (in annex 1 it is shown the year that education was transferred to each AC government).

The reason for differences in transferring some political responsibilities to ACs reflects the political relationship between the central and regional governments, and, more specifically, the recognition afforded by the Spanish Constitution to ACs. In this regard, a distinction should be made between two types of Communities, depending on the route taken to autonomy: on the one hand, those ACs allowed to follow article 151 of the Constitution or under the *foral* regime that received more responsibilities, such as education and health; on the other, those ACs following article 143 of the Constitution with lower transfer levels (see annex 1). Nevertheless, there has been an ongoing process whereby the latter have also assumed responsibilities pertaining to health and education -see Pereyra (2002) for a comprehensive discussion of the evolution in educational administration in the regional governments.

Furthermore, the objective of governments is to provide services, such as education, to maximize social welfare. Thus, we assume that the allocation of governmental budget expenditures maximizes the social welfare function. However, there are two constraints operating at the regional level: the existence of limited resources and regional environmental characteristics. In addition, Behrman and Craig (1987) indicate that governments that act regionally incorporate a decision regarding the weighting of welfare. Thus, such governments need to decide in terms of inequality aversion as far as the issue of school failure rates is concerned. Therefore, regional governments will decide the implementation of educational policies so as to cover either their needs or their regional environmental features.

3. Regional data

Regional annual data correspond to the last decade available (1992-2003). Table 1 presents the details concerning the definition and source of the variables that are used in

the paper and table 2 contains descriptive statistics for the overall variables. We consider three endogenous variables: the school dropout rate at age 16, the rate of repetition at age 15, and the percentage of students who failed the university entrance exam or PAU exam (*Pruebas de Acceso a la Universidad*, a standardized national examination that students sit in order to gain admission to university). Average regional figures prove that a reduction in dropout (either for men or women) is achieved during the considered period although it is also observed an increase in men repetition rates as well as in failing university entrance exam. The contrary evolution of dropout rates and repetition rates seems reasonable since to reduce dropout at 16 might be necessary to increase repetition at 15.

[Insert Table 1 & 2 here]

Figures 1, 2 and 3 show a strong heterogeneous regional pattern (either for the rates or the tendency) for the main outcome variables. In addition, within each AC, gender differences can be observed in relation to school dropout and repetition rates. Note that there is a rather low non-significant correlation between dropout and repetition rates with failing PAU rates. On the contrary, the correlation between dropout and repetition is significant although it is weak (0.34 for men and 0.44 for women). As Figure 1 shows there are peaks in school dropout for the AC series. These are a consequence of the implementation of the 1990 Spanish educational law (named LOGSE –*Ley Orgánica de Ordenación General del Sistema Educativo*), which, among other factors, expanded compulsory education from 14 to 16 years. The peaks are observed in different years (though mainly for 2000 and 2001) since LOGSE was not implemented at the same time in all the ACs.

[Insert Figures 1, 2 & 3 here]

The educational instruments evaluated are overall expenditure per pupil, class-size and pupil-teacher ratio. For the former, expenditure is conveniently deflated by means of regional educational inflation. Overall expenditure includes educational spending from all levels of government (central, regional and local). It should be stressed that we are able to obtain the educational spending statistics of the central government in those regions in which education had not yet been transferred to the AC governments. These

data were provided by the General State Comptroller -*Intervención General de la Administración del Estado, IGAE* (see annex 2).

In the case of the second instrument, class-size is defined as the average number of students per educational unit in lower secondary education (named *ESO-Educación Secundaria Obligatoria*). Pupil-teacher ratio considers the average number of students per teacher in primary and secondary education (there are no data available only for secondary education). Though both policies do not address the same inputs –given that class-size considers classroom inputs other than just the number of teachers (Boozer and Rouse, 2001) - they are included as alternative factors in the estimations because, when computing the condition number, collinearity was observed between both educational policies. The reason lies on the high statistically significant correlation between both educational instruments (0.86).

In the case of exogenous control variables, we take into consideration different factors at the regional level. First, since it is well-known that the characteristics of the labour market are relevant to school dropout rates, we include the following variables: the activity rates for those with higher secondary education; the youth unemployment rates (considering men and women separately) in lagged terms, since simultaneity may appear between dropout and unemployment; and the rate of immigration. Second, we consider the level of regional economic development by means of the Gross Domestic Product per capita (GDPpc). Third, we include variables related to the personal and family environment, which might have an incidence on the dependent variables, such as regional educational level (through the share of population older than 16 with a university degree), the regional fecundity rates for 15-19-year-old women and the average number of children per women.

In addition, we take into consideration two variables related to the school system: the regional share of people attending public school as well as the percentage of immigrants at school. The former allows us to include a measure of a household's educational preferences as well as budget effort (private schools, even if they are partly funded by the government, are an expense for families). In fact, strong regional heterogeneity in public-private school attendance is observed. Thus, while three regions (Catalonia, Madrid and the Basque Country) show percentages attending private schools higher

than 40%, most of the regions present shares lower than 34%. Likewise, the present variable would be collecting differential particularities in tuition configuration (such as diverse pupil-teacher ratios in public and private schools). The latter provides information on changes in educational demand derived from different levels of foreign students at the regional level (migration between regions is not considered since regional mobility between students is insignificant).

4. Econometric strategy

In order to partially control unobserved heterogeneity in the regional environmental characteristics we need to include fixed effects (Besley and Case, 2000). In addition, panel data allow us to consider whether tastes vary regionally over time. Preferences are not equal for Spanish regional governments since differences in income per capita levels or other covariates can be a proxy of differences in public goods preferences (Oates, 1972). On this question, Strumpf and Oberholzer-Gee (2002) claim that a measure of tastes that captures changes in time would be complementary to the heterogeneity captured by means of fixed effects. Hence, here we estimate panel data with fixed effects.

However, the empirical analysis also has to consider a relevant aspect. Endogeneity may be present because of reverse causality or factors that can be endogenously determined (Besley and Case, 2000) and, therefore, the estimated effects for educational policy instruments would be unduly misleading. Related to reverse causality, educational policy instruments may reflect initial regional differences in educational outcomes. For instance, a positive correlation between expenditure per pupil and dropout rates may be expected since the initial higher dropout the greater expenditure. In order to detect whether simultaneity is present we account for the correlations between failure rates (dropout, repetition and failing PAU exam) and the implemented regional educational instruments. We observe a negative statistically significant correlation between dropout rates and the regional expenditure per pupil (-0.61 for men and -0.56 for women). This also applies for men and women repetition rates (-0.24 and -0.40, respectively) and regional failing PAU rates (-0.35). Likewise, we also compute the correlations between above mentioned failure rates and class-size as well as pupil-teacher ratios. We

evidence a positive significant correlation between men and women dropout and class-size (0.67 and 0.70, respectively) as well as men and women repetition rates and class-size (0.17 and 0.41, respectively). However, the correlation between failing PAU rates and class-size resulted to be statistically non-significant. Finally, the same kind of results is observed between the dependent variables and the pupil-teacher ratio. Therefore, reverse causality is not expected.

However, we also test for endogeneity using instrumental variables (IV) panel data. The instrumental strategy adopted meant we first check the endogeneity of all educational policies by means of the Davidson-Mackinnon test. This is of particular relevance because evidence exists that IV provides a less efficient estimation than that provided by OLS when exogeneity is common. The instruments used for expenditure per pupil are: two-lagged per capita transfers from central government and the regional share of people holding grants. These instruments are correlated with expenditure. On one hand, the higher transferred resources from the central government the greater regional expenditure. On the other hand, the higher granted people the more expenditure. As we expected, we evidence a very low correlation between the instruments with dropout, repetition or failing rates.

In the case of class-size and pupil-teacher ratio, the instruments used are population density and a rural-urban dummy variable. Both measures result to be highly correlated with class dimension measures. Thus, our results indicate that both educational instruments can be considered exogenous. The Davidson-Mackinnon test does not reject the exogeneity assumption as for the regional expenditure ($F = 0.159$, p-value = 0.691), the class-size ratio ($F = 0.035$, p-value = 0.852) and the pupil teacher ratio ($F = 0.042$, p-value = 0.838). We tested overidentification and first stage significance to detect instrument validity and, thus, to achieve consistency (e.g. for expenditure we obtain $\chi^2 = 0.252$, $p > \chi^2 = 0.616$). Hence, IV estimation is not considered, which corroborates our previous findings based on correlation measures.

Thus, our final econometric model is shown in equation (1). $Y_{i,t}$ represents the regional educational outcomes: school dropout rates at age 16, the percentage of students required to repeat an academic year at age 15, and the percentage of students who failed the PAU exam. $E_{i,t}$ are the educational policy instruments (expenditure per pupil, class-

size and pupil-teacher ratios), $V_{i,t}$ is the regional demand for public education (the share of students enrolled in public schools), and $X_{i,t}$ denotes regional environmental characteristics (including family and school characteristics as well as those related to the labour market). In the case of the dependent variables, dropout and repetition rates are considered separately for gender, since significant differences are observed (for Spain, the average dropout rate for males is 5.3 percentage points higher than that for female students, who record a figure of 12.6%; the difference is 10.7 points in the case of the repetition rate, with females recording a rate of 34%). The lack of data by gender does not enable us to undertake the same kind of analysis for the percentage of students failing the university entrance examinations. We followed the method proposed by Papke and Wooldridge (1996) who show that the Quasi Maximum Likelihood Estimator (QMLE) is a better alternative when the dependent variable is, as it is in our case, a fractional value. These authors proposed a non-linear function for estimating the expected values of dependent variables ($Y_{i,t}$) conditional on a vector of covariates, such as the one in model (1):

$$E(Y_{i,t} / E_{i,t}, V_{i,t}, X_{i,t}) = G(E_{i,t}\beta_1, V_{i,t}\beta_2, X_{i,t}\beta_3) \quad (1)$$

where G is any cumulative distribution function and βs are the population parameters. The authors recommend a logistic distribution and the use of the Bernoulli log-likelihood function to obtain the QMLE of the βs. Thus, the best course of action is to estimate using a generalized linear model (GLM) with a binomial exponential distribution and a logit as the link function. We also consider robust standard errors and regional dummies to collect unobserved regional heterogeneity (fixed effects). Previously, we also test the preference of considering fixed effects rather than random ones by means of the Hausman test (χ^2 = 75.47, p>χ^2 = 0.00). Likewise, multicollinearity is not detected except whether class-size and pupil-teacher ratio are introduced at the same time (the correlation between both indicators is 0.86). For this reason, we introduce both instruments separately in our estimates.

Furthermore, in the empirical analysis we consider above mentioned peaks in the school dropout variable (most probably as a consequence of the implementation of the LOGSE) through a dummy variable for each AC. Likewise, for regional dropout and

repetition rates, we also include a lagged term to capture the tendency (alternatively we also test the inclusion of a trend variable). The latter allows us to collect the inertia of the failure series which allows us to disentangle the effects arisen from the tendency of the series, e.g. due to lower standards in primary and compulsory secondary education, instead of those really corresponding to the implementation of educational policies. In the case of the PAU failure estimation, dummy year variables are used so as to include the presence of easier or more difficult PAU exams, since the difficulty of this national test is known to fluctuate.

Finally, we consider some other covariates such as the regional population density, regional criminology rates, the share of women teachers in each region and dummies indicating the leading party in each regional government. All these additional variables are not statistically significant and results are robust to their omission (results available upon request). As a consequence of the reduced panel dimension and to avoid either inefficiency effects arisen from the inclusion of irrelevant variables or multicollinearity, we decide to exclude all these additional covariates.

5. Empirical findings

Table 3 shows the results for school dropout rates at age 16, Table 4 displays the repetition rates at age 15 and Table 5 contains the results concerning the percentage of students failing the PAU exam.

If we consider the effects of educational policies on school failure rates, we find a significant positive effect of class-size and pupil-teacher ratio on school dropout and repetition rates for female students (see Tables 1 and 2). Thus, the larger the class-size the greater the percentage of females who dropout or who repeat an academic year. The pupil-teacher ratio corroborates these findings for female students. However, class-size and the pupil-teacher ratio are not statistically significant in relation to failure rates in the PAU exam (see Table 3). As for the effects of regional expenditure per pupil, we observe significant negative effects in the case of the dropout rate of male pupils and in failing the PAU exam. However, increased expenditure per pupil is found to increase repetition rates for both male and female students.

[Insert Tables 3, 4 & 5 here]

Thus, our results show that policies related to the pupils' personal attention (i.e. increasing the number of teachers per student and lowering the number of pupils per class) reduce school failure rates (dropout and repetition) for female students. However, these policies have no effect on school failure rates among their male counterparts. This suggests that the unobserved effects of these two variables on failing the PAU exam might reflect the fact that we are unable to divide the data by gender.

As expected, increased expenditure per pupil reduces failure rates in the PAU exam and school dropout rates, although in the case of dropouts only among male students. This might be a consequence of the higher levels of male dropout, and, thus, expenditure per pupil only serves to reduce the gender gap. Thus, as discussed in Hanushek (2003), it seems that there is a limit to the positive effect of public expenditure on school failure rates (evident here in the rate of school failure among females). In addition, the relationship between expenditure per pupil and the repetition rate (for both male and female students) might reflect the fact that the Spanish educational laws (since 1990) oblige students to stay on at school until they are 16 years old. Such a policy might result in children aged 15 with educational difficulties having to repeat an academic year rather than leaving the educational system. At this stage, we have to note that our results are robust to the inclusion of the ratio between regional expenditure and the GDPpc instead of just using the deflated regional expenditure per pupil. This alternative measure allows us to consider the regional public budgetary effort on education to avoid possible effects from the regional expenditure simply being increased as a consequence of the additional resources addressed to education derived from the expansion of the Spanish economy during the considered period.

Furthermore, we compute the marginal effects of the three educational instruments (at the average level) on dependent variables (when statistically significant). Note that, though it is relevant to know the signs of the effects of these educational instruments it is also important the magnitude of the impact. Assuming the other covariates constant, related to dropout, the marginal effects of the expenditure variable are between -2.7% and -2.9% (depending on the regression applied), while the effect of class-size is 0.9%

and that of pupil-teacher ratio 0.8%. Though the effect of expenditure per student is higher than that of the variables related to pupil attention note that the decrease in dropout around 2.8% caused by expenditure per pupil needs and increase of one thousand euros per pupil (a 20.3% increase of expenditure per pupil in 2003, whilst the average increase per year in real terms for the considered decade was 3.6%). Therefore, the high levels of financial resources demanded by expenditure per pupil makes this policy ineffective. The same applies for the expenditure per pupil effect on failing in the PAU exam, though in this case marginal effects are higher (-4.9%). Related to (women) repetition rates, lower marginal effects of class-size and pupil-teacher ratio are observed than for dropout. In the case of expenditure per pupil, its positive effect on repetition rates at 15 years old may be due to the fact that the LOGSE expansion of compulsory education (from age 14 to 16), i.e. the reductions in dropout at 15 lead to higher levels of repetition at this age.

[Insert Table 6 here]

In addition to the effects of educational policy instruments, we briefly consider the effects of regional environmental characteristics by including variables related to school, the labour market and the family. Taking the school variables first, the number of immigrant students is related to higher dropout and repetition rates among female students. Moreover, the higher the percentage of students attending public schools the higher the rates of dropout and PAU failure among both male and female students. However, this variable is associated with lower rates of repetition among females. The effects of both variables on school dropout could be related to the lower average socioeconomic level of those attending public schools and immigrant students.

Regional labour market features are found to have only a small effect on the variables related to school failure. Although we expected stronger effects (as reported in Peraita and Pastor, 2000, and Petrongolo and San Segundo, 2002, for students at post-compulsory levels), it should be borne in mind that we consider students aged 15 or 16 that had not finished compulsory education. However, the negative relationship observed between the regional activity rate of those with higher levels of secondary education and the school dropout rate among males seems reasonable. As expected, the labour market has no effect on failing the PAU exam since this variable is related to

students' performance (not dropout). That is, labour market would not have consequences since those proceeding to higher education are less likely to be influenced by the job market whilst they are trying to get into that higher educational level.

In the case of the family environment, the share of the population with a university degree correlates positively with success in the PAU exam (in line with Albert, 2000) and negatively with the repetition rate for female students. As expected, the higher the fecundity rate among teenagers, the greater the dropout rate among female students. In addition, average number of children per women has no statistically significant effect on the school failure variables considered here.

We finally introduce a dummy denoting those years in which education was on the responsibility of the central government (MEC territory) and regional expenditure. The interaction of this dummy variable with expenditure per pupil allows us to capture the effects derived from decentralizing educational responsibilities. Since this dummy variable (and the interaction described before) are not statistically significant, we can state that decentralizing did not affect positively or negatively on the school failure rates considered (results available upon request). However, we should note that these results only apply for the considered period (1992-2003) and nothing can be said for the overall Spanish decentralization process. Further research needs to be done so as to conclude about this issue.

6. Conclusions

In this paper we examine the effects of three educational policy instruments (expenditure per pupil, class-size and pupil-teacher ratio) on three educational outcomes related to academic failure in schools: regional dropout rates at the end of compulsory education (at age 16), the percentage of students who were required to repeat one or more academic years (at age 15), and the percentage of students who failed the university entrance examination.

Our results show that educational policies related to a pupil's personal attention only have an effect on female students. Specifically, we observed that a reduction in class-

size and pupil-teacher ratio diminishes school dropout and repetition rates for females. However, no significant effect is found between class-size and pupil-teacher, on failure rates in the university entrance examination. Thus, policies aimed at improving a student's personal attention are effective in reducing school failure rates among female students but have little effect in improving students' performance in the post-compulsory education examination considered here.

In the case of regional expenditure per pupil, we find significant negative effects on the school dropout rate among males (which is considerably higher in real terms than the figure for females) and on the failure rate in the PAU exam. Thus, increased expenditure seems to be an effective measure for reducing the school dropout gender gap as well as for enhancing student performance, although we find out a small effect through the compute of the odds. Likewise, the negative effect on repetition rates for male and female students could be related to the fact that education is compulsory until the age of 16 and, therefore, a policy such as this would tend to result in children aged 15 with educational difficulties having to repeat an academic year instead of leaving the educational system.

To sum up, policies aimed at improving a student's personal attention seem to succeed in reducing school failure rates before the end of compulsory education (albeit only among female students) while increased expenditure per pupil helps to increase student performance after compulsory education (though this policy had different effects as regards school failure in lower secondary education).

Annex 1. Educational transfer process

Autonomous Communities	Year of transference
Foral regime	
Basque Country	1980
Navarre	1990
Article 151	
Andalusia	1982
Canary Islands	1983
Catalonia	1980
Galicia	1982
Valencia	1983
Article 143	
Aragon	1998
Asturias	1999
Balearic Islands	1997
Cantabria	1998
Castille-Leon	1999
Castille-la Mancha	1999
Extremadura	1999
Madrid	1999
Murcia	1999
Rioja	1998

Annex 2. Central government expenditure at the regional level

For expenditure by the Ministry of Education and Science (MEC) in the ACs still administered by this Ministry (that is, where education has not been transferred to the regional government), the MEC provides data for the whole territory that it administrates (not for each AC). In order to assign educational spending to each region, therefore, we used data from the General State Comptroller (*IGAE*). Specifically, we assigned educational spending by the Ministry of Education in each region for the following programs:

422A	Pre-primary and primary education (*Educación infantil y primaria*)
422C	Secondary education and official language schools (*Educación secundaria, formación profesional y escuelas oficiales de idiomas*)
422I	Education abroad (*Educación en el exterior*)
422F	Arts (*Enseñanzas artísticas*)
422J	Additional educational support programmes (*Enseñanza compensatoria*)
422K	Life-long learning and e-learning for non-university levels of education (*Educación permanente y a distancia no universitaria*)
421A	Administration (*Dirección y servicios generales de la educación*)
421B	Teacher training (*Formación permanente del profesorado*)
422O	New information and communication technologies applied to education (*Nuevas tecnologías aplicadas a la educación*)
423B	Other educational services (Servicios complementarios a la enseñanza)
423C	Support to other educational activities (Apoyo a otras actividades escolares)
542G	Educational research (Investigación educativa)
422E	Education for disabled students (Educación especial)

We also considered educational expenses incurred by the organism responsible for investments in schools (*Junta de Construcciones, Instalaciones y Equipo Escolar*). In those ACs in which the regional government has responsibility for the educational system, expenditure from the MEC was irrelevant and not considered.

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Figure 1 Regional secondary schooling dropout rates at age 16

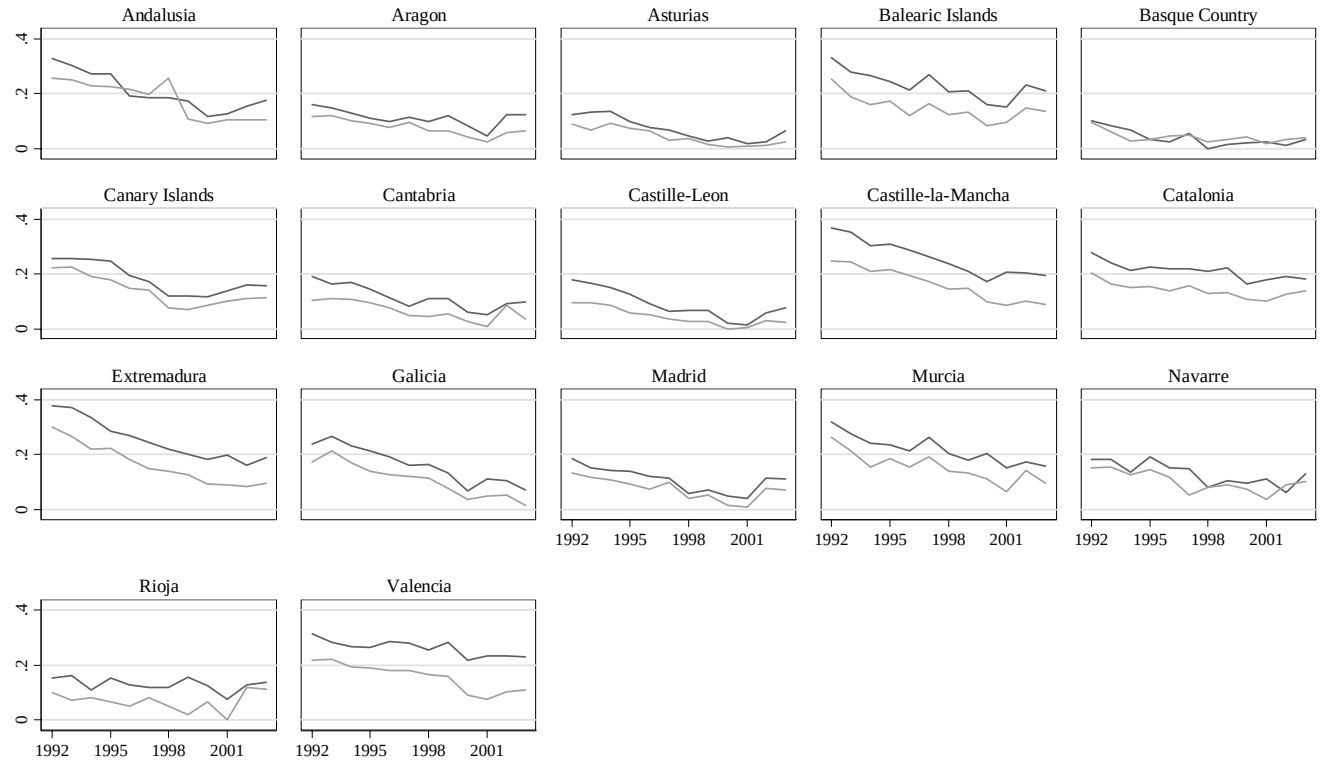


Figure 2 Regional secondary repetition rates at age 15

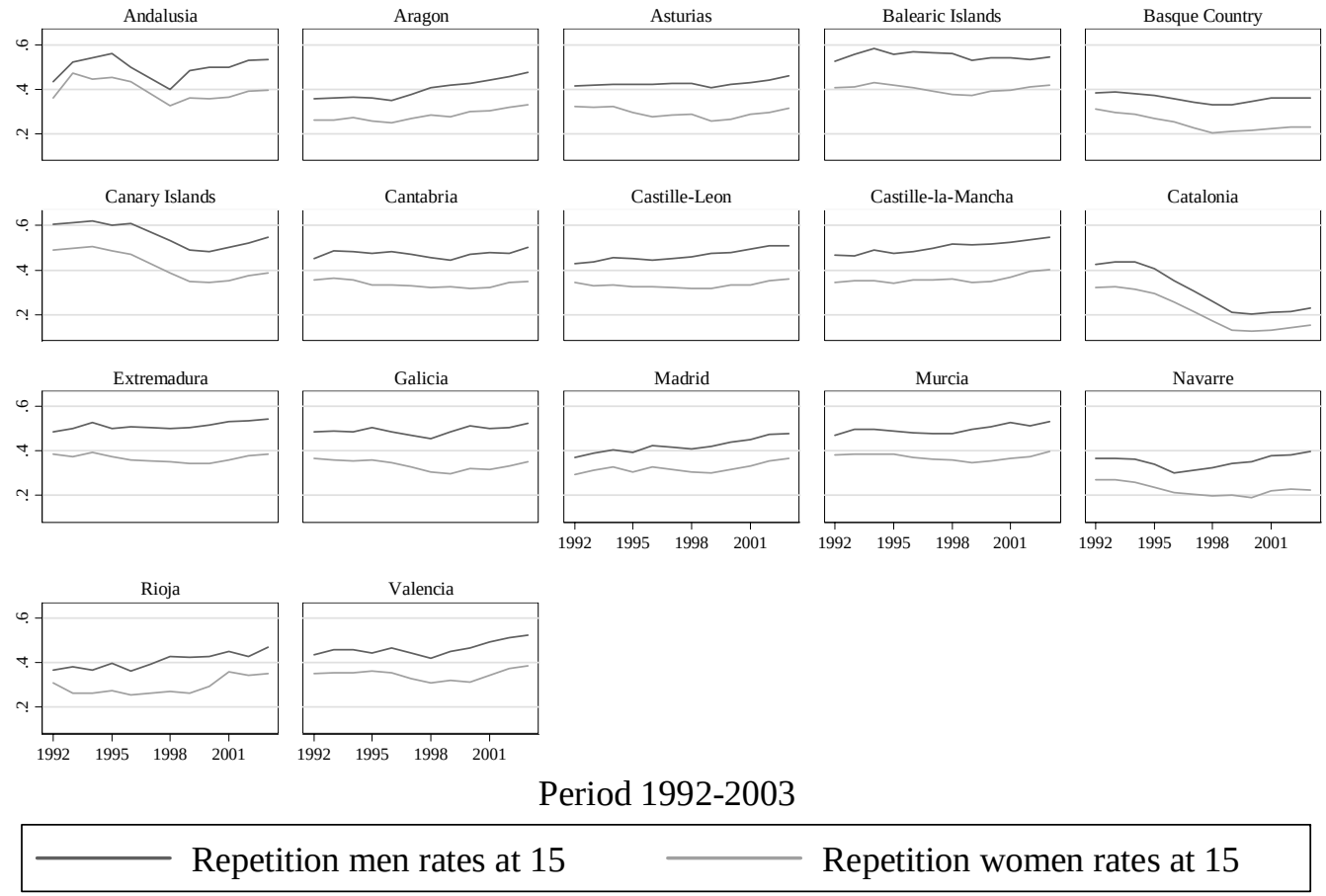
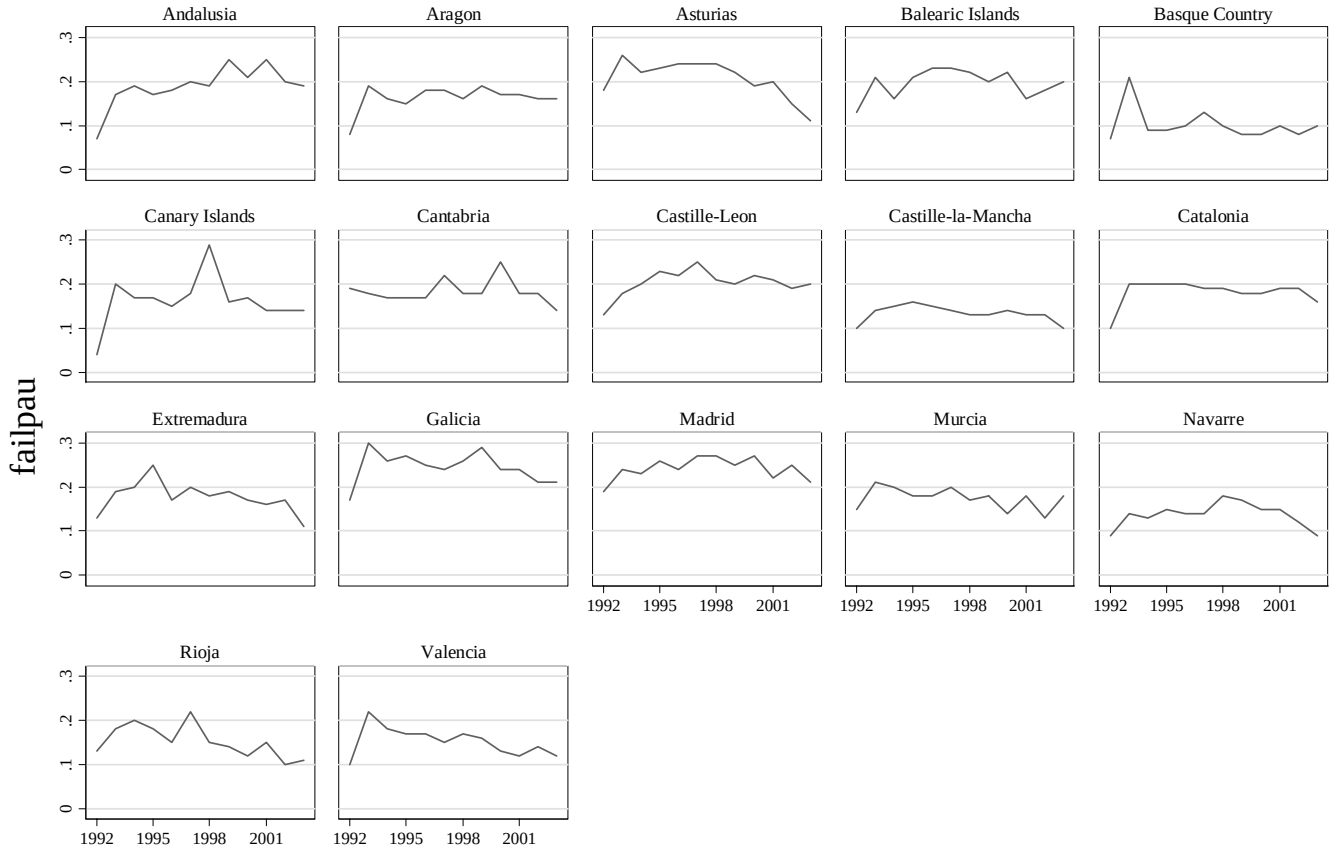


Figure 3 Regional failing rates in PAU exam



Graphs by ACs

Table 1 Definition and source of the variables

Variables	Definition	Source
Deflated expenditure per pupil	Non-university expenditure in each region / regional non-university students (in 1992 thousand Euros base)	Statistical yearbooks. Spanish Ministry of Education and Science (MEC), (www.mec.es) and General State Comptroller (IGAE)
Gross Domestic Product in per capita terms	Regional GDP in per capita terms (in 1992 million Euros base)	Spanish National Institute of Statistics (www.ine.es)
Class-size	Average number of pupils by unity in lower secondary education	Statistical yearbooks. Spanish MEC (www.mec.es)
Pupil-teacher ratio	Average number of pupils by teacher in primary and secondary education	Statistical yearbooks. Spanish MEC (www.mec.es)
Activity rate	Activity rate of those with higher than lower secondary education	Spanish National Institute of Statistics (www.ine.es)
Male (female) youth unemployment rates	Unemployment rates by gender for people between 16 to 24 years old	Spanish National Institute of Statistics (www.ine.es)
Immigration rates	Immigrants from outside EU per 100.000 inhabitants	Spanish National Institute of Statistics (www.ine.es)
Share of public educational attendance	Share of pupils enrolled in public educational institutions in non university education	Statistical yearbooks. Spanish MEC (www.mec.es)
Share of population older than 16 with university degree	Population educational level: those with an university degree	Institut Valencià d'Investigacions Econòmiques (IVIE) www.ivie.es
Immigration schooling rates	Percentage of non university pupils born abroad	Spanish National Institute of Statistics (www.ine.es)
Children per women	Average number of children per women	Spanish National Institute of Statistics (www.ine.es)
Fecundity rates for girls aged 15-19	Fecundity rates (x1000 women) for girls between 15-19 years old	Spanish National Institute of Statistics (www.ine.es)
Dummy indicating rural-urban	Decade average percentage of students in non-university education in towns up to 10,000 inhabitants greater than 40% = 1	Statistical yearbooks. Spanish MEC (www.mec.es)
Population density	Number of inhabitants by squared kilometre	Spanish National Institute of Statistics (www.ine.es)
Share of granted students	Percentage of granted students in non-university education	Statistical yearbooks. Spanish MEC (www.mec.es)
Transferred resources from central government	Transfers per capita from central government to regions (thousand Euros)	BADESPE (www.estadif.meh.es) Spanish Ministry of Economics and Treasury

Table 2 Descriptive statistics: 1992 vs 2003

	Variables	1992	2003
Endogenous variables	Men dropout rates	0.240 (0.088)	0.138 (0.056)
	Women dropout rates	0.178 (0.072)	0.080 (0.040)
	Men repetition rates	0.440 (0.065)	0.481 (0.084)
	Women repetition rates	0.346 (0.055)	0.341 (0.073)
	Failing PAU rates	0.121 (0.045)	0.149 (0.043)
Covariates	Overall deflated expenditure per pupil	1.438 (0.272)	2.014 (0.387)
	Gross Domestic Product per capita	12.407 (2.421)	15.978 (3.243)
	Overall deflated expenditure per pupil / GDPpc	0.119 (0.027)	0.130 (0.031)
	Class-size	24.771 (1.869)	20.041 (2.066)
	Pupil-teacher ratio	17.394 (1.278)	11.665 (1.052)
	Activity rate (of those with higher secondary education)	60.387 (3.261)	64.188 (3.740)
	Young male unemployment rates	31.331 (14.38)	25.49 (8.136)
	Young female unemployment rates	45.202 (10.380)	41.679 (9.109)
	Immigration rates	0.046 (0.061)	0.897 (0.639)
	Share of public educational attendance	67.506 (10.284)	67.524 (9.059)
	Share of population older than 16 with university degree	10.716 (2.904)	18.982 (4.439)
	Immigration schooling rates	0.462 (0.357)	5.675 (2.998)
	Average number of children by women	1.276 (0.225)	1.262 (0.170)
	Fecundity rates for girls aged 15-19	9.817 (4.353)	9.934 (3.767)

Standard deviation reported into brackets.

Table 3 Regional dropout rates: QMLE estimations

	Dropout Males	**Dropout Males**	**Dropout Females**	**Dropout Females**
Lagged dropout rate	1.7931 (2.61)a	1.5307 (2.07)b	2.8724 (2.61)a	2.4606 (2.17)b
Deflated expenditure per pupil	-0.2244 (-2.15)b	-0.2471 (-1.99)b	-0.1608 (-0.70)	-0.2134 (-0.87)
Class-size	0.0483 (1.45)		0.1134 (2.45)b	
Pupil-teacher ratio		0.0452 (1.26)		0.0953 (2.57)b
Activity rate (of those with higher secondary education)	-0.0282 (-2.68)a	-0.0276 (-2.61)a	-0.0208 (-1.27)	-0.0200 (-1.32)
Male youth unemployment rates	-0.0022 (-0.99)	-0.0032 (-1.58)		
Female youth unemployment rates			0.0001 (-0.01)	-0.0008 (-0.30)
Immigration rates	0.0245 (0.34)	0.0273 (0.38)	-0.0987 (-0.95)	-0.0944 (-0.86)
Share of public educational attendance	0.0574 (2.45)b	0.0536 (2.17)b	0.0654 (2.26)b	0.0551 (2.04)b
Share of population older than 16 with university degree	-0.0126 (-0.56)	-0.0126 (-0.70)	-0.0027 (-0.09)	-0.0057 (-0.24)
Immigration schooling rates	0.0249 (1.05)	0.0269 (1.09)	0.0589 (2.08)b	0.0676 (2.31)b
Average number of children by women	-0.0111 (-0.03)	-0.0319 (-0.11)	-0.7521 (-1.21)	-0.6851 (-1.13)
Fecundity rates for girls aged 15-19	0.0264 (1.14)	0.0339 (1.59)	0.0390 (1.29)	0.0529 (1.83)c
Fixed effects (regional dummies)	YES	YES	YES	YES
N*T-1 (17*11)	187	187	187	187
Wald χ^2	4,002.25 (0.00)	6,526.50 (0.00)	2,599.98 (0.00)	4,079.54 (0.00)

a, b and c denote significance at 1, 5 and 10% respectively. We considered dummies for peaks as a consequence of LOGSE implementation.

Table 4 Regional repetition rates: QMLE estimations

	Repetition Males	**Repetition Males**	**Repetition Females**	**Repetition Females**
Lagged repetition rate	3.2278 (5.80)a	3.1676 (5.58)a	3.6743 (5.64)a	3.3266 (4.48)a
Deflated expenditure per pupil	0.0841 (1.93)c	0.0799 (1.82)c	0.1823 (3.38)a	0.1828 (3.38)a
Class-size	0.0123 (1.11)		0.0279 (2.39)b	
Pupil-teacher ratio		0.0116 (1.06)		0.0330 (3.38)a
Activity rate (of those with higher secondary education)	-0.0040 (-0.80)	-0.0040 (-0.81)	-0.0059 (-1.19)	-0.0059 (-1.22)
Male youth unemployment rates	-0.0014 (-1.11)	-0.0016 (-1.32)		
Female youth unemployment rates			0.0008 (0.92)	0.0010 (1.14)
Immigration rates	0.0046 (0.21)	0.0061 (0.28)	0.0450 (2.36)b	0.0472 (2.23)b
Share of public educational attendance	-0.0109 (-1.60)	-0.0121 (-1.53)	-0.0192 (-2.28)b	-0.0225 (-2.33)b
Share of population older than 16 with university degree	0.0000 (0.00)	0.0005 (0.08)	-0.0110 (-1.60)	-0.0091 (-1.73)c
Immigration schooling rates	0.0010 (0.14)	0.0026 (0.38)	0.0156 (1.94)c	0.0222 (2.73)a
Average number of children by women	0.2732 (1.64)	0.2648 (1.52)	0.2747 (1.48)	0.2527 (1.48)
Fecundity rates for girls aged 15-19	-0.0054 (-0.57)	-0.0047 (-0.53)	-0.0184 (-3.04)a	-0.0164 (-2.96)a
Fixed effects (regional dummies)	YES	YES	YES	YES
N*T-1 (17*11)	187	187	187	187
Wald χ^2	793.39 (0.00)	1,200.26 (0.00)	2,163.60 (0.00)	3,565.69 (0.00)

a, b and c denote significance at 1, 5 and 10% respectively. We considered dummies for peaks as a consequence of LOGSE implementation.

Table 5 Failing rates in PAU exam: QMLE estimations

	Failing exam & dummy-years	**Failing exam & dummy-years**
Deflated expenditure per pupil	-0.3458 (-2.85)a	-0.3437 (-2.82)a
Class-size	-0.0107 (-0.37)	
Pupil-teacher ratio		0.0131 (0.33)
Activity rate (of those with higher secondary education)	-0.0090 (-0.59)	-0.0111 (-0.74)
Youth unemployment rates	-0.0001 (-0.03)	0.0002 (0.08)
Immigration rates	-0.0627 (-0.87)	-0.0642 (-0.89)
Regional GDPpc	0.0527 (0.71)	0.0453 (0.68)
Share of public educational attendance	0.0419 (1.74)c	0.0400 (1.70)c
Share of population older than 16 with university degree	-0.0407 (-2.77)a	-0.0423 (-2.80)a
Immigration schooling rates	0.0085 (0.37)	0.0089 (0.37)
Average number of children by women	-0.4653 (-0.81)	-0.4401 (-0.80)
Fecundity rates for girls aged 15-19	0.0261 (1.01)	0.0246 (1.02)
Fixed effects (regional dummies)	YES	YES
Time effects (year dummies)	YES	YES
N*T-1 (17*11)	204	204
Wald χ^2	560.96 (0.00)	189.82 (0.00)

a, b and c denote significance at 1, 5 and 10% respectively.

Table 6 Marginal effects at the average level (when covariates significant)

	Expenditure		**Class-size**	**Pupil-teacher ratio**
	Class-size included in the regression	*Pupil-teacher ratio included in the regression*		
Dropout men	-0.0267	-0.0294		
Dropout women			0.0090	0.0082
Repetition men	0.0208	0.0198		
Repetition women	0.0397	0.0398	0.0061	0.0072
Failing PAU exam	-0.0493	-0.0489		