

THE EFFECTS OF REGIONAL EDUCATIONAL POLICIES ON SCHOOL FAILURE IN SPAIN*

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This paper presents a regional analysis of the effects of educational policies implemented in Spain between 1992 and 2003, focusing specifically on school failure rates. We consider the impact of expenditure per pupil, class size, and pupil-teacher ratio on dropout rates at the end of compulsory education and on the proportion of early school-leavers in the 18-24 year age group. Our results indicate that higher levels of educational expenditure per pupil and lower class sizes and pupil-teacher ratios reduce rates of dropout and early school-leaving (although class-size is not always significant). However, the magnitude of the effects of these variables is small at the average level.

Key words: school failure, school dropout, regional educational policy.

JEL Classification: I22, I28, R50.

A number of recent comparative studies of European Union and OECD countries have highlighted serious problems in the Spanish educational system, especially with regard to students' performance. These studies have found that Spain has higher levels of school dropout and early school-leavers and lower levels of skills and results in secondary education tests [OECD (2004, 2006, 2007) and MEC (2006a)].

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In order to improve students' performance, Spanish governments have implemented a large amount of legislation on education in the past twenty years (in our view, an excessive amount, with six fundamental laws since 1985). These reforms, introduced by the central government, extended the period of compulsory education from 14 to 16 years old and reorganized the educational system in a bid to raise the standards. In general, however, the effects on students' performance have not met expectations. In addition, these reforms have been accompanied by an intensive process of decentralization, to the extent that, by 2003, Spain's 17 regional governments (or Autonomous Communities, ACs) administered more than 90% of the educational budget (MEC, 2006b).

Performance problems are not distributed equally among the ACs (MEC, 2006a). Though, to a large extent, the differences may be attributed to the characteristics of each AC (for example, its level of economic development, the nature of its labour market, rural/urban population distribution, etc.), the educational policies pursued by regional governments may also have had an effect on the regional differences in educational results. The main goal of the present study is to examine the effects of policy on educational performance at a regional level. Specifically, we consider the effects of three policy instruments –expenditure per pupil, class size and pupil-teacher ratio– on two educational outcomes related to academic failure: regional dropout rates at the end of compulsory education (at age 16), and the regional share of early school-leavers in the 18-24 age group.

The empirical evidence on the effectiveness of educational policies on student performance (including the three instruments considered in this paper) is not conclusive [see Heyneman and Loxley (1983), Betts (1995), Akerhielm (1995), Woessman (2001) and Hanushek (2003)]. The published results are inconsistent. For example, while Bradley, Johnes and Millington (2001) report that the higher the pupil-teacher ratio, the poorer the results among English secondary students (period 1993-1998), in the TIMSS analysis (the Third International Mathematics and Science Study, 2003, which presented results for 39 countries), Woessman found that a higher level of expenditure per pupil, lower class sizes and lower pupil-teacher ratios had a negative incidence on students' results. There are two reasons for this conflicting evidence: first, the results are highly sensitive to the variables considered and to the econometric method implemented; second, policy effectiveness depends heavily on local characteristics (for example, legislation, specific government policy, etc.).

At this point, we should stress that our study was carried out during a period of disruption in the Spanish education system. In 2006 and 2007, the whole educational system was reformed with the adoption of two new laws: one related to non-university education, the 2006 Education Act (*Ley Orgánica de Educación*), and the other related to universities, the Universities Act of 2007 (*Ley Orgánica de Universidades*), modifying the earlier version passed in 2001. As noted above, the international indicators published at this time also reflected Spain's poor educational standing among European Union and OECD countries and highlighted the significant differences between Spanish regions. The present study is the first to examine these data at the regional level in an attempt to analyze the effects of

our three educational policy instruments on school failure rates. Furthermore, the paper generates a new variable for determining regional expenditure per pupil.

In conducting the empirical analysis, a misspecification bias appears if regional characteristics related either to educational policies or to environmental features are omitted. This bias is exacerbated when working with aggregate samples and can produce misleading results (Hanushek, 2003). Here, we estimate panel data fixed effects so as not to omit key environmental and regional variables and to partially capture the unobserved heterogeneity. Specifically, since dependent variables range between 0 and 1, we use a generalized linear model. The analysis also takes into consideration the endogeneity problem that may arise between educational outcomes and instruments.

Our results show that educational expenditure per pupil, class size, and pupil-teacher ratio have the expected results on student failure rates: higher levels of educational expenditure per pupil, lower class size, and lower pupil-teacher ratios reduce rates of dropout and early school-leaving. However, the magnitude of the effects of these variables is small at the average level.

The paper is structured as follows. The following section describes the effect of the decentralization process on the provision of education in Spain. Section 2 presents the data and Section 3 describes the econometric strategy used in the empirical analysis. Section 4 shows the main findings, and the final section contains the conclusions.

1. DECENTRALIZATION AND THE REGIONAL PROVISION OF EDUCATION IN SPAIN

We conduct our analysis at regional level in order to identify differences in school failure rates from region to region but, more importantly, we choose this level because part of the responsibility for education in Spain was gradually transferred from central to regional governments during the period under analysis (1992-2003). Although there is a common legal framework for the whole country, AC governments legislate on certain educational matters. In addition, regional governments administer most of the educational budget: between 1992 and 2003, the proportion of expenditure managed by regional government rose from 60.2% to 95.4% (MEC, 2006b).

This high degree of decentralization occurred not only in education but in most social policies as well. Responsibility for the administration of social issues has been gradually transferred to the regional governments [see Arze, Martinez-Vazquez and McNab (2005)]. However, the process has been very uneven, with some AC governments taking charge of social policies at the beginning of the 1980s while others had to wait until the end of the 1990s. In the case of education, of the 17 ACs, only seven (Andalusia, Canary Islands, Catalonia, Valencia, Galicia, Navarre and the Basque Country) had some responsibility for education in the 1980s whilst, for the remaining ACs, responsibility in this area was transferred from the central government (specifically from the Ministry of Education and Science) between 1997 and 1999 (the dates of the transfer of responsibilities to each AC government are shown in annex 1).

The differences observed in the process of transferring political responsibilities to ACs can be attributed to two factors: the political relationship between the central and regional governments and the differences in the recognition that the Spanish Constitution grants to the various ACs. In fact, ACs can be divided into two types, depending on the route taken to autonomy: on the one hand, those allowed to follow article 151 of the Constitution and the so called *Foral* Communities, which were granted powers over areas such as education and health; and, on the other, ACs covered by article 143 of the Constitution, in which the transfer levels are lower (see annex 1). Nevertheless, in an ongoing process, ‘article 143-ACs’ have also assumed responsibilities related to health and education [Pereyra (2002)] for a comprehensive discussion of the evolution of the process of decentralization with regard to education.

Finally, in educational provision, it has to be taken into account that there are two constraints operating at the regional level: the existence of limited resources and the welfare decisions of regional governments when allocating spending. With regard to the first point, while there has been a considerable degree of decentralization in public spending in Spain (comparable to countries with a long-standing federal tradition), the level of decentralization in relation to revenues has been significantly lower. In 1980, the central government received 88.9% of total public revenue and the ACs received none (the rest being administered by local authorities). By 2003, the central government’s share had fallen to 66.3% and the ACs’ share had risen to 23.3%. In relation to expenditure, the central public sector accounted for 89.5% of all expenditure in 1980, but only 54.6% in 2003; over this period, the proportion of regional government expenditure increased from 0% to 32.1%. Therefore, there has been a major asymmetry between the decentralization of expenditure and that of revenue.

2. REGIONAL DATA

Annual regional data correspond to the last decade available (1992-2003). Table 1 presents the details concerning the definitions and sources of the variables that are used in the article, and Table 2 contains descriptive statistics for the overall variables. We consider two endogenous variables: the school dropout rate at age 16 (defined as one minus the net share of schooling at that age), and the share of early school-leavers at age 18-24 (defined as the population aged between 18 and 24 with no more than lower secondary education and is not in schooling or training, which constitutes one of the 2010 Lisbon Objectives of the European Union in education and training).

Average regional figures show that dropout and early school-leaver rates fell for both sexes during the period considered (see Figures 1 and 2). These figures also show a strong heterogeneous regional pattern for both rates and the tendency. In addition, within each AC, gender differences are observed in school dropout and early school-leaver rates. Note that there is a highly significant correlation between dropout and early school-leavers rates (0.84 for men and 0.85 for women).

Table 1: DEFINITION AND SOURCE OF THE VARIABLES AND INSTRUMENTS

Variables	Definition	Source
School dropout rate at age 16	One minus the net share of schooling at age 16	Statistical yearbooks. Spanish Ministry of Education and Science (MEC), (www.mec.es)
Share of early school-leavers at age 18-24	Share of 18-24 year old population that has not completed higher secondary education and is not in schooling or training	Statistical yearbooks. Spanish Ministry of Education and Science (MEC), (www.mec.es)
Deflated overall non-university expenditure per pupil	Non-university public and private educational expenditure in each region / regional non-university students in public and private schools (in 1992 thousand Euros base)	Public expenditure and public and private pupils: Statistical yearbooks. Spanish Ministry of Education and Science (MEC), (www.mec.es) and General State Comptroller (IGAE); Private expenditure: Spanish National Institute of Statistics (Continuous Household Budget Survey and requested data)
Class-size	Average number of students per unit in lower secondary education in public and private education	Statistical yearbooks. Spanish MEC
Pupil-teacher ratio	Average number of pupils per teacher in primary and secondary education in public and private education	Statistical yearbooks. Spanish MEC (www.mec.es)
Male (female) youth unemployment rates	Unemployment rates by gender for people between 16 and 24 years old	Spanish National Institute of Statistics (www.ine.es)

Source: Own elaboration.

Table 1: DEFINITION AND SOURCE OF THE VARIABLES AND INSTRUMENTS (continuación)

Variables	Definition	Source
Share of public educational attendance	Share of pupils enrolled in public educational institutions in non-university education	Statistical yearbooks . Spanish MEC (www.mec.es)
Average schooling years	Average schooling years of working-age population	Institut Valencià d'Investigacions Econòmiques (IVIE) www.ivie.es
Immigration schooling rates	Percentage of non-university pupils born abroad in public and private schools	Spanish National Institute of Statistics (www.ine.es)
Fertility rates for girls aged 15- 19	Fertility rates (x1000 women) for girls of between 15 and 19	Spanish National Institute of Statistics (www.ine.es)
Share of rural students	Percentage of students in non-university education in towns of up to 10,000 inhabitants	Statistical yearbooks . Spanish MEC (www.mec.es) and interpolated data for the 1992-95 period
Population density	Number of inhabitants per square kilometre	Spanish National Institute of Statistics (www.ine.es)
Share of students with grants	Regional percentage of students with grants in non-university education	Statistical yearbooks . Spanish MEC (www.mec.es)
Total regional government financial resources	Total regional government financial resources considering homogeneous responsibilities (thousand Euros)	Own computation from de la Fuente and Vives (2003) & de la Fuente and Gundín (2008)

Source: Own elaboration.

Table 2: DESCRIPTIVE STATISTICS: 1992 vs. 2003

Variables		1992	2003
Endogenous variables	Male dropout rates	0.240 (0.088)	0.138 (0.056)
	Female dropout rates	0.178 (0.072)	0.080 (0.040)
	Early male school-leavers	0.451 (0.080)	0.363 (0.088)
	Early female school-leavers	0.350 (0.093)	0.234 (0.071)
Covariates	Deflated overall expenditure per pupil	1.904 (0.352)	3.420 (0.702)
	Class-size	27.630 (1.376)	24.207 (1.682)
	Pupil-teacher ratio	17.394 (1.278)	11.665 (1.052)
	Young male unemployment rates	31.331 (14.38)	25.49 (8.136)
	Young female unemployment rates	45.202 (10.380)	41.679 (9.109)
	Share of public educational attendance	67.506 (10.284)	67.524 (9.059)
	Average schooling years	7.14 (0.631)	8.76 (0.402)
	Immigration schooling rates	0.462 (0.357)	5.675 (2.998)
	Fertility rates for girls aged 15-19	9.817 (4.353)	9.934 (3.767)

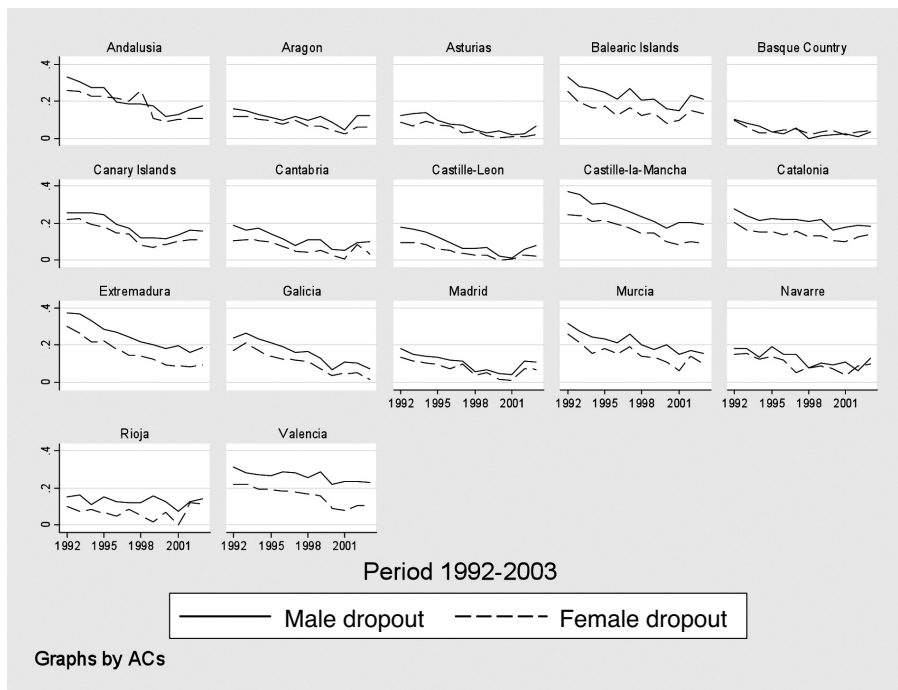
Note: standard deviation reported in parentheses.

Source: Own elaboration.

The educational instruments evaluated are overall non-university educational expenditure per pupil, class size, and pupil-teacher ratio. Expenditure is deflated by means of the regional educational inflation rate and includes public spending on public and private non-university institutions by all levels of government (central, regional and local) as well as family educational expenditure on non-university levels. Pupils comprise students at public and private schools. We obtained the statistics on the central government's expenditure on education in the regions in which education had not yet been transferred to the AC governments from the General State Comptroller – the *Intervención General de la Administración del Estado, IGAE* (see annex 2).

Class size is defined as the average number of students per educational unit in lower secondary education (named *ESO, Educación Secundaria Obligatoria*). The pupil-teacher ratio reflects the average number of students per teacher in primary and secondary education (there are no regional data available for secondary education alone). Both variables include public and private schools. Though the two variables 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 is observed (see Section 3).

Figure 1



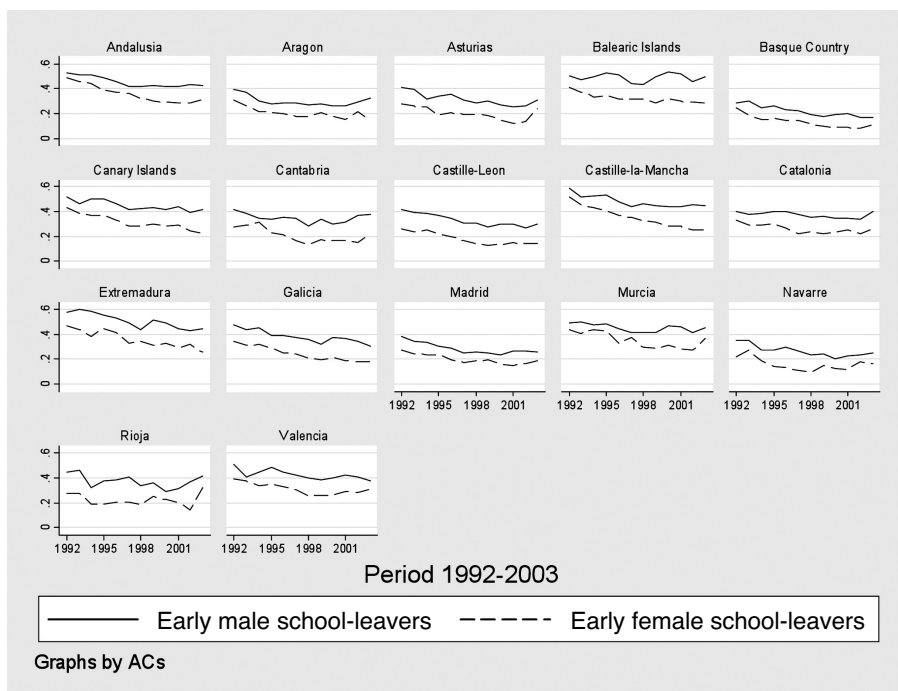
Source: Own elaboration.

Figure 3 shows the different position of each AC with regards to the three educational policy instruments indicated above. The significant differences observed between ACs for each instrument may be important when considering educational policy implementation from a regional perspective.

In an international comparison, and related to secondary education for the 2003-2004 school year, the educational policy instruments show the following figures. With regard to overall expenditure per pupil (at educational institutions for all services) Spain allocated 6,418 US\$ (in Purchasing Power Parities) whilst the average of all OECD countries was 6,962 US\$. Considering class size (in lower secondary school), the figure is 25 students per group in Spain (the highest in the European Union, alongside Germany and Greece) compared with an OECD average of 24. Finally, there were 10.8 pupils per teacher in Spain compared with an OECD average of 13.6 [see MEC (2006a)].

In the case of exogenous control variables, various factors are taken into consideration at regional level. First, since it is well known that the characteristics of the labour market are relevant in school failure rates, we include the following variables in our study: youth unemployment rates and the regional educational level. In the former, unemployment may be related to lower levels of school dropout

Figure 2

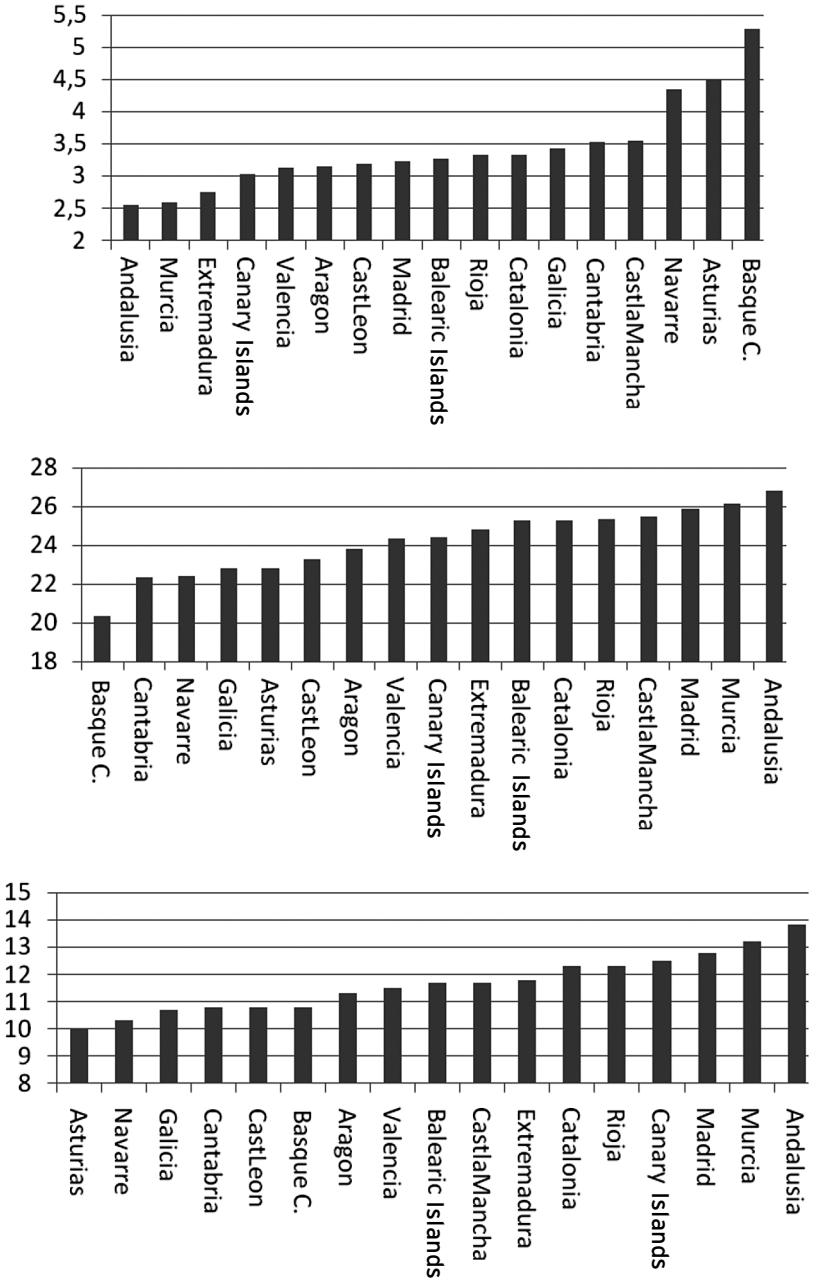


Source: Own elaboration.

since the opportunity cost of remaining at school is reduced. Because unemployment levels are different for men and women, we consider them separately as well as in lagged terms, since simultaneity may appear between dropout and unemployment. Regional educational level is considered since more educated societies are expected to have a higher interest in reducing school dropout. It is calculated from the average years of schooling of the working-age population.

Second, we consider variables related to the personal and family environment which may have an influence on the dependent variables, such as the regional fertility rates for 15-19-year-old women and the average number of children per woman. Both variables are expected to increase school dropout (especially that of women). Finally, we include two variables related to the school system: the regional share of pupils attending public schools (public schools do not include private public funded or “concerted” schools) and the percentage of immigrants at private and public schools. The first variable allows us to include a measure of a household’s educational preferences as well as the financial sacrifice involved. In fact, strong regional heterogeneity in public/private school attendance is observed: while three regions (Catalonia, Madrid and the Basque Country) show private school attendance rates of higher than 40%, most regions present

Figure 3



Source: Own elaboration.

shares lower than 34%. Similarly, this variable reflects differential features in the organization of teaching (such as diverse pupil-teacher ratios). The percentage of immigrants at school provides information on educational demand derived from diverse proportions of foreign students at the regional level (migration between regions is not considered, since regional mobility between students is insignificant).

3. ECONOMETRIC STRATEGY

We should consider that preferences are not equal for Spanish regional governments, since differences in income per capita levels or other covariates may be a proxy of differences in public goods preferences [Oates (1972)]. In order to partially control the unobserved heterogeneity in the regional environment, we need to include fixed effects [Besley and Case (2000)]. Moreover, preferences might change over time [Strumpf and Oberholzer-Gee (2002)] and, therefore, panel data is needed. Finally, we also consider time dummies to capture trend changes. As a consequence, here we estimate panel data with fixed and time effects.

However, the empirical analysis must also consider the presence of endogeneity because of i) reverse causality and ii) the fact that factors may be endogenously determined. On one hand, educational policy instruments may reflect initial regional differences in educational outcomes. On the other hand, according to Besley and Case (2000), this involves identifying the determinants of the policies that are included on the right hand side of the regressions. Therefore, in the presence of endogeneity, the estimated effects for educational policy instruments may be misleading. For this reason, we use instrumental variables (IV). This strategy obliges us first to check the endogeneity of all educational policies by means of the Davidson-Mackinnon test. The null hypothesis states that the OLS estimator would yield consistent estimates. Then, the rejection of the null hypothesis indicates that the endogenous regressors' effects on the estimates are meaningful. This is particularly important because there is evidence that IV provides a less efficient estimation than OLS when exogeneity is common. The instruments used for expenditure per pupil are per capita regional resources (defined as total regional government financial resources in per capita terms considering homogeneous responsibilities¹) and the regional share of people receiving grants, since both instruments are related to expenditure. The instruments used for class size and pupil-teacher ratio are the share of students in rural schools and regional population density. The Davidson-

(1) This variable is an index where the Spanish average equals 100 and all ACs are ordered considering total regional financial resources per capita. It is assumed that all regions are responsible for providing health and social services. For the 1992-97 period, the index is provided by de la Fuente and Vives (2003). For 2002-2004, de la Fuente and Gundín (2008) give information only for non-*Foral* regions. Thus, we consider the per capita revenue ratio between the Basque Country and Catalonia for 2005 [see de la Fuente (2008)] to compute the revenue for the two *Foral* ACs. Then, we compute the average revenue per capita for all 17 regions and we obtain the corresponding index where each AC is allocated. For the 1998-2001 period, where data is unavailable, interpolation was needed.

Mackinnon test does not reject the exogeneity assumption for all educational policy variables. Hence, IV estimation is not finally considered.

Our final econometric model is shown in equation [1]. $Y_{i,t}$ represents the regional educational outcomes: school dropout rates at age 16, and share of early school-leavers between ages 18-24. $E_{i,t}$ are the educational policy instruments (overall non-university educational expenditure per pupil, class size and pupil-teacher ratio), $V_{i,t}$ is the regional demand for public education (the share of students enrolled in public schools), and $X_{i,t}$ denotes the region's environmental characteristics (including family and school as well as the labour market). The dependent variables 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 for females (17.9% vs. 12.6%, and in the case of early school-leavers 38.2% vs. 27%, respectively). We follow 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 in our case, a fractional value. These authors propose a generalized linear model (GLM) for estimating the expected values of dependent variables ($Y_{i,t}$) conditional on a vector of covariates, where G is any cumulative distribution function and the β s are the population parameters:

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

Papke and Wooldridge (1996) recommend a logistic distribution and the use of the Bernoulli log-likelihood function to obtain the QMLE of the β s. Thus, the best course of action is to estimate using a GLM with a binomial exponential distribution and a logit as the link function for linearizing. 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 ($\chi^2 = 75.47$, $p > \chi^2 = 0.00$). Likewise, there is multicollinearity when educational policy variables are introduced at the same time since correlations are considerably high (expenditure correlates -0.57 with class size and -0.70 with pupil-teacher ratio, whereas the correlation between class size and pupil-teacher ratio is 0.79). For efficiency reasons, we introduce them separately into our estimates. Following Borland, Howsen and Trawick (2005), we test several relationships between educational instruments ($E_{i,t}$) and school failure rates to avoid the use of an incorrect functional form. We include the squared values of expenditure per pupil, class-size and pupil-teacher ratio but none of them were statistically significant.

Furthermore, in the empirical analysis we consider a dummy variable for each AC related to the LOGSE (the 1990 Spanish Education Act named *Ley Orgánica de Ordenación General del Sistema Educativo*). We do not consider the year when LOGSE was implemented, but when its effects were observed (when students educated in the LOGSE system reached 16 years old). These dummy variables are included in the analysis of school dropout at age 16 but not for early school leavers aged 18-24 since the implementation of LOGSE is not relevant.

Finally, we consider other covariates such as the regional population density, regional crime rates, the share of women teachers in each region and dummies in-

dicating the leading party in each regional government. None of these additional variables are statistically significant and the results are robust to their omission (results available upon request). As a consequence of the reduced panel dimension, and to avoid either inefficiency effects arising from the inclusion of irrelevant variables or multicollinearity, we exclude all these additional covariates.

4. EMPIRICAL FINDINGS

Table 3 shows the results for school dropout rates at age 16, and Table 4 shows those for early school-leavers between ages 18-24. Both tables include computations of marginal effects at the average value of each variable.

If we consider the effects of educational policies related to attention to pupils on school failure rates, we find that the pupil-teacher ratio increases school dropout in both female and male students. The same effect is observed for class size but only for females. Thus, the larger the class size or the pupil-teacher ratio, the greater the percentage of students who drop out. The same effects are also observed on the rate of early school-leavers for the pupil-teacher ratio whereas class size turns out to be not statistically significant in any regression. As regards the effects of educational expenditure per pupil, we observe that the higher the expenditure, the lower the dropout rate among male and female pupils and the lower the share of male and female early school-leavers.

Therefore, all educational policy variables show the expected results, since higher levels of educational expenditure per pupil, and lower levels of class size and pupil-teacher ratios, reduce rates of dropout and early school-leaving (with the exception of class size in some regressions where it is not statistically significant). However, results in Tables 3 and 4 show that the magnitude of these effects is small. For example, with respect to school dropout, an additional thousand Euros per pupil, which represents an increase of around 29% of 2003 deflated expenditure, would reduce the female dropout rate by 2.5% (for males the figure is 3.1%). Likewise, a reduction of 1 pupil per class (4.2% in relative terms for 2003) would lead to a decrease of 0.5% in female dropout. In addition, a decrease of 1 pupil per teacher (8.5%) diminishes both female and male dropout rates by 1.5%. As indicated, results show the small magnitude of the effects although comparisons between the three educational policies are not possible since the cost of the educational policies related to class size and pupil-teacher ratio are not available.

In addition to the effects of educational policy instruments, we briefly consider the impact of regional environmental characteristics by including variables related to school, labour market and family variables. Taking the school variables first, the number of immigrant students is related to higher dropout rates among female students. Moreover, the higher the percentage of students attending public schools, the higher the rates of male and female dropout. The effects of these two variables on school failure could be related to the lower average socioeconomic level of immigrant students and those attending public schools. As in Peraita and Pastor (2000) and Petrongolo and San Segundo (2002), regional labour market features are significant, especially in dropout rates. We observe a negative relationship between youth unemployment rates and the school dropout rate for all stu-

Table 3: REGIONAL DROPOUT RATES: QMLE ESTIMATIONS, MARGINAL EFFECTS

	Male			Female		
	Expenditure per pupil	Class size	Pupil teacher ratio	Expenditure per pupil	Class size	Pupil teacher ratio
Deflated expenditure per pupil-0.0311 (0.008)a			-0.0247 (0.006)a			
Class-size	0.0039 (0.003)		0.0147 (0.004)a	0.0048 (0.002)b		0.0146 (0.002)a
Pupil-teacher ratio						
Youth unemployment rates (male or female)	-0.0006 (0.000)b	-0.0007 (0.000)b	-0.0003 (0.000)	-0.0003 (0.000)	-0.0003 (0.000)c	0.0000 (0.000)
Share of public educational attendance	0.0053 (0.002)b	0.0048 (0.003)c	0.0021 (0.002)	0.0066 (0.002)a	0.0060 (0.002)a	0.0042 (0.002)a
Average schooling years	-0.0236 (0.014)c	-0.0409 (0.014)a	-0.0072 (0.011)	-0.0314 (0.009)a	-0.0427 (0.009)a	-0.0074 (0.008)
Immigration schooling rates	-0.0004 (0.003)	-0.0008 (0.003)	0.0018 (0.003)	0.0023 (0.002)	0.0020 (0.002)	0.0050 (0.002)b
Average number of children by women	0.0760 (0.056)	0.0679 (0.061)	0.0196 (0.047)	0.0398 (0.055)	0.0335 (0.060)	0.1243 (0.047)a
Fertility rates for girls aged 15-19	0.0027 (0.003)	0.0032 (0.003)	0.0034 (0.003)	0.0018 (0.003)	0.0024 (0.003)	-0.0013 (0.002)
N*T-1 (17*11)	204	204	204	204	204	204
Wald χ^2	124.80 (0.00)	186.72 (0.00)	491.26 (0.00)	3,556.13 (0.00)	10,427.52 (0.00)	2,195.28 (0.00)

a, b and c denote significance at 1, 5 and 10%, respectively. Standard errors are reported in parentheses. All estimations include fixed effects (regional dummies) and dummies corresponding to peaks for LOGSE appliance.
Source: Own elaboration.

Table 4: REGIONAL EARLY SCHOOL-LEAVERS RATE: QMLE ESTIMATIONS, MARGINAL EFFECTS

	Male			Female		
	Expenditure per pupil	Class size	Pupil teacher ratio	Expenditure per pupil	Class size	Pupil teacher ratio
Deflated expenditure per pupil-0.0357 (0.008)a			-0.0376 (0.013)a			
Class-size	0.0053 (0.003)		0.0148 (0.004)a	0.0055 (0.004)		0.0202 (0.004)a
Pupil-teacher ratio						
Youth unemployment rates (male or female)	-0.0004 (0.000)	-0.0004 (0.000)	-0.0001 (0.001)	-0.0009 (0.000)a	-0.0010 (0.000)a	-0.0005 (0.000)c
Share of public educational attendance	0.0018 (0.003)	0.0016 (0.003)	-0.0012 (0.003)	0.0021 (0.003)	0.0015 (0.003)	-0.0018 (0.003)
Average schooling years	-0.0325 (0.010)a	-0.0558 (0.013)a	-0.0211 (0.012)c	-0.0278 (0.009)a	-0.0490 (0.013)a	0.0000 (0.012)
Immigration schooling rates	0.0034 (0.004)	0.0039 (0.004)	0.0061 (0.004)	-0.0022 (0.003)	-0.0029 (0.003)	0.0005 (0.003)
Average number of children by women	0.0407 (0.094)	0.0169 (0.097)	-0.0214 (0.095)	0.1086 (0.082)	0.0793 (0.086)	0.0339 (0.078)
Fertility rates for girls aged 15-19	0.0042 (0.004)	0.0048 (0.004)	0.0047 (0.004)	0.0067 (0.004)	0.0081 (0.005)c	0.0076 (0.004)b
N*T-1 (17*11)	204	204	204	204	204	204
Wald χ^2	55.95 (0.00)	384.76 (0.00)	91.17 (0.00)	146.90 (0.00)	160.81 (0.00)	105.35 (0.00)

a, b and c denote significance at 1, 5 and 10%, respectively. Standard errors are reported in parentheses. All estimations include fixed effects (regional dummies) and dummies corresponding to peaks for LOGSE appliance.
Source: Own elaboration.

dents. This variable only has negative effects on female early school-leavers. Likewise, the average years of schooling of the working-age population correlate negatively with male and female dropout and with male and female early school-leavers. Finally, regarding the family environmental variables, the average number of children per women increases female dropout rates whereas fertility rates for girls aged 15-19 correlate positively with the female school-leavers rate.

We also introduce a dummy denoting the years in which education was the responsibility of the central government (MEC, Ministry of Education) 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) is not statistically significant, we conclude that decentralization had neither a positive or a negative effect on school failure rates (results available upon request). However, we should note that these results only apply to the period considered (1992-2003) and nothing can be said with regard to the overall Spanish decentralization process. Further research is required in order to reach firm conclusions on this issue.

5. CONCLUSIONS

In this paper, we examine the effects of three educational policy instruments (overall expenditure per pupil, class size and pupil-teacher ratio) on two educational outcomes related to academic failure in schools: regional dropout rates at the end of compulsory education (at age 16), and the share of early school-leavers in the 18-24 year age group.

The results show that expenditure per pupil and pupil-teacher ratio influence school dropout in both female and male students: the larger the expenditure per pupil or the lower the pupil-teacher ratio, the lower the percentage of students who drop out. The same effects are observed in the case of early school-leavers. As regards class-size, it correlates positively with dropout rates only for female students. Therefore, we find that the three educational policy instruments considered (with some exceptions for class-size) reduce failure rates in the Spanish education system (especially when dropping out is considered).

Nevertheless, in accordance with most studies at a regional level for the USA, results also show that the magnitude of these effects is very small [see Hanushek (2003)]. Thus, they lead us to conclude that the educational policy instruments considered may be useful to reduce school dropout and early school-leaving although not significantly. Concerning expenditure, ACs also have to consider whether most of the increase has to be public or private according to political preferences.

Finally, it can be pointed out that further research is needed to determine the best policies to reduce school failure rates. This would mean computing the cost of class size and pupil-teacher rate reductions and analyzing other policies focused on school and class management as well as on school choice and admission. In addition, studies with microdata are also needed to evaluate all these policies.

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
Castile-Leon	1999
Castile-La Mancha	1999
Extremadura	1999
Madrid	1999
Murcia	1999
Rioja	1998

Source: Own elaboration.

ANNEX 2: CENTRAL GOVERNMENT EXPENDITURE AT THE REGIONAL LEVEL

The Ministry of Education provides data for its expenditure in the ACs that it still administers (that is, where responsibility for education has not been transferred to the regional government). However, these data refer to the whole territory administered by this Ministry, and are not broken down by AC. Therefore, in order to assign educational spending to each region, we used data from the General State Comptroller (*IGAE*). Specifically, we assigned the educational spending carried out by the Ministry of Education in each region for the following programs:

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

Source: Own elaboration.

As the table shows, the central government's education expenditure covers all programs related to non-university education if these programs are already offered (per region) by the Ministry of Education. Both direct expenditure on pre-primary and primary education (422A) and secondary and vocational and language education (422C), which represent about 90% of non-university expenditure, are taken into account, as well as the remaining programs such as the funding of teacher training, out-of-school activities, and complementary services. We think that these programs promote higher quality education and, therefore, must be considered. In fact, international studies also include programs of this kind.

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

Expenditure on all programs included in the analysis is territorially distributed by AC to a large extent (above 80% depending on each program and year). Within non-territorialized expenditure, in most of the programs (such as pre-primary, primary, secondary, professional education, official language schools and education for disabled students), 95% of the expenditure is classified under "various regions", which contains subsidies to private ('concerted') schools. This expenditure has been imputed to each AC depending on the number of students in publicly funded or 'concerted' schools. The figures for other non-regionalized expenditure have not been divided by AC since they refer to expenditure on central services or expenditure abroad.

IGAE data are for the 1992-96 period and, therefore, for 1997-98, interpolation was needed. This does not create problems because MEC public expenditure is very stable in all ACs. Table A.2.1 shows data used from the IGAE referring to central government expenditure on non-university education in each region. Table A.2.2 contains the expenditure of the regional governments and Table A.2.3 that of the local governments. The final table, A.2.4, contains total public expenditure on non-university education in each region considering all levels of government. The values are the result of adding the figures in Tables A.2.1. A.2.2 and A.2.3.

Table A.2.1: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF CENTRAL GOVERNMENT IN EACH AC
(INCLUDING EXPENDITURE TO PUBLIC SCHOOLS AND PRIVATE PUBLIC FUNDED SCHOOLS)

(thousands of Euros)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Andalusia	0	0	0	0	0	0	0	0	0	0	0	0	0
Aragon	258,022	295,452	316,384	318,700	342,196	371,303	402,885	0	0	0	0	0	0
Asturias	270,581	292,302	307,649	318,198	339,261	358,267	378,339	399,535	0	0	0	0	0
Balearic Islands	144,980	168,514	176,431	183,848	201,098	225,207	0	0	0	0	0	0	0
Canary Islands	0	0	0	0	0	0	0	0	0	0	0	0	0
Cantabria	120,754	140,619	150,056	151,390	162,180	178,193	195,788	0	0	0	0	0	0
Castile-Leon	616,925	693,038	749,774	755,460	811,756	869,955	932,325	999,168	0	0	0	0	0
Castile-La-Mancha	415,550	448,477	483,230	495,209	539,077	589,530	644,706	705,045	0	0	0	0	0
Catalonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Valencia	0	0	0	0	0	0	0	0	0	0	0	0	0
Extremadura	260,318	283,189	310,051	324,030	347,971	375,667	405,567	437,846	0	0	0	0	0
Galicia	0	0	0	0	0	0	0	0	0	0	0	0	0
Madrid	1,343,824	1,195,549	1,295,836	1,271,911	1,357,394	1,514,783	1,690,422	943,213	0	0	0	0	0
Murcia	273,208	301,192	323,159	334,624	365,897	405,750	449,943	249,475	0	0	0	0	0
Navarre	0	0	0	0	0	0	0	0	0	0	0	0	0
Basque Country	0	0	0	0	0	0	0	0	0	0	0	0	0
Rioja	59,030	68,471	76,265	75,458	83,858	88,662	93,742	0	0	0	0	0	0
Total	3,763,193	3,886,802	4,188,835	4,228,828	4,550,687	4,977,317	5,193,716	3,734,282	0	0	0	0	0

Source: IGAE.

Table A.2.2: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF AUTONOMOUS COMMUNITIES

(thousands of Euros)	1992	1993	1994	1995	1996	1997	1998
Andalusia	2,167,507	2,169,943	2,226,970	2,370,345	2,502,982	2,547,429	2,694,629
Aragon	0	835	6,257	10,980	12,621	83,809	88,382
Asturias	0	3,961	4,255	6,539	71,967	81,237	98,074
Balearic Islands	0	2,542	3,624	5,319	2,675	29,613	252,206
Canary Islands	616,421	628,401	674,170	747,973	809,047	832,190	877,928
Cantabria	0	2,037	2,037	3,402	5,259	35,545	38,771
Castile-Leon	0	487	1,569	1,725	195,990	212,323	215,908
Castile-La-Mancha	0	13,324	12,651	19,100	26,955	74,517	72,528
Catalonia	1,508,195	1,664,139	1,689,914	1,743,875	1,853,480	2,029,454	2,114,026
Valencia	1,007,035	1,075,362	1,130,736	1,159,118	1,236,615	1,298,924	1,410,721
Extremadura	0	0	10,854	14,028	63,978	63,980	74,771
Galicia	801,794	862,955	914,099	935,422	978,603	1,035,368	1,128,581
Madrid	0	101,102	97,875	137,103	586,155	596,290	716,343
Murcia	0	9,214	8,024	7,603	61,093	66,070	72,981
Navarre	192,465	206,344	213,420	227,217	246,426	261,124	271,300
Basque Country	763,407	853,990	860,674	926,669	978,693	1,023,481	1,091,118
Rioja	0	0	0	889	2,819	15,838	17,766
Total	7,056,824	7,594,637	7,857,129	8,317,307	9,635,358	10,287,193	11,236,032

Source: Ministry of Education for ACs where educational policy has been transferred and Ministry of Economics and Public Finance for ACs without transferred responsibilities.

Table A.2.2: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF AUTONOMOUS COMMUNITIES (continuation)

(thousands of Euros)	1999	2000	2001	2002	2003	2004
Andalusia	2,858,491	3,044,315	3,232,983	3,478,804	3,685,914	3,988,034
Aragon	437,154	488,943	519,099	568,026	589,496	626,052
Asturias	98,074	421,918	457,065	489,323	506,573	519,305
Balearic Islands	317,533	344,915	396,606	441,603	482,951	526,673
Canary Islands	991,207	975,195	1,006,278	1,036,703	1,083,812	1,151,336
Cantabria	215,120	235,024	234,501	247,380	252,557	299,015
Castile-Leon	240,226	1,070,803	1,159,332	1,252,712	1,314,673	1,357,184
Castile-La-Mancha	82,238	771,032	881,216	1,037,356	1,069,932	1,148,395
Catalonia	2,276,231	2,397,731	2,498,686	2,798,435	3,034,470	3,365,757
Valencia	1,566,774	1,698,795	1,844,148	2,046,405	2,222,441	2,373,614
Extremadura	77,867	472,695	566,485	662,987	638,526	669,121
Galicia	1,194,579	1,207,862	1,239,163	1,357,780	1,394,746	1,442,019
Madrid	943,213	1,879,998	2,068,492	2,272,228	2,455,020	2,648,327
Murcia	249,475	533,178	575,282	626,481	670,181	700,378
Navarre	283,913	306,522	330,887	350,104	377,460	403,836
Basque Country	1,234,045	1,240,379	1,354,640	1,445,241	1,531,961	1,589,270
Rioja	99,112	117,264	127,920	134,271	145,189	154,952
Total	13,165,252	17,206,569	18,492,783	20,245,838	21,455,900	22,963,268

Source: Ministry of Education for ACs where educational policy has been transferred and Ministry of Economics and Public Finance for ACs without transferred responsibilities.

Table A.2.3: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF LOCAL GOVERNMENTS

(thousands of Euros)	1992	1993	1994	1995	1996	1997	1998
Andalusia	112,672	104,011	146,797	110,292	114,841	113,014	145,577
Aragon	20,440	19,118	23,067	23,962	25,711	25,507	23,283
Asturias	11,083	18,193	21,468	20,759	20,206	20,633	23,121
Balearic Islands	15,061	12,405	16,029	17,357	16,035	22,081	22,754
Canary Islands	42,714	38,970	47,191	45,028	47,252	52,078	50,725
Cantabria	6,455	7,609	9,827	9,370	7,350	8,775	13,054
Castile-Leon	42,858	45,479	46,242	43,603	46,596	46,506	44,709
Castile-La-Mancha	25,243	29,708	32,322	36,499	32,028	36,283	38,765
Catalonia	254,330	254,565	249,053	317,665	261,867	295,163	307,658
Valencia	83,805	85,728	87,820	86,414	98,452	108,909	117,961
Extremadura	22,418	21,588	21,318	19,689	21,120	24,876	20,170
Galicia	58,286	46,945	48,039	48,412	51,561	49,626	55,882
Madrid	108,495	97,094	114,950	106,728	94,780	116,134	89,010
Murcia	28,230	23,241	26,234	28,308	27,022	31,259	36,307
Navarre	11,960	16,149	17,261	21,366	19,250	20,597	21,937
Basque Country	62,830	90,344	95,465	63,545	70,775	71,821	61,712
Rioja	2,819	2,957	2,981	3,185	2,999	4,598	3,179
Total	909,698	914,103	1,006,064	1,002,182	957,845	1,047,859	1,075,806

Source: Ministry of Public Finance; Budgets and budget outlay data of local governments.

Table A.2.3: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF LOCAL GOVERNMENTS (continuation)

(thousands of Euros)	1999	2000	2001	2002	2003	2004
Andalusia	230,128	171,914	216,821	228,096	236,182	259,331
Aragon	24,305	21,823	28,999	29,842	28,284	35,130
Asturias	26,126	23,716	27,562	28,684	32,509	33,350
Balearic Islands	26,078	27,310	33,524	50,062	54,845	47,958
Canary Islands	56,056	54,157	66,406	69,445	74,205	81,882
Cantabria	10,542	11,407	9,923	13,371	13,107	12,791
Castile-Leon	46,032	41,806	44,962	48,509	52,816	63,729
Castile-La-Mancha	40,664	38,230	62,962	57,901	57,462	66,365
Catalonia	295,145	315,658	343,382	387,010	423,489	504,458
Valencia	134,543	128,340	143,504	169,327	182,047	178,159
Extremadura	21,853	19,040	24,185	23,848	29,390	29,662
Galicia	59,590	57,469	61,670	71,498	79,367	77,547
Madrid	144,051	156,810	168,854	190,736	215,490	264,258
Murcia	34,264	34,270	38,759	40,133	46,346	47,629
Navarre	24,419	29,083	33,332	43,026	46,055	57,376
Basque Country	73,900	78,264	88,806	76,662	95,488	106,062
Rioja	3,696	2,777	5,211	6,212	5,255	7,849
Total	1,251,391	1,212,073	1,398,856	1,523,593	1,672,337	1,873,537

Source: Ministry of Public Finance; Budgets and budget outlay data of local governments.

Table A.2.4: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF ALL GOVERNMENTS

(thousands of Euros)	1992	1993	1994	1995	1996	1997	1998
Andalusia	2,280,179	2,273,954	2,373,767	2,480,637	2,617,823	2,660,443	2,840,206
Aragon	278,462	315,406	345,707	353,643	380,529	480,619	514,550
Asturias	281,664	314,456	333,372	345,496	431,434	460,137	499,534
Balearic Islands	160,041	183,461	196,084	206,525	219,807	276,901	274,960
Canary Islands	659,135	667,371	721,361	793,001	856,299	884,268	928,653
Cantabria	127,209	150,265	161,920	164,161	174,789	222,513	247,613
Castile-Leon	659,783	739,003	797,585	800,788	1,054,343	1,128,784	1,192,942
Castile-La-Mancha	440,793	491,509	528,203	550,808	598,060	700,330	755,999
Catalonia	1,762,525	1,918,704	1,938,967	2,061,540	2,115,347	2,324,617	2,421,684
Valencia	1,090,840	1,161,090	1,218,556	1,245,532	1,335,067	1,407,833	1,528,682
Extremadura	282,736	304,778	342,223	357,746	433,069	464,523	500,508
Galicia	860,080	909,900	962,138	983,834	1,030,164	1,084,994	1,184,463
Madrid	1,452,319	1,393,745	1,508,660	1,515,741	2,038,328	2,227,207	2,495,774
Murcia	301,438	333,647	357,416	370,535	454,011	503,078	559,231
Navarre	204,425	222,493	230,681	248,583	265,676	281,721	293,237
Basque Country	826,237	944,334	956,139	990,214	1,049,468	1,095,302	1,152,830
Rioja	61,849	71,428	79,246	79,533	89,676	109,098	114,687
Total	11,729,714	12,395,543	13,052,028	13,548,316	15,143,890	16,312,368	17,505,554

Source: Own elaboration.

Table A.2.4: PUBLIC EXPENDITURE IN NON-UNIVERSITY EDUCATION OF ALL GOVERNMENTS (continuation)

(thousands of Euros)	1999	2000	2001	2002	2003	2004
Andalusia	3,088,619	3,216,229	3,449,804	3,706,900	3,922,096	4,247,366
Aragon	461,459	510,766	548,098	597,868	617,780	661,182
Asturias	523,735	445,634	484,627	518,007	539,083	552,654
Balearic Islands	343,611	372,225	430,130	491,665	537,796	574,631
Canary Islands	1,047,263	1,029,352	1,072,684	1,106,148	1,158,017	1,233,218
Cantabria	225,662	246,431	244,424	260,751	265,664	311,806
Castile-Leon	1,285,425	1,112,609	1,204,294	1,301,221	1,367,489	1,420,913
Castile-La-Mancha	827,947	809,262	944,178	1,095,257	1,127,393	1,214,760
Catalonia	2,571,376	2,713,389	2,842,068	3,185,445	3,457,959	3,870,215
Valencia	1,701,317	1,827,135	1,987,652	2,215,732	2,404,488	2,551,773
Extremadura	537,566	491,735	590,670	686,835	667,916	698,783
Galicia	1,254,169	1,265,331	1,300,833	1,429,278	1,474,113	1,519,565
Madrid	2,030,477	2,036,808	2,237,346	2,462,964	2,670,510	2,912,585
Murcia	533,214	567,448	614,041	666,614	716,526	748,007
Navarre	308,332	335,605	364,219	393,130	423,515	461,212
Basque Country	1,307,945	1,318,643	1,443,446	1,521,903	1,627,449	1,695,332
Rioja	102,808	120,041	133,131	140,483	150,444	162,802
Total	18,150,925	18,418,642	19,891,645	21,780,201	23,128,237	24,836,805

Source: Own elaboration.



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RESUMEN

El artículo presenta un análisis regional de los efectos de determinadas políticas educativas, aplicadas en España entre 1992 y 2003, sobre el fracaso escolar. En concreto se considera el impacto del gasto por alumno, el tamaño de la clase y la relación de alumnos por profesor sobre las tasas de fracaso al final de la educación obligatoria y sobre la proporción de abandono temprano a la edad de 18-24 años. Nuestros resultados indican que un mayor nivel de gasto educativo por alumno y un menor tamaño de clase y de la relación profesor-alumno reducen la tasa de fracaso escolar y el abandono temprano (aunque el tamaño de la clase no resulta siempre estadísticamente significativo). Sin embargo, la magnitud de los efectos de estas variables es pequeña en el nivel medio.

Palabras clave: fracaso escolar, abandono escolar, política educativa regional.

Clasificación JEL: I22, I28, R50.