EVALUATION OF THE EFFECTS OF DECENTRALIZATION ON EDUCATIONAL OUTCOMES IN SPAIN

Paula Salinas Peña [*]

Universitat de Barcelona (UB)

Institut d'Economia de Barcelona (IEB)

Abstract: Several arguments of Fiscal Federalism Theory argue that decentralization policies can lead to improved levels of efficiency in the provision of public goods and services. The aim of this study is to contrast this hypothesis by evaluating the decentralization effects on educational outcomes in Spain, which we will measure through the *Survival Rate*, defined as the proportion of students in last course of *ESO* (compulsory education) who access to *Bachillerato* (non-compulsory education). To do that, we will use a panel data set of the 50 provinces in Spain, for the period 1980-2003, so that the available information covers all the education decentralization process. The main conclusion of the study is that decentralization in Spain has implied an improvement of government efficiency in educational policy, and that this improvement has been greater in Autonomous Communities with a good fiscal discipline and a high level of per capita public revenues.

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Contact Address: Dpt. Economia Política i Hisenda Pública
Avda. Diagonal, 690, Torre 4, 2ª Planta
08034 Barcelona
Phone: 93.403.59.16
e-mail: paulasalinas@ub.edu

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1. Introduction

In recent years, several countries have embarked in decentralization processes whose main objective was to improve efficiency and quality in the provision of public goods and services. For example, in the United Kingdom, the Scotland and Wales Parliaments have been founded as a result of the decentralization process, while in Spain and Italy the autonomy of regional governments has notably been raised during the last two decades. In the same way, some developing economies as Argentina, Bolivia or India, have devolved the provision of public services to the regional and local authorities. As a result of these international movements towards decentralization, and of the general conviction about its beneficial effects, this issue is now present in the political programme of a lot of countries and in the political economy recommendations coming from some international organizations, especially the OECD and the World Bank. However, the benefits of decentralization have to be compared with its potential drawbacks before concluding its superiority in terms of social welfare and efficiency.

The main arguments in favour of decentralization come from the Fiscal Federalism Theory. It is argued that decentralization can lead to improved levels of efficiency in the provision of public goods and services, as a consequence of the local governments' better knowledge about population circumstances (Oates, 1972). In addition, decentralization can raise the political participation of the population, what would make local governments to be more responsive to the citizen demands than the central government (Shah, 1998). However, Fiscal Federalism Theory also remarks some disadvantages of the decentralization process that can be especially important in certain socioeconomic contexts. On the one hand, it is argued that decentralization can lead to higher levels of corruption and that local governments are more prone to be captured by local elites than the central ones (Prud'homme, 1995). On the other hand, the existence of spillover effects and the lack of technical capabilities by local governments can also reduce efficiency in the provision of public goods and services under a decentralized system. So, the theory is not conclusive about the effects of decentralization, and empirical analysis is necessary to determine which of these effects, positive or negative, are predominant, and in which contexts they will appear.

Although theoretical analysis about the effects of decentralization has always been present in the economic literature, empirical analysis about this issue has been practically non-existent until recent years. Some examples of this empirical literature

are Faguet (2004) and Solé and Esteller (2005), which contrast the hypothesis that decentralization allows a better matching between political decisions and local preferences and needs *(allocative efficiency*). Another example is Barankay and Lockwood (2005), who analyze the relationship between decentralization and *productive efficiency* of government in education policy. Finally, we can also find some papers that try to analyze the effects of decentralization on the quality of government in a more general way (Treisman, 2002).

Despite the existence of these studies, the empirical evidence about the effects of decentralization on the efficiency and outcomes of public policies continues being poor and, in some cases, it leads to contradictory conclusions. So, in a context where decentralization policies are becoming more and more popular, we consider that it is necessary to complement the existing empirical literature about their effects. Specifically, the aim of this study is to analyze the effects of decentralization on education outcomes in Spain, which we will measure through the *Survival Rate,* defined as the proportion of students who stay at school after finishing compulsory education. A second objective of the analysis is to determine in which conditions it is more probable that decentralization lead to an improvement of education outcomes, and in which ones this effect could be negative.

As we have noted above, in the last two decades Spain has been involved in a strong decentralization process. As a result, it has become one of the most decentralized economies in Europe, what will allow us to study some of the effects of this process in terms of education outcomes. The results that we obtain in the study suggest that decentralization in Spain has lead to better education outcomes, and that these better results are more important in Autonomous Communities with a good fiscal discipline and a high level of per capita public revenues. The effects of decentralization on education in Spain had only been studied in Solé and Esteller (2005), focusing on the allocative efficiency implications of decentralization. According to this study, the decentralization process in Spain has improved allocative efficiency in education and road investment, what is in the line of our conclusions.

The paper is organized as follows. First, following to this section, there is a review of the literature about the effects of decentralization. Fiscal Federalism theory establishes several arguments for and against decentralization, which provide a context for the empirical studies that try to contrast these different arguments. The third section describes the main aspects of the educational sector in Spain, with special reference to

the decentralization process. The fourth section provides a description of the model which we will estimate, the data we will use to do this estimation and the results we obtain. Finally, the last section contains the conclusions of the study.

2. Literature Review

2.1 The theory

Fiscal Federalism Theory has traditionally expressed the decentralization problem as a trade-off between its potential benefits, in terms of both productive and allocative efficiency, and its possible drawbacks, derived from the existence of spillover effects and economies of scale.

The main argument in favour of decentralization is the *Decentralization Theorem* (Oates, 1972) which argues that, in the absence of externalities and economies of scale, decentralized provision of public goods will always be preferable to the centralized one in terms of social welfare. The reason is that while central government produces a uniform level of public goods, provision by local governments can differ between regions according to the heterogeneous local tastes and needs. Oates (1972) justifies this assumption in terms of the lower information about local preferences and needs what central government has access to, and some political problems that would prevent him from provisioning heterogeneous levels of public goods and services in the different regions.

More recent literature, from a political economy point of view, allows relaxing this hypothesis by modelling legislative behaviour at the central level of government (Lockwood, 2002; Besley and Coate, 2003). The main findings of these studies seem to confirm Oates' conclusion that decentralization would be preferable when externalities are small and/or regions heterogeneous. However, it is possible to find some differences between the two approaches. On the one hand, in the new political economy approach the costs of centralization are not derived from a uniform level of provision of public goods, but from the inefficient spending decisions made by the legislature at the central level. On the other hand, the arguments which support that centralization improves efficiency in the presence of externalities are also very different. In the Oates' approach, centralization would be preferable in these circumstances because it allows internalizing

spillover effects. However, in the political economy approach, externalities influence central government incentives to allocate funds efficiently.

The general conclusion of these theoretical studies is that, if externalities are low and districts heterogeneous, decentralization will improve allocative efficiency. However, implicit in this proposition there are some assumptions it would be convenient to bear in mind, overcoat if we were analyzing the effects of decentralization in developing countries. First, it is supposed that regional governments have access to better information about local preferences and circumstances than the central government, what allows them to be more responsive and to better match local preferences with the provision of public goods and services. But in developing countries, even if local authorities have access to better information about population preferences and circumstances, they may lack of the technical capabilities and the necessary resources to respond to population demands. Second, it is also supposed the existence of democratic processes that allow people to express their wants and preferences. However, local elections in developing countries, when they exist, say little about local preferences, because they are usually decided on the basis of personal, tribal or political party royalties (Prud'homme, 1995). Finally, in these studies governments are supposed to be benevolent, in the sense that they act in the interest of citizens. This hypothesis, however, has been questioned by several authors in recent years. They emphasize the fact that governments could have their own interests or to be captured by lobbies and rent-seeking groups, leading to different types of government corruption. Seabright (1996), for example, has modelled how decentralization affects government's incentive to act according to the interests of citizens, concluding that it will depend on the *political accountability*, defined as the probability that the welfare of a given region determine the re-election of government. Given that the *political accountability* or the electoral control over incumbents is greater at the local level, decentralized governments will have more incentives to act according to the preferences of the population than centralized ones and, therefore, to be less corrupt. Hindriks and Lockwood (2005) and Persson and Tabellini (2000) arrive to similar conclusions about the relationship between decentralization, political accountability and government behaviour. We can also find some studies that analyze the relationship between decentralization and lobbying, concluding that the effect of decentralization on corruption is ambiguous and context-specific, so that empirical analysis is necessary (Redoano, 2004; Bardhan and Mookherjee, 2000; Bardhan and Mookherjee, 2005).

2.2 Empirical work

As we have seen, the theoretical analysis does not allow extracting any conclusion about the superiority of centralization or decentralization in terms of economic efficiency, so that empirical analysis is necessary. However, the empirical literature about the effects of decentralization on both allocative and productive efficiency has been practically non-existent until recent years and, nowadays, it continues being notably scarce.

The influence of decentralization on allocative efficiency has been analyzed in Faguet (2004) and Solé and Esteller (2005), which contrast if decentralization has changed investment patterns (across Bolivian municipalities in the first case and Spanish provinces in the second case), as well as to what extent these changes were related to objective measures of needs. In both studies the conclusion is that decentralization has lead to a better adjustment between investment patterns and needs, corroborating one of the main theories of Fiscal Federalism. However, Akin et al. (2001), who analyze allocation of funds between public and non-public goods in Uganda, conclude that the regional governments tend to allocate fewer resources to public good type activities than the central government, so that the social welfare is reduced with decentralization.

The relationship between decentralization and productive efficiency has been analyzed through the influence of decentralization on some type of measure of policy's outcome. Positive effects of decentralization on education outcomes in Argentina have been obtained by Habibi et al. (2001), who uses the ratio of students enrolled in secondary school per one thousand primary students as dependent variable. Galiani and Schargrodsky (2001) and Galiani, Gertler and Schargrodsky (2005) obtain also positive effects of decentralization on education outcomes, measured by standardized tests scores of argentine students, but only in provinces with not very huge fiscal deficits. The same results have been obtained in Barankay and Lockwood (2005), analyzing the effects of decentralization on educational attainment in Swiss cantons, measured as the number of students who obtain the university entrance level qualification related to the number of 19 years population (*maturité rate*). Faguet and Sanchez (2006) find also evidence of improved education outcomes in Colombia (measured as the year-on-year increase in student enrolment) as a result of the decentralization process. However, we can also find opposite results about the effects of decentralization on education

outcomes. One example is Mahal et al (2000), although their results could be biased, because they use a cross-section analysis, which does not allow them to control for unobservable characteristics of Indian villages. Treisman (2002), who analyze the effects of decentralization on the quality of public services in basic education (among other measures of government quality), finds also evidence about the negative effects of decentralization on education outcomes.

Finally, the relationship between decentralization and corruption has been analyzed in several studies, which also arrive to contradictory conclusions. While Treisman (2002) finds quite strong evidence about the fact that decentralization leads to higher levels of perceived corruption, Fisman and Gatti (2001) and Huther and Shah (1998) conclude just the opposite.

Therefore, we can see that some papers stand in contradiction to each other about the effects of decentralization on government's quality and education outcomes. Given this trouble, and the fact that the case of Spain has only been analyzed in Solé and Esteller (2006), focusing on allocative efficiency, we have considered interesting to empirically analyze the effects of decentralization on education outcomes in Spain.

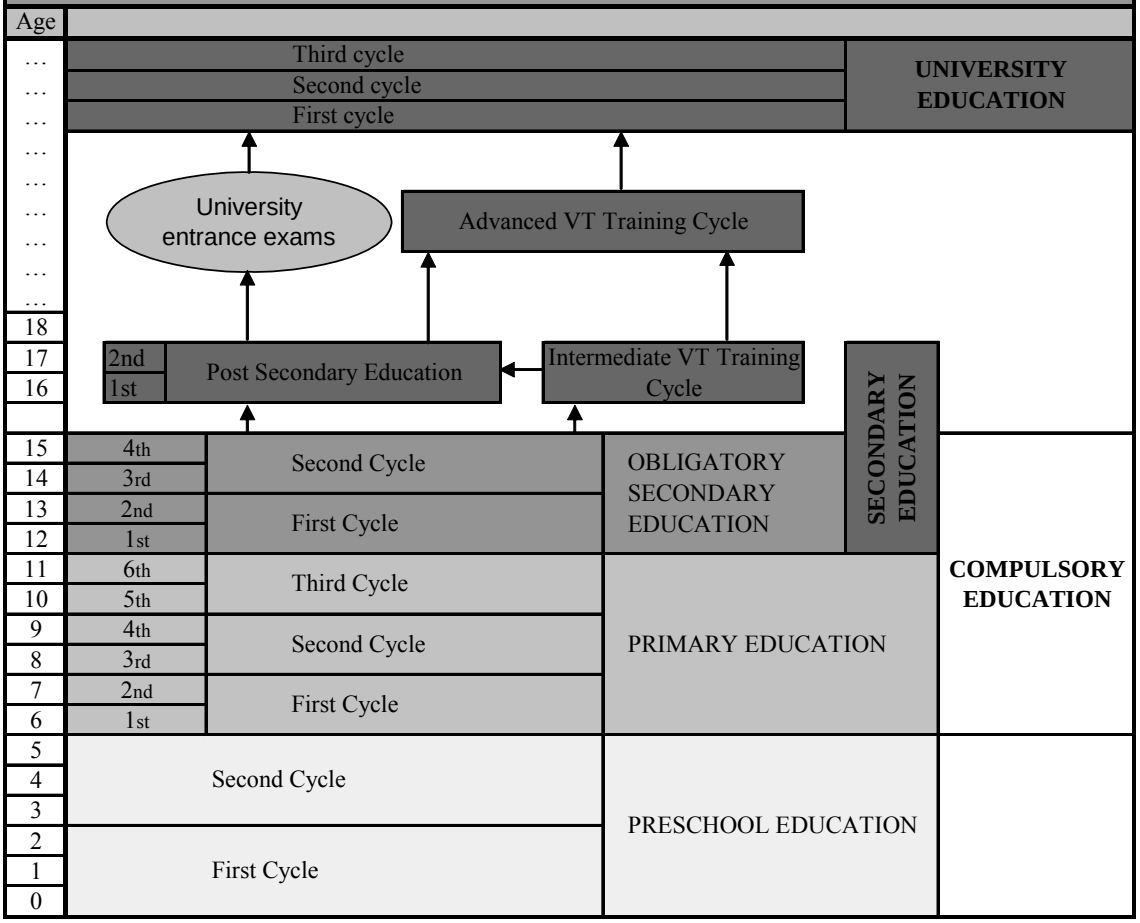
3. The main aspects of the educational sector in Spain

3.1 Educational system in Spain

The educational system in Spain has experienced several reforms during the last thirty years, in response to the changing needs of an economy that has showed a great development during this period. In 1970, the *Ley General de Educación* (LGE) layed down compulsory education until 14 years age and established the free access to it. In addition, this law implanted vocational training in the educational system, as an alternative way to continue studies after finishing compulsory education, with the main objective of making easier the students' entry to the labour market. In 1985, the *Ley Orgánica Reguladora del Derecho a la Educación* implanted state assisted schools, to combine the free access to education with the free election of the centre. However, the basic structure of the educational system was not altered until 1990, when the *Ley Orgánica de Ordenación General del Sistema Educativo* (LOGSE) stated compulsory education until 16 instead of 14 years old, and implanted advanced vocational training.

As a result of this reform, the educational system in Spain is now structured as is showed in Table 1.

Table 1. Educational System Structure



Source: *El Sistema Educativo Español 2002 (MEC)*

In this study, we will analyze the effects of decentralization on the proportion of students enrolled in last course of Obligatory Secondary Education (*ESO*) who access to Post Secondary Education (*Bachillerato*), as a measure of the *Survival Rate* in school. Obviously, with this measure we are leaving aside students who access to vocational training cycles (*Ciclos Formativos*) after finishing compulsory education. The lack of data about students who access to first course of vocational training does not allow including these students in our measure of the *Survival Rate*. However, in Spain, the educational itinerary which includes *Bachillerato* education is the main way to access to the university and to the jobs that require more qualified personnel, so that we consider that the *Survival Rate* variable, as it has been defined above, is a good way to measure the educational attainment in Spain.

3.2 Decentralization process

We can set the beginning of the decentralization process in Spain in 1978, when the Spanish Constitution was approved. In fact, the Constitution stated the basis that would allow Spain to become one of the most decentralized economies in Europe. Specifically, it established the right of Spanish provinces to unite to form autonomous regions (so that 17 Self-governing Communities were formed) and specified the division of competences between the central government and these new autonomous or regional governments. In relation to the educational sector, The Constitution keeps for the central government the definition of the structure of the educational system, the regulation of the requirements for obtaining, issue and standardization of academic degrees and professional qualifications and the establishment of basic rules to guarantee the unity of the Spanish educational system. The other educational competences, however, can be devolved to the regional governments.

One of the main particularities of the decentralization process in Spain is the asymmetry it has been made with (García-Milà and McGuire, 2002). While provinces with common historic, cultural and economic characteristics, insular territories and provinces with an historic regional status can accede to all competences not kept for the central government in the Constitution (section 149) since the approval of their Devolution Statutes (that is Catalunya, País Vasco, Galicia and Andalucía), the other autonomous regions will have to wait five years since the approval of their Devolution Statutes to receive these competences. In practice, however, these non historic autonomous regions were not able to receive the educational competences until the approval of the *Acuerdos Autonómicos de ampliación de competencias* in 1992, and the transfers were not effective until the final years of the nineties. We can see this fact in Table 2, which shows the year of the approval of the Devolution Statutes and the year in which educational powers were transferred to each Autonomous Community. Although the decentralization process has lasted almost two decades, nowadays all autonomous regions have the same level of educational competences. As we will see later, the fact that the different regions received educational competences at different points in time, on the basis of historical reasons, allows us applying public policy evaluation methods, using the non-decentralized autonomous communities as control group.

Table 2. Statutes of Autonomy and educational competences transfer laws		
Autonomous Community	Statutes of Autonomy Constitucional Laws	Educational transfers decrees
Andalucía	6/1981	3936/1982
Aragón	8/1982	1982/1998
Asturias	7/1981	2081/1999
Baleares	2/1983	1876/1997
Canarias	10/1982	2091/1983
Cantabria	8/1981	2671/1998
Castilla y León	4/1983	1340/1999
Castilla La Mancha	9/1982	1844/1999
Cataluña	4/1979	2809/1980
Extremadura	1/1983	1801/1999
Galicia	1/1981	1763/1982
Madrid	3/1983	926/1999
Murcia	4/1982	938/1999
Navarra	13/1982	1070/1990
País Vasco	3/1979	2808/1980
La Rioja	3/1982	1826/1998
C. Valenciana	5/1982	2093/1983

Source: *Boletín Oficial del Estado (BOE)*

4. Empirical analysis

4.1. The model

Our first objective is to analyze the effects of the decentralization in Spain on education outcomes. As we have seen in the literature review, in this way we can estimate the effects of decentralization on government's productive efficiency in the provision of goods and services. Therefore, what we are going to do is to estimate an education production function (see Pritchett and Filmer (1997) for a review of education production functions), in which the education outcomes of provinces are related to the educational inputs and the decentralization variable.

In the literature about education we can find several variables that try to measure educational attainment, like the net enrolment rate (Mahal et al., 2000), the average tests scores in Language and Maths grades (Galiani and Schargrodsky, 2001) or the number of students that obtain the university entrance level qualification deflated by the number of 19 years old population (Barankay and Lockwood, 2005). Here, we will measure the educational attainment through the *Survival Rate*, defined as the number of students who access to Post-Secondary Education (*Bachillerato*) related to the students enrolled in the last course of compulsory education (*E.S.O.*) in each province. A similar measure

was used in Habibi et al. (2001), defined as the ratio of students enrolled in secondary school per one thousand of primary students. Although it would have been more interesting to use the results obtained in some standardized test as dependent variable, like the University entrance exams (called PAAU in Spain), or the results obtained from PISA (the OCDE Programme for International Student Assessment), it has not been possible. On the one hand, PAAU scores were not available for public and private schools separately, so that we could not use them to reach our objective, that is, to evaluate the effects of decentralization on the outcomes of public schools. On the other hand, the data from PISA or other similar projects were only available for recent years, so that it was not possible to analyze the effects of decentralization in Spain, which started at the beginning of the eighties. However, in a country where enrolment rates in compulsory education are near 100%, as in Spain, it is also interesting to use a variable which measures the permanence of students at school after this period. It is supposed that a good level of education quality will make students to stay at school, instead of going to the labour market or to vocational training cycles, so that we can say that if decentralization implies an increase in the *Survival Rate*, it is because it has raised education quality.

In relation to the educational inputs, we can find different types of variables that are considered to be important at explaining education outcomes. On the one side, there are school inputs –like the number of teachers, classes' size or educational spending–, directly controlled by government, but whose significance is not clear in the literature (Hanushek, 1986). On the other side, family characteristics –like income, parental education or family structure– have been found to be more important at explaining education outcomes than school inputs (Hanushek, 1986), as well as the characteristics of the other students (like racial composition of schools) and the educational sector context (unemployment rate or labour demand). In our empirical exercise, we will use the *pupil per teacher ratio,* to measure school inputs; *per capita income* and *population background,* to measure family characteristics; and *unemployment rate,* to represent the educational sector context. The *pupil per teacher rate* is a good measure of school inputs, in the sense that it will be correlated with the classes' size and with the public spending on education. In principle, we would expect the coefficient of this variable to be negative, so that the less the number of pupils per teacher, the better the education outcomes. Family characteristics, measured through *per capita income* and *population background* variables, are expected to positively influence education outcomes. On the

one side, we can suppose that low income families are not able to spend as much economic resources as high income families on children education (for example on private lessons), what will negatively affect child educational attainment. In addition, some students from low income families will probably have to spend more time working than those from high income families, what can also influence their educational attainment. On the other side, family background has also been demonstrated to have a positive influence on the performance of children at schools, probably because more educated parents will give a greater importance to education than less educated parents. Finally, *unemployment rate* can influence the decisions of students, in the sense that a higher unemployment rate will encourage them to stay at school after finishing compulsory education.

The decentralization variable is measured with a dummy, which takes the values 1 if the province is in a decentralized Autonomous Community (for all the years after decentralization has taken place), and 0 otherwise. We consider this variable to be very appropriated in the case of Spain, where decentralization of education expenditures implies decentralization of decision making power towards Autonomous Communities. However, we will also make the estimations with an alternative measure of decentralization, which will allow us having into account the fact that the effect of decentralization can be different depending on the years passed since it has taken place.

Therefore, the empirical model we want to estimate takes the following form:

$$Y_{it} = \Phi_i + \theta_t + X_{it}\beta + d_{it}\alpha + U_{it} \qquad (1)$$

where Φ_i and θ_t are vectors of province and year dummy variables, Y_{it} is the *Survival Rate* in province i and year t, X_{it} includes input variables, d_{it} is the *decentralization dummy* variable and U_{it} is a province time-varying error term. This specification corresponds to the *differences-in-differences* estimation method, widely used in the political evaluation literature and in the analysis of the decentralization effects on education outcomes. The main advantages of this methodology are, on the one side, that it allows controlling for unobservable or non-measurable characteristics of provinces that may have an influence both on the education outcomes and on the decision of decentralizing or not, Φ_i. For example, the given importance to the education in a society or governance differences are factors that can influence both students' outcomes

and the wish of regional governments to receive educational competences. If we do not control for these individual unobservable characteristics of provinces, then $E[U_{it} \mid d_{it}] \neq 0$ and $\hat{\alpha}$ would be biased (Heckman and Hotz, 1989). On the other side, this methodology also allows controlling for the temporary shocks that affect equally to the outcomes of the different provinces, θ_t (for example, a central government reform).

The idea behind this estimator is that it uses the outcomes of provinces in non-decentralized Autonomous Communities *(control group)* to approximate what would have happened with the outcomes of provinces in decentralized Autonomous Communities *(treated group)* in case they would not have been decentralized, that is, to construct the *counterfactual.* Both the treated and control groups must have equal observable and unobservable characteristics before the decentralization policy, in order to ensure that the behaviour of their outcomes would have been the same in the absence of this decentralization policy. Then, the *differences-in-differences* estimator compares the growth of the outcome of the treated provinces with the growth of the outcome of the non-treated ones, being the difference between them the effect of the treatment on the treated (Blundell and Costa Dias, 2000):

$$\hat{\alpha}_{DD} = (\overline{Y}_{t_1}^{(T)} - \overline{Y}_{t_0}^{(T)}) - (\overline{Y}_{t_1}^{(C)} - \overline{Y}_{t_0}^{(C)}) \qquad (2)$$

where $\overline{Y}_{t_1}^{(T)}$ and $\overline{Y}_{t_0}^{(T)}$ are the mean outcomes of the treated group after and before decentralization, respectively, and $\overline{Y}_{t_1}^{(C)}$ and $\overline{Y}_{t_0}^{(C)}$ are the mean outcomes of the control group after and before decentralization. Despite the advantages presented by this estimation method, it is based on very restrictive assumptions. On the one side, it supposes that temporal shocks and their effects on the dependent variable are the same in all provinces, what is quite hard to justify. Each province can be affected by different shocks and, even in case these shocks were the same, provinces can react differently between them depending on their own characteristics. On the other side, the results obtained by this method are only robust if there are no changes in groups' composition (treated and control groups) and if we have observations both for before and after the decentralization programme. But the first of these assumptions is not valid in the case of Spain when we use provinces in non-decentralized Autonomous Communities as control group, because they change from the control group to the treated group as they receive educational competences.

One way to solve the first problem cited above is to use a *random-trend model* instead of the *differences-in-differences* estimation method, what allows relaxing the assumption of common temporal effects. We can see the specification of this model below, which main advantage is that each province is supposed to have a different trend:

$$Y_{it} = \Phi_{1i} + t \cdot \Phi_{2i} + X_{it}\beta + d_{it}\alpha + U_{it} \quad (3)$$

where Φ_{1i} are the province dummy variables and Φ_{2i} are the province specific trends. If we observe the evolution of the *Survival Rate* variable in each province, we can see that differential trends between them is a good assumption, given that while some provinces show a growing trend for this variable, the others show a decreasing trend or a constant evolution through time.

An alternative way to solve the problems presented by the *differences-in-differences* method is to use private schools in each province as an additional control group. Private schools are supposed to be a good control group, in the sense that they are probably affected by the same shocks than public schools in the same province. In this way, we can control for individual-temporary shocks which affect education outcomes in each province differently and that are varying in time. Then, the model we would estimate corresponds to the *differences-in-differences of the difference* between public and private schools:

$$Y_{it}^{pub} - Y_{it}^{priv} = \Psi_i + \Gamma_t + X_{it}(\beta^{pub} - \beta^{priv}) + d_{it}\alpha + U_{it} \quad (4)$$

The main problem of using private schools as control group in the case of Spain is that they include state assisted schools, so that they can be affected in some way by decentralization. If this is the case, decentralization coefficient would not be capturing the effect of decentralization on the outcomes of public schools, because we would be controlling it when we subtract the outcomes of private schools from the equation. However, state assisted schools have a high degree of autonomy in their functioning system, so that public performance is limited to financing a part of their costs. Therefore, we can expect that their outcomes are not affected by decentralization, at least to the same extent than public ones.

When we include school inputs in any of these specifications of the education production function, the decentralization coefficient will not measure the full effect of decentralization on education outcomes, because it leaves out the effect of the variation of the inputs as a result of decentralization. In this case, the decentralization coefficient will be measuring the effect of decentralization on the efficiency of government in education policy. Then, to measure the whole effect of decentralization on education outcomes we will have to exclude school inputs from the estimated equation. So, we will make estimations both with and without pupils per teacher rate.

To achieve our second objective, that is, to determine in which conditions it is more probable that decentralization leads to better outcomes of education policies, we will add some interaction terms to the specified equations. In the literature, several factors have been considered to influence the effects of decentralization on policy outcomes. Galiani and Schargrodsky (2001) and Barankay and Lockwood (2005), for example, find that decentralization effects on education outcomes are positive when regional governments have a good fiscal discipline, but negative in regions with a bad fiscal discipline. In the same way, Galiani, Gertler and Schargrodsky (2005) find that positive effects of decentralization disappear when schools are in a poor area or a badly administered province. Following these empirical papers, we will add to the specifications above two interaction terms. An interaction term between decentralization and fiscal discipline, which we will measure through public surplus of regional governments, and an interaction term between decentralization and the province's wealth, measured through per capita income. Since public surplus of regional governments is influenced by the amount of revenues which they dispose of, we will also add to the regression equations an interaction term between decentralization and per capita public revenues. This term will also allow us having into account the government's restriction or freedom to make educational policy, what can also influence education outcomes. Therefore, we will estimate the following models:

$$Y_{it} = \Phi_i + \theta_t + X_{it}\beta + d_{it}\alpha + (d_{it}Z_{it})\delta + U_{it} \tag{5}$$

$$Y_{it} = \Phi_{1i} + t \cdot \Phi_{2i} + X_{it}\beta + d_{it}\alpha + (d_{it}Z_{it})\delta + U_{it} \tag{6}$$

$$Y_{it}^{pub} - Y_{it}^{priv} = \Psi_i + \Gamma_t + X_{it}(\beta^{pub} - \beta^{priv}) + d_{it}\alpha + (d_{it}Z_{it})\delta + U_{it} \tag{7}$$

where Z_{it} is the vector of the interaction term variables. According to the existing previous results, we could expect that a good fiscal discipline (or a high public surplus) will be related to a higher effect of decentralization on education outcomes, so that the coefficient of this variable will be positive. In the same way, it is expected that *per capita income* will have a positive influence on the effects of decentralization, both because high income provinces will probably be more responsive to policy changes, and because per capita income level can be correlated with unobservable factors (like population control of government), which also have an influence on the effects of decentralization, and whose effects would be collected in this term. Finally, per capita public revenues are also expected to influence positively the effects of decentralization on education outcomes.

4.2. Data

To estimate the models above, we have a panel data set with the 50 provinces of Spain, for the period 1980-2003, so that we have 1200 observations. As we can see, the available information covers all the education decentralization process, which started in the early eighties, with the decentralization towards Catalunya, País Vasco, Galicia, Andalucía, Canarias and Comunidad Valenciana, and finished at the end of the nineties, when education was decentralized to the rest of Autonomous Communities.

The *Survival Rate* is defined as the number of students who access to Post-Secondary Education (*Bachillerato*) related to the students enrolled in the last course of compulsory education (*ESO*) in each province. With this variable we want to measure the proportion of ESO last course students who access to *Bachillerato*, so that to calculate it we divided the enrolled pupils in the first course of *Bachillerato* (once we have subtracted pupils who repeat) by enrolled pupils in the last course of ESO (the year before). The data about enrolled pupils and pupils who repeat have been obtained from the Annuals published by the *National Statistics Institute* until 1985 and by the *Ministry of Education and Science* after this year (Table 3 shows the availability and definition of these variables). The main problem of using the *Survival Rate* as the outcome measure is that this variable can be influenced by pupils coming from private schools, so that it will be overvaluating the proportion of students who access to *Bachillerato.* However, it is supposed that the more the pupils coming from private schools, the better

the quality of public education, because in other case students would prefer to stay at private school. Then, a raise in the *Survival Rate* motivated by this movement of students from private to public schools could also be interpreted as an improvement in the quality of education in public schools.

Table 3. Definition and availability of educational data

Variable	Definition	Available data	Classified in
Enrolled pupils	It includes all enrolled students in each course, even if he has enrolled for the complete course or for some subjects.	*Period: 1975/76-2004/05*	Courses Public/private schools
Pupils who repeat	It includes students who are registered in a course in which they have been enrolled yet, but not those who are registered in a complete course for the first time but has some subjects pending of the course before, nor those who have repeated previous courses but not the course of reference.	*Period: 1980/81-2004/05*	Courses Public/private schools
Teachers	Personnel who exercise teaching directly over students at school during school hours.	*Period: 1975/76-2004/05*	Primary/Secondary school Public/private schools

Source: *Estadística de la Enseñanza en España (INE) and Estadísticas de la Educación en España (MEC)*

As we can see in Table 3, the information about the number of teachers, necessary to calculate the pupil per teacher ratio, has also been obtained from the annuals published by the *National Statistics Institute* and the *Ministry of Education and Science*. Given that it is not possible to obtain this information for each course separately, the *pupil per teacher ratio* makes reference to all the Secondary Education stage, so that there are included pupils and teachers of Obligatory Secondary Education, Post-Secondary Education and Intermediate Vocational Training Cycles (see Table 1).

Per capita income series, measured in thousands of euros of 1990, has been constructed from data published by the *Fundación BBVA* (period 1980-1986) and from the *Regional Accounts* published by the *National Statistics Institute* (period 1986-2003). *Population background,* defined as the percentage of Working Population having a university degree, has been calculated from the Human Capital series published by the *Instituto Valenciano de Investigaciones Económicas* (IVIE) and the *Fundación BBVA*.

Finally, the data to calculate the *Unemployment Rate* has been obtained from the Quarterly Survey of the Labour Market ("Encuesta de Población Activa"), carried out by the *National Statistics Institute*.

As we have discussed above, for non decentralized Autonomous Communities to be a good group of control, so that they approximate accurately what would have happened in decentralized communities in case they would not had been decentralized, both groups of communities should present similar observable and unobservable characteristics at the moment of decentralization. If we compare observable characteristics of the autonomous communities decentralized during the eighties (treated group) with the characteristics of the autonomous communities decentralized during the nineties (control group), we observe that they are very similar (Table 4).

Table 4. Autonomous Communities characteristics comparison (data from 1980)

Variables	Treated Group		Comparison Group	
	Mean	Std. Desv.	Mean	Std. Desv.
Survival Rate (Public schools)	74.79	5.43	74.46	5.86
Survival Rate (Private schools)	76.63	5.55	77.01	8.59
Pupils per teacher rate (Public schools)	16.91	1.17	16.88	1.15
Pupils per teacher rate (Private schools)	14.99	2.83	14.34	1.81
Per capita income	4.58	0.76	4.46	0.81
Population background	6.50	1.58	7.32	1.79
Unemployment rate	11.05	5.49	9.05	3.18

Note: In the treated group there are included Catalunya, País Vasco, Galicia, Andalucía, Valencia and Canarias.

The *Decentralization dummy* has been constructed from laws about transfers of educational powers from the central to the regional governments, published in the *Boletín Oficial del Estado* (BOE). It will take the values 1 if province *i* is in a decentralized Autonomous Community in year *t*, and 0 otherwise. As an alternative measure of decentralization, we will use the proportion of schooling years that a pupil in first course of Bachillerato has been under a decentralized regime. That is, during how many of the eleven years of schooling of the *Bachillerato* students the educational policy has been decentralized.

The variables used to interact with decentralization, in order to analyze which factors can influence the decentralization effects, are defined as follows. First of all, we measure fiscal discipline through public surplus in percentage of the Autonomous Community GDP, as Barankay and Lockwood (2005) do. Second, the province's wealth

is measured through per capita income; and third, the amount of public revenues disposable by regional governments has been calculated by subtracting the specific transfers for health and social security services from the total revenues[1], in order to homogenize the data between those Autonomous Communities which have been devolved these competences and those who have not. Public finance data are obtained from BADESPE database, while GDP and per capita income data are obtained from the *Regional Accounts* published by the *National Statistics Institute* and from the *Fundación BBVA.*

As we can see in Table 5 below, where descriptive analysis of each variable is showed, all variables present a great variation both across time (within) and across individuals (between).

Table 5. Descriptive analysis of variables

Variable		Mean	Std. Dev.
Survival Rate (Public schools)	overall	73.452	6.870
	between		4.462
	within		5.260
Survival Rate (Private schools)	overall	72.589	18.311
	between		5.167
	within		17.582
Pupils per teacher rate (Public schools)	overall	14.205	2.760
	between		0.958
	within		2.592
Pupils per teacher rate (Private schools)	overall	15.962	2.891
	between		1.797
	within		2.278
Per capita income	overall	5.633	1.445
	between		1.029
	within		1.025
Population background	overall	12.167	4.688
	between		2.622
	within		3.903
Unemployment rate	overall	16.390	7.177
	between		5.749
	within		4.370
Public Surplus	overall	-0.186	0.846
	between		0.270
	within		0.802
Public Revenues	overall	0.624	0.527
	between		0.215
	within		0.482

[1] Autonomous Communities public revenues are mainly composed by their own taxes, tax-sharing and central government transfers (either general or specific).

4.3 Main Results

Table 6 shows the results obtained in the estimation of the three models specified above, when we use the decentralization dummy variable to analyze its effects on the policy outcomes. Each model (*differences-in-differences, random trend model* and the *differences-in-differences* of the difference between public and private schools or *triple differences*) is estimated including the school input variable (*pupils per teacher rate*) and without including it, giving rise to the different interpretations of the decentralization coefficient. Heteroscedasticity and correlation between panels have been considered in all the estimations, according to the results obtained in the modified Wald test (to capture heteroscedasticity between groups in panel data) and the Breusch-Pagan test, respectively. Autocorrelation problems have also been corrected, according to the results of the Wooldridge test for panel data models, considering a panel specific first order autocorrelation structure.

Table 6. Estimation results with decentralization dummy and without interaction terms

Variables	***Differences in differences***		***Random Trend Model***		***Triple differences***	
	With Inputs	*Without Inputs*	*With Inputs*	*Without Inputs*	*With Inputs*	*Without Inputs*
DC_t	1.070 (2.96)***	0.926 (2.38)**	2.008 (30.84)***	2.119 (29.01)***	0.261 (0.40)	0.836 (1.33)
Pupils per teacher rate$_t$	-0.460 (-7.49)***	-	-0.317 (-18.18)***	-	0.871 (10.78)***	-
Per capita income$_t$	-0.430 (-4.14)***	-0.196 (-1.38)	0.417 (13.36)***	0.434 (16.67)***	1.621 (2.16)**	1.049 (6.58)***
Population Background$_t$	0.113 (2.32)**	0.144 (2.49)**	0.008 (0.70)	-0.020 (-1.86)*	-0.039 (-0.34)	-0.317 (-3.24)***
Unemployment rate$_t$	-0.012 (-0.45)	-0.058 (-1.84)*	0.071 (8.71)***	0.065 (8.45)***	-0.068 (-1.11)	-0.006 (-0.12)
FE_i Wald Test [(1)]	Yes	Yes	Yes	Yes	Yes	Yes
FE_t Wald Test [(1)]	Yes	Yes	-	-	Yes	Yes
$Trend_i$ Wald Test [(1)]	-	-	Yes	Yes	-	-
Model Wald Test	3812.22***	5992.53***	3567.02***	2289.84***	13783.52***	18238.11***
Wooldridge Test [(2)]	6.41**	6.35**	41.26***	42.60***	21.25**	9.42***

Note: (1) The Wald test contrast the joint significance of the Fixed Effects or Trends; (2) The Wooldridge Test for panel data models contrast the correlation structure of the error terms; *, ** and *** mean that the coefficient is significant at 90%, 95% and 99% level, respectively; "Yes" means that the FE or Trends are jointly significant, and "No" means that they are not significant. Heteroscedasticity and correlation between panels has been considered in all estimations, and autocorrelation problems have been corrected according to the results of the Wooldridge Test for panel data models.

If we look at the results obtained in this table we observe that, contrary to the conclusion of some empirical studies about education, school inputs (measured as the ratio between pupils and teachers) seem to have a small but significant impact on education outcomes: more *pupils per teacher* are related to lower *Survival Rates*[2]. However, the effects of *per capita income* and *population background* are not clear in these estimations. Per capita income has a negative effect in the *differences-in-differences* estimation results, while its coefficient is positive and significant when we estimate the *random trend* and *triple differences models*. Population background coefficient, quite the opposite, is positive and significant in the *differences-in-differences* estimations, while it is not significant at the 95% level in the *random trend model* estimations. Although we can think that this contradiction could be explained by the high correlation between these two variables (0'79), what could be biasing the results, when we exclude one of them from the equation we obtain the same results. *Unemployment rate* shows a positive impact on education outcomes in the *random trend model*, so that a high unemployment rate encourages students to carry on with their studies, although it is negative and not significant at the 5% level in the *differences-in-differences* estimations. The coefficients of these variables in the triple differences model are in some way difficult to interpret. We can say that per capita income has a positive influence on the difference between public and private school outcomes, so that the Survival Rate in public schools is better in relation to the private one when per capita income is higher. Quite the opposite is the effect of the *population background*, although it is only significant when *pupils per teacher ratio* is not included. Finally, the coefficient of the *unemployment rate* variable is not significant in this model, as it could be expected, because this variable will affect equally to the decisions of pupils in public and private schools.

[2] We have also made estimations including educational capital stock per pupil (data from IVIE-BBVA) as school input variable, obtaining that its effect is positive and significant in the *differences-in-differences* model, but negative in *random trend model*. However, this measure of capital stock is not very accurate to our purposes, as it includes universities capital stock, so that we have excluded it from our estimations.

The coefficient of the decentralization dummy is positive and significant in the first two models, so that we can say that decentralization has implied an improvement of the *Survival Rate* of students in public schools. If we compare the decentralization coefficients in the specifications with and without the input variable, we observe that they are very similar. So, we can infer that decentralization has not lead to changes in the pupil per teacher rate, and that the increase in the *Survival Rate* has been motivated by an improvement of government efficiency. However, the decentralization dummy variable is not significant in the triple differences model. The lack of significance of its coefficient when we control for private schools, could be indicating that decentralization has had an effect on private schools too, so that we cannot use them as control group, or that when we control for province specific time variant effects, the effect of decentralization disappears. Surprisingly, if we exclude per capita income from the estimated equation, the decentralization variable becomes highly significant, while the educational background variable becomes also positive and significant. Then, another possible explanation of these results is that the correlation between these two variables is biasing them.

4.4 Differential decentralization effects between Communities

Table 7 shows the results that we obtain when the interaction terms are included in the estimated equations. As we can see, coefficients of the input variables are of the same sign and magnitude than before, while the decentralization coefficient has experienced some important changes. The decentralization coefficient is now significant in all the specifications, being positive in the *random trend* and *triple differences* models, but negative in the *differences-in-differences* model.

However, the effect of the decentralization on education outcomes will not only depend on the decentralization dummy coefficient, but also on the coefficients of the interaction terms variables. If we look at them, the coefficient of the interaction term between *decentralization* and *public surplus* shows a positive sign in the three models, so that decentralization effects are better in provinces located in an Autonomous Community with a good fiscal discipline (with a positive public surplus), and worse in provinces located in autonomous communities with a bad fiscal discipline (with a negative public surplus). However, this coefficient is only significant (at the 95% of confidence level) in the *random trend model*. The interaction term between

decentralization and *per capita income* shows a positive effect in the *differences-in-differences* model, but it is negative in the other two models, and the opposite occurs with the interaction term between *decentralization* and *public revenues*. Despite these differences between the coefficients of the three models, when we estimate the effect of the decentralization for the mean values of the interaction term variables (obtained from Table 5), we observe that it is very similar in the different equations, and equal to the one obtained when no interaction terms were included in the model (Table 6). However, the conclusions about how each interaction term influences this effect are different in each equation.

Table 7. Estimation results with decentralization dummy and with interaction terms

Variables	*Differences in differences*		*Random Trend Model*		*Triple differences*	
	With Inputs	*Without Inputs*	*With Inputs*	*Without Inputs*	*With Inputs*	*Without Inputs*
DC_t	-3.728 (-3.73)***	-6.111 (-4.55)***	3.586 (6.91)***	3.137 (8.72)***	8.008 (3.40)***	5.484 (2.58)***
Pupils per teacher $rate_t$	-0.427 (-6.62)***	-	-0.276 (-16.00)***	-	0.904 (9.46)***	-
Per capita $income_t$	-1.188 (-5.60)***	-1.342 (-5.51)***	0.721 (8.51)***	0.693 (8.73)***	2.559 (4.47)***	2.295 (2.65)***
Population $Background_t$	0.204 (5.54)***	0.187 (3.38)***	-0.025 (-1.24)	-0.049 (-3.23)***	-0.019 (-0.16)	0.009 (0.09)
Unemployment $rate_t$	-0.003 (-0.16)	-0.033 (-1.07)	0.077 (13.04)***	0.073 (8.57)***	-0.096 (-1.57)	0.008 (0.18)
DC * Public Surplus	0.061 (0.57)	0.184 (1.34)	0.740 (11.86)***	0.805 (29.26)***	0.439 (1.67)*	0.353 (1.18)
DC * Per capita income	1.179 (6.61)***	1.605 (6.82)***	-0.399 (-5.99)***	-0.294 (-4.56)***	-1.440 (-4.26)***	-1.018 (-3.08)***
DC * Public Revenues	-2.737 (-5.85)***	-2.937 (-6.75)***	1.422 (10.73)***	1.329 (5.13)***	0.656 (0.77)	0.407 (0.46)
FE_i Wald Test [1]	Yes	Yes	Yes	Yes	Yes	Yes
FE_t Wald Test [1]	Yes	Yes	-	-	Yes	Yes
$Trend_i$ Wald Test [1]	-	-	Yes	Yes	-	-
Model Wald Test	4772.17***	3439.15***	2413.80***	3679.17***	25427.98***	34774.23***
Wooldridge Test [2]	6.46***	6.43***	38.41***	39.86***	21.11***	9.55***

Note: see Table 6

Given the limitations discussed above about the *differences-in-differences* method, and the different trends observed for the *Survival Rate* in each province, it is natural to think that the estimations of the *random trend model* offers a better adjustment of the dependent variable than the *differences-in-differences* estimations. Then, according to the results in *random trend model* estimation, the effect of decentralization is positively affected by the *public surplus* and *revenues* of the regional governments, so that a positive public surplus and a high level of revenues of the autonomous community will make the positive effects of decentralization to be greater. And it is negatively affected by *per capita income* of provinces, so that it will be lower in high income provinces than in low income ones. This result, which seems to stand in contradiction with some of the conclusions obtained by Galiani, Gertler and Schargrodsky (2005), could be explained by the fact that education outcomes are greater in high income provinces than in low income ones (as the coefficient of per capita income shows), so that their reaction to decentralization will be lower. That is, it will be easier to raise the *Survival Rate* in low income provinces, where it presents smaller values, than in high income provinces. In Table 8 we observe the decentralization effects for the mean values of the interaction term variables in each autonomous community. If we compare, for example, the effects of decentralization in two autonomous communities with similar public surplus and revenues, but very different per capita income level, as Extremadura and Madrid, we observe that the effects of decentralization are very different between them, being very high in Extremadura, where per capita income is the lowest of Spain, and very low in Madrid, where per capita income is one of the greater of Spain. However, if we look at the effects of decentralization in Navarra, we observe that they are much greater than in Madrid, despite having a similar level of per capita income. This is because public revenues in Navarra are much higher than in Madrid, what bring us to another possible explanation about why the effect of decentralization is lower in high income communities. Given that high income communities have more needs to be satisfied (in terms of infrastructures, public services, …), if governments do not have enough revenues to cover them, the benefits of decentralization will be lower because they will have a restriction on the resources disposable to spend on education.

Table 8. Decentralization effects for mean values of the interaction term variables				
Autonomous Community	Mean values			Decentralization effect
	Public Surplus	*Public Revenues*	*Per capita income*	
Andalucía	-0.476	0.660	4.673	2.308
Aragón	-0.243	0.497	6.307	1.596
Asturias	0.262	0.439	5.507	2.207
Baleares	0.077	0.351	7.135	1.295
Canarias	0.257	0.729	5.481	2.626
Cantabria	-0.079	0.526	5.865	1.935
Castilla y León	-0.080	0.531	5.673	2.018
Castilla La Mancha	0.317	0.639	5.015	2.728
Cataluña	-0.431	0.778	6.876	1.630
Extremadura	-0.048	0.559	3.993	2.752
Galicia	-0.486	0.737	5.004	2.278
Madrid	-0.189	0.352	7.193	1.077
Murcia	-0.255	0.378	5.070	1.912
Navarra	-0.123	1.691	7.201	3.026
País Vasco	0.079	1.124	7.668	2.183
La Rioja	-0.175	0.513	6.620	1.545
C. Valenciana	-0.614	0.510	5.843	1.526
España	**-0.186**	**0.624**	**5.633**	**2.088**

Note: The decentralization effects are calculated in base on the results obtained in the estimation of the *random trend model* with inputs.

4.5 Alternative measures to decentralization dummy variable

Although we consider that decentralization dummy variable is very appropriated to analyze the decentralization effects in Spain, since it allows having into account that fiscal decentralization also implies political decentralization, it is interesting to estimate the models above using some other variable which allow us to consider that the effects of decentralization may be different through time. Specifically, we will define the decentralization variable as the proportion of schooling years that a pupil in first course of *Bachillerato* has been under a decentralized regime. In this way, we are considering the possibility that the effects of decentralization on students' *Survival Rate* are not immediate, so that if a cohort has been all schooling years under a centralized regime except the last one, probably the decentralization won't have any effect on its *Survival Rate*. We present the results obtained when we use this decentralization variable in Table 9 and Table 10.

In general, the results in Table 9 are very similar to the ones obtained with the decentralization dummy variable. The most important change is that decentralization coefficient becomes significant in the *triple differences model*, but negative. The

positive coefficient of the decentralization variable in the first two models shows that the more the years a cohort has been under a decentralized regime, the better the *Survival Rate* of this cohort in public schools. However, the negative coefficient of the decentralization variable in the *triple differences model* shows that the difference between public and private *Survival Rate* decrease when the years since decentralization rise. One possible explanation of this result would be that private schools (state assisted schools) are positively affected by the decentralization reform, but their response is slower than that of the public ones. So, the decentralization coefficient is not significant when we consider the decentralization dummy variable, but significant when we allow the effect of decentralization varying in function of the years passed since it was effective.

Table 9. Estimation results with proportion of years under decentralization variable and without interaction terms

Variables	***Differences in differences***		***Random Trend Model***		***Triple differences***	
	With Inputs	*Without Inputs*	*With Inputs*	*Without Inputs*	*With Inputs*	*Without Inputs*
DC_t	1.366 (2.06)**	1.387 (2.21)**	1.917 (5.11)***	1.381 (6.96)***	-3.762 (-2.86)***	-2.853 (-2.80)***
Pupils per teacher $rate_t$	-0.494 (-7.52)***	-	-0.347 (-20.39)***	-	0.874 (9.58)***	-
Per capita $income_t$	-0.360 (-3.29)***	-0.152 (-1.21)	0.325 (14.46)***	0.348 (13.25)***	1.100 (1.63)	1.211 (1.92)**
Population $Background_t$	0.110 (2.12)**	0.119 (2.15)**	-0.005 (-0.58)	-0.036 (-4.64)***	-0.041 (-0.34)	-0.449 (-3.58)***
Unemployment $rate_t$	-0.011 (-0.42)	-0.065 (-2.23)**	0.068 (14.68)***	0.061 (11.98)***	-0.065 (-1.07)	-0.005 (-0.09)
FE_i Wald Test [(1)]	Yes	Yes	Yes	Yes	Yes	Yes
FE_t Wald Test [(1)]	Yes	Yes	-	-	Yes	Yes
$Trend_i$ Wald Test [(1)]	-	-	Yes	Yes	-	-
Model Wald Test	4015.69***	7300.78***	1232.71***	416.70***	13783.52***	60977.56***
Wooldridge Test [(2)]	6.13**	6.07**	36.44***	37.55***	21.27**	9.34***

Note: see Table 6

When we add the interaction term variables to the estimated equations, we obtain the results observed in Table 10. In this case, there are more important changes in relation to the model in which decentralization dummy variable was used. If we observe the results obtained in the *random trend model*, the coefficient of the decentralization variable is now negative, while the coefficient of per capita income variable is negative and the coefficient of the interaction term between these two variables is positive. So, according to these results, the effects of decentralization will be greater in high income provinces than in low income ones, contrary to the conclusion that we obtained before.

Table 10. Estimation results with proportion of years under decentralization variable and with interaction terms

Variables	***Differences in differences***		***Random Trend Model***		***Triple differences***	
	With Inputs	*Without Inputs*	*With Inputs*	*Without Inputs*	*With Inputs*	*Without Inputs*
DC_t	2.234 (1.13)	0.072 (0.03)	-2.090 (-2.69)***	-3.603 (-2.23)**	3.688 (0.94)	9.836 (2.55)**
Pupils per teacher $rate_t$	-0.369 (-4.61)***	-	-0.290 (-14.74)***	-	0.943 (11.23)***	-
Per capita $income_t$	-0.405 (-1.42)	-0.415 (-1.39)	-0.251 (-3.51)***	-0.395 (-3.39)***	2.864 (3.94)***	2.967 (4.42)***
Population $Background_t$	0.124 (2.16)**	0.185 (3.05)***	-0.030 (-2.76)***	-0.060 (-3.32)***	-0.208 (-2.38)**	-0.304 (-3.73)***
Unemployment $rate_t$	-0.016 (-0.46)	-0.045 (-1.33)	0.070 (11.99)***	0.065 (9.02)***	-0.083 (-1.27)	-0.087 (-1.43)
DC * Public Surplus	0.229 (1.28)	0.215 (1.20)	0.860 (38.56)***	0.893 (10.10)***	-0.024 (-0.07)	0.512 (2.18)**
DC * Per capita income	0.451 (1.69)*	0.777 (2.54)**	0.845 (6.87)***	1.080 (6.03)***	-2.193 (-3.62)***	-2.698 (-5.31)***
DC * Public Revenues	-2.271 (-2.82)***	-2.485 (-3.73)***	0.577 (2.17)**	0.710 (2.60)***	4.046 (2.65)***	3.645 (3.62)***
FE_i Wald Test (1)	Yes	Yes	Yes	Yes	Yes	Yes
FE_t Wald Test (1)	Yes	Yes	-	-	Yes	Yes
$Trend_i$ Wald Test (1)	-	-	Yes	Yes	-	-
Model Wald Test	5458.71***	4063.88***	3367.49***	791.45***	45051.91***	21953.82***
Wooldridge Test (2)	6.52***	6.49***	38.80***	37.93***	21.47***	9.55***

Note: see Table 6

Table 11. Decentralization effects for mean values of the interaction term variables				
Autonomous Community	Mean values			Decentralization effect
	Public Surplus	*Public Revenues*	*Per capita income*	
Andalucía	-0.476	0.660	4.673	1.830
Aragón	-0.243	0.497	6.307	3.317
Asturias	0.262	0.439	5.507	3.042
Baleares	0.077	0.351	7.135	4.208
Canarias	0.257	0.729	5.481	3.183
Cantabria	-0.079	0.526	5.865	3.101
Castilla y León	-0.080	0.531	5.673	2.941
Castilla La Mancha	0.317	0.639	5.015	2.789
Cataluña	-0.431	0.778	6.876	3.798
Extremadura	-0.048	0.559	3.993	1.565
Galicia	-0.486	0.737	5.004	2.146
Madrid	-0.189	0.352	7.193	4.029
Murcia	-0.255	0.378	5.070	2.193
Navarra	-0.123	1.691	7.201	4.865
País Vasco	0.079	1.124	7.668	5.106
La Rioja	-0.175	0.513	6.620	3.649
C. Valenciana	-0.614	0.510	5.843	2.614
España	**-0.186**	**0.624**	**5.633**	**2.870**

Note: The decentralization effects are calculated in base on the results obtained in the estimation of the *random trend model* with inputs.

The difference between these results and the ones obtained when we use the decentralization dummy variable could be explained by the fact that high income communities with a low level of public revenues but a high *Survival Rate*, spend more time in adjusting their policies and so, in obtaining positive results. So, when we don't have into account that the effect of decentralization is not immediate, we obtain that the effect of decentralization in high income communities is smaller than in low income communities.

Although the coefficient of the decentralization variable is now positive in the *triple differences* model, if we calculate the effect of the decentralization for the mean values of the interaction term variables, it is negative in all autonomous communities. So, the difference between public and private outcomes is reduced as a consequence of decentralization, although we cannot explain the reason and it would need to be analyzed in more detail to extract any conclusion.

5. Conclusions

The effects of decentralization on productive efficiency of government are not clear in the theoretical literature, where several trade-offs are signalled. In addition, the empirical literature trying to contrast these trade-offs has been practically non-existent until recent years, and nowadays it continues being notably scarce. In a context where decentralization policies are in the agenda of several countries and in the main recommendations coming from international organizations, we considered necessary to make an insight into this problem. Specifically, we focus our attention on the effects of decentralization in Spain on the outcomes of the educational policy, although our analysis could be extended to the other public policies.

We first have made our estimations with the *differences-in-differences* method, widely used in the literature analyzing the effects of decentralization on policy outcomes. However, given the problems presented by this estimation method, we have extended our model both by having into account different trends for each province and by controlling with private schools. Estimations have been made with a panel data set of the 50 provinces of Spain, for the period 1980-2003, so that all the decentralization process is covered.

In general, our results show that the impact of the decentralization process in Spain has had a positive impact on education outcomes, measured as the *Survival Rate*, that is, the proportion of students in the last course of ESO who access to *Bachillerato*. The fact that the effects of decentralization are the same when we consider school inputs and when we do not, shows that the increase in the *Survival Rate* has been mainly motivated by an improvement of government efficiency.

The estimations including the interaction term variables allow us extracting some conclusions about the determinants of the decentralization effects to be greater or smaller. First of all, positive effects of decentralization are greater in provinces located in Autonomous Communities with a good fiscal discipline (with a positive public surplus), and smaller in provinces located in autonomous communities with a bad fiscal discipline (with a negative public surplus). In the same way, the effects of decentralization are more important in communities with a high level of public revenues, because of the greater degree of autonomy that it implies. However, the decentralization effects seems to be lower in high income communities which have not a high level of public revenues when we use decentralization dummy variable, although

they are higher when we allow them to vary depending on the years passed since decentralization was effective. This is because high income communities have more needs to be satisfied, so that if regional governments do not have enough revenues to cover them, they will have a restriction on the resources disposable to spend on education. So, they will need more time to adjust their policies, what is not captured by the decentralization dummy variable.

Contrary to the conclusions of some empirical papers, our estimations show that the school input variable (the pupil per teacher rate) is significant, so that the more the pupils per teacher, the worse the *Survival Rate*. This result is interesting in terms of educational policy implications, because it supposes a chance for governments to directly influence education outcomes.

Although the results obtained allow extracting some conclusions about the decentralization effects on education outcomes in Spain, it could be necessary to analyze the effects of decentralization on the other public sectors, as health or infrastructures. In addition, it is necessary to have into account that the effects of decentralization can be context specific, so that our results could not be comparable to what would happen in other countries if they decentralize. However, they give us an insight about which circumstances can make these effects to be better or worse.

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