THREE ESSAYS ON EMPIRICAL RESEARCH IN THE ECONOMICS OF EDUCATION

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THREE ESSAYS ON EMPIRICAL RESEARCH IN THE ECONOMICS OF EDUCATION

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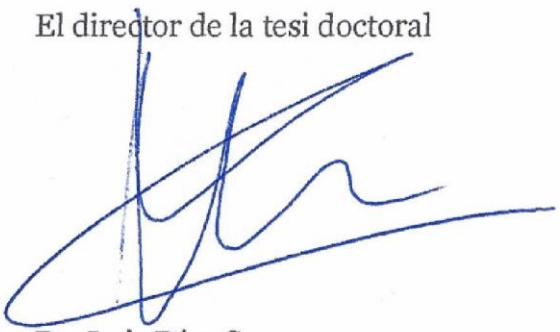
FAIG CONSTAR que aquest treball, titulat "Three Essays on Empirical Research in the Economics of Education ", que presenta Enric Meix Llop per a l'obtenció del títol de Doctor, ha estat realitzat sota la meva direcció al Departament d'Economia d'aquesta universitat i que acompleix els requeriments per poder optar a Menció Internacional.

Barcelona, 7 de juliol de 2015

El director de la tesi doctoral



Dr. Luis Díaz Serrano

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Chapter 1

Introduction

The current thesis project, entitled “Three Essays on Empirical Research in the Economics of Education", was developed under the direction and supervision of Dr. Luis Diaz Serrano, professor at the University Rovira i Virgili.

The main motivation for this project lies in the importance of education across society and the influence that political institutions can have on the educational environment. The role of education in a society is widely discussed and accepted and can be summarized by the notion of human capital. The main idea is that each person’s education is an investment in human capital which allows the individual to contribute to society in a productive way. As an investment it is based on the hope of future benefits such as creating higher wages, lower risk of unemployment, higher productivity and so on, but it also has to be considered as an opportunity cost on students’ time and the initial cost in terms of direct spending.

In addition to human capital, education also plays an important role in theories of social capital. Education exerts causal effects on outcomes such as mutual trust, civic behavior, social norms or crime, all of which are connected to the role of individuals in the society’s well-being. Together, both theories demonstrate the importance of education for the mid and long-term economic and social well-being improvement of societies.

Here, the role of the political institutions is fundamental because in a welfare-state model they have to ensure the universality of this public service, at least in the first stages, and, at the same time, promote efficiency in order to exert a positive influence on economic growth and development.

Against this background, the main aim of this thesis is to disentangle some of the relations between the different actors involved in education and political institutions. To achieve this goal we have developed three research papers with different methodologies, data and objectives but with the same common thread.

The first chapter of this thesis is entitled “Decentralization and Academic Achievement: A Cross-Country Analysis”. This chapter draws inspiration from the low quality of student outcomes present in many developed countries and the recent tendency towards

decentralization. Countries initiate decentralization processes in order to allocate public resources in a more efficient way and this, basically, affects the three welfare state pillars: health, social protection and education. In the analysis we include not only fiscal decentralization but also political decentralization measures and, as such, we advance the literature, most of which focuses solely on fiscal issues.

In order to overcome the problem of how to measure quality and efficiency in the provision of public services in the case of education, we have taken the academic achievement of students in compulsory education, as measured by the individual PISA scores, as a suitable measure of efficiency. Therefore, to conduct this analysis we collected fiscal decentralization data from the World Bank and political decentralization data from the Regional Authority Index at a country level. This data was then matched with individual PISA data that also comprises individual characteristics at personal, familial and school level. In respect of the empirical analysis, in the initial stage we used a fixed effects approach but here we detected a potential endogeneity problem since there may exist characteristics that affect both decentralization decisions and academic outcomes. To overcome this problem we also conducted an instrumental variables model.

In the initial empirical stage, our results pointed towards the idea that only fiscal decentralization had an effect on students' outcomes since the political decentralization variable was non-significant. Our results imply that countries with sub-national governments with the capacity to deliver and collect resources at a local level are able to obtain better academic outcomes.

The instrumental variables analysis confirms and expands the results obtained with the fixed effects model. The impact of the fiscal decentralization variable remain positive and significant whereas the political decentralization variable exerts a negative and significant effect on students' achievement.

This analysis opens new paths for research because although we consider the temporal dimension of our data this is not a true panel. Specific data regarding decentralization in education and the creation of true panels will allow researchers to test our results and develop a more accurate picture of the findings we obtained.

The second chapter is entitled “Do Schools Discriminate Against Homosexual Parents? Evidence from an Internet Field Experiment”. In this case, the paper draws inspiration from a news item that appeared in the Spanish media highlighting homophobic behaviors towards homosexual parents in some Spanish schools. From this case a question emerged: is this discriminatory behavior from schools against homosexual parents generalized or is it simply an anecdotal case? Here, we also have to take into account that Spain was the third country in the world to promote a law recognizing homosexual marriage and child adoption rights but is also a country where the Catholic Church is present in some educational institutions.

Although there is an abundance of literature that analyzes a wide range of discrimination issues, studies analyzing discrimination against homosexuals are still rare. However, the few studies that do address this issue reveal the existence of sexual orientation discrimination in labor and housing markets, mainly against male homosexuals. The existence of discrimination against female homosexuals is unclear.

In order to answer this question we designed an internet field experiment creating three different fictitious profiles (heterosexual, male homosexual and female homosexual couples). We sent emails to all private and semi-private schools in the Catalan region during the child pre-registration period; in each email the sexuality of the parents was clearly stated and a request was made to visit the school visit and attend an interview. At this point, and after processing the emails, we created our own database in order to test whether schools were more hesitant to provide feedback to homosexual parents than to their heterosexual counterparts.

Our findings are consistent with the previous literature regarding homosexual discrimination in other fields such as housing or labor. In comparison with heterosexual couples, male homosexual parents were 20 percentage points less likely to receive an answer from the school. Female homosexual couples were also less likely to receive an answer from schools (4 percentage points lower than heterosexual couples), however, this difference was not statistically significant.

However, we cannot be sure that if we made a formal application for admission to the schools these applications from homosexual parents would be rejected. However, we

think that the fact that schools are more hesitant to interact with gay parents than with heterosexual couples is an indicator of the existence of some kind of subtle discrimination and prejudice against homosexual couples.

The third and final chapter is entitled “Efficiency vs. equity in education: What do citizens value most?”. This research paper was developed with the aim of testing the extent to which citizens prefer welfare state policies that promote efficiency over those that promote equity.

Policy makers are encouraged to pursue both efficiency and equity in order to maximize long-term benefits and reduce economic and social costs, but it is also commonly asserted that in most situations there is likely to be a trade-off between these two objectives. To the best of our knowledge there are no papers that have delved into how government implementation of policies related to the welfare state affect the citizens’ level of satisfaction.

To analyze this question we used data from the European Social Survey, a cross-national survey that has been conducted every two years from 2002 to 2012. We used the six available waves and matched these with efficiency and equity proxies. For measures of efficiency we used the PISA country scores in mathematics, reading and science, and for equity variables we used the country gross enrolment rate for primary, secondary and tertiary levels. Finding measures of equity and efficiency is a difficult task but we believe that the chosen variables have allowed us to calibrate this effect.

Our results suggest that the educational efficiency proxies had an unequivocal positive effect on citizens’ satisfaction with their educational system. In contrast, the results for the equity measures depend on which educational level is being analyzed. On the one hand, the universality measures for primary education have a negative and significant effect on all specifications whereas, on the other hand, this effect is positive for secondary and tertiary levels.

From this result we observe that citizens do not positively value universality in the first stages of education. This result may be conditioned because developed countries have

enjoyed decades during which the entire child population has been enrolled at primary stages and this service is now taken for granted.

Taking these three chapters together we make a case for the crucial role of political institutions in improving educational standards within a country. This role includes not only the fiscal structure but also the fight against discrimination and the implementation of policies that affect educational institutions. The task is not easy but politicians have to take serious consideration of the existing and developing economic literature which could help them to make better choices based on empirical data and research.

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Chapter 2

Decentralization and Academic Achievement: A Cross-Country Analysis

1 – Introduction

In public economics, the relationship between the provision of universal public services and decentralization is a recurring issue. Despite its relevance, from an empirical point of view this link is undoubtedly under-researched. All studies devoted to analyzing the effects of decentralization focus on fiscal decentralization, while the role of political decentralization has been ignored. Also most of the existing studies analyze the issue on pure economic grounds, such as on economic growth, income inequality or the redistribution of wealth. Although economic growth or the reduction of poverty are desirable side effects, we think these studies lose sight that the main objective of decentralization is not economic growth or the redistribution of income, but better provision of public services to citizens. After all, the decentralization theorem (Oates, 1972, 1999) is about delivering services closer to the people because of informational advantages of local governments in respect to economic or social characteristics of regions. Therefore, the impact of decentralization on efficiency in the provision of public services should receive more attention. Education, health and social protection should be at the core of the analyses, constituting the three pillars of the welfare state. We should expect these public services to be affected by decentralization processes. In this study we aim at covering these gaps by not only empirically analyzing the impact of fiscal decentralization on an objective measure of efficiency and quality of a public service, but also by analyzing for the first time the impact of political decentralization.

One of the main problems in this type of empirical analyses is that it is very difficult to measure objectively the quality and the efficiency of the provision of public services. As is Barankay and Lockwood (2007), in this study we use students' outcomes as a suitable proxy of this efficiency and quality. According to the decentralization theorem, fiscal and political decentralization should promote a more efficient provision of this public good, which one would expect to be translated into better student performance.

The interest of this study is also boosted by the fact that in recent decades a tendency towards decentralization in many developed and developing countries has come into existence. Indeed, nowadays the amount of the global population residing in countries under some level of decentralization outnumbers those in totally centralized countries. Our results indicate that in more fiscally decentralized countries students perform better, while the impact of political decentralization on students' outcomes is statistically significant and negative, but fairly small.

With the objectives described above, the paper is structured as follows: Section 2, provides the conceptual framework of the study; Section 3 reviews the literature related to decentralization and education; in Section 4 we present the empirical framework; Section 5 discusses the results; and finally Section 6 contains the conclusions.

2 – Conceptual framework

The use of the word decentralization has become increasingly common in both economic and political language, although there is not a clear definition for execution. In both the public and private sector the word decentralization implies a change of authority in favor of lower levels of governmental hierarchy. One of the first authors to study decentralization was Oates (1972), who established that decentralization, and thus bringing decisions closer to the population, improves social welfare by reducing information asymmetry allowing for a better adjustment between local supply and heterogeneous local demand. Thus, a decentralized system is expected to use public spending tightly tied to the preferences of the population, obtaining the corresponding benefits to society in terms of efficiency gains. Tax revenues by the sub-national governments provide incentives for good functioning of the decentralized system because when local expenditure is partly financed by their own tax revenues, local authorities become directly accountable to the voters in terms of where and how these taxes have been spent. Voters should be capable of evaluating correctly the performance of local governments. On the other hand, it is also possible that the different sub-national governments compete to establish better bundles of goods and services in order to maintain their tax bases or attract taxpayers from other regions, starting an expenditure competence.

It may occur that decentralization does not improve public service provision when local communities do have the capacity to impose their views or local elites monopolize public resources according to their own preferences (Bardhan and Mookherjee, 2005). For example, if these elites do not make use of public health or education, they will push the government to spend on other items closer to their needs, which usually do not coincide with the needs of the rest of the population. Smith (1985) shows that decentralization in the provision of public services may not be efficient if sub-national governments are less technically capable than the national governments to properly distribute public goods. Rondinelli et al. (1984) identify the problem of using decentralization in order to serve

political objectives. In this way, the decentralization process is not evaluated by improvements in efficiency but also by how good or bad it satisfies the policy objectives. With this premise, it is common for central and sub-national governments to have some tolerance when decentralization reforms translate into inefficient processes if the policy objective is met and the quality of public services does not decrease to such an extent that society expresses its rejection.

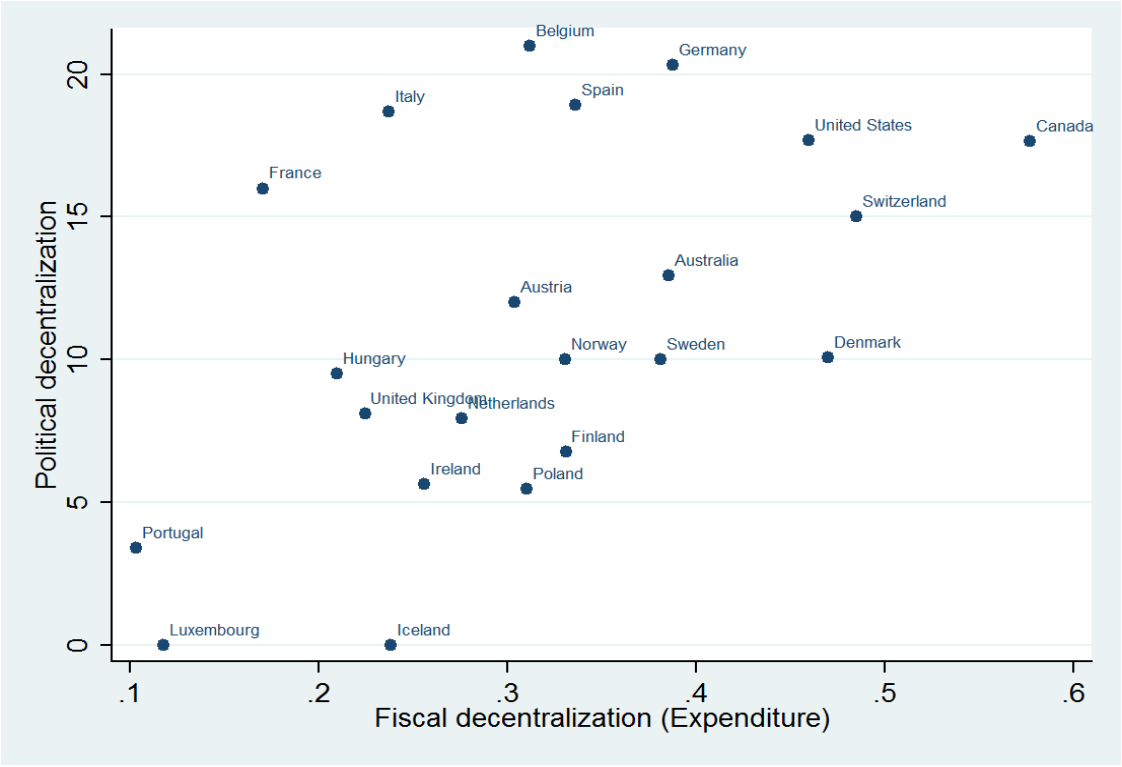
In the educational field, the need for decentralization comes from the new global economic conditions (McGinn and Welsh, 1999). The discussion on the efficiency of a decentralized education system has been preceded by the adoption of market policies by most countries in both developed and developing countries. The increase of the universality of education has resulted in an increased number of students enrolled in schools. Therefore, spending on education has also been increased. In this scenario, many governments face great budget concerns in educational matters which do not always translate into good results; this may involve an increase in the demand for skills on the part of governments.

Some reasons why governments decide to initiate decentralization processes around education include seeking improvements in efficiency and financing and redistributing power to decision-making bodies with better knowledge of educational needs. The efficiency goal is argued for on the basis that a centralized system is often characterized as having a high bureaucratic burden, thus incurring losses of resources and time. By decentralizing decisions, they are accelerated and at the same time better information becomes available to operate. The efficient allocation of resources by sub-national governments allows better adjustment of the allocations in education as opposed to large national budgets, which are not always allocated efficiently. On the other hand, the redistribution of decision-making is seen as a way to include the less weighted groups, providing better facilities to attend to their needs. Currently, most educational systems are based on the distribution of responsibilities across different levels of government. It is common that the central government sets minimum requirements on the activities of sub-national governments, which implies that they are held accountable to central government.

To our understanding, it is also important to distinguish between political and fiscal decentralization, since contrary to what one might expect, not all of the most fiscally

decentralized countries are the most politically decentralized and vice-versa (see Figure 1). For instance, Germany, Switzerland, the United States or Canada combine high levels of both political and fiscal decentralization. However, countries such as Sweden or Denmark are characterized by high levels of fiscal decentralization combined with low levels of political decentralization, while in Italy and France it is the other way around. Countries such as England, Portugal, Luxembourg, Ireland, Iceland or Hungary exhibit low levels of both fiscal and political decentralization.

Figure 1: Relationship between Fiscal and Political decentralization



3 – Overview of the empirical literature

The decentralization theorem postulates that decentralization is unequivocally good for the improvement of the quality and efficiency of public services. Nonetheless, as we point out in the previous section, from a theoretical point of view some author's highlight some situations in which the impact of decentralization could be negative. This circumstance suggest that some empirical evidence is necessary; however, the majority of empirical studies relate decentralization to both economic growth and inequality and the results

are not unambiguous. Another common feature of this literature is that it only considers the impact of fiscal decentralization, while political decentralization has generally been ignored. For instance, Davoodi and Zou (1998) in a study of 46 countries, and Rodríguez-Pose and Ezcurra (2010) in a study of 21 OECD countries, find empirical evidence of a negative relationship between fiscal decentralization and economic growth. Rodríguez-Pose and Ezcurra (2010) also disaggregate expenditure and find that the portion for education has a negative relationship with economic growth. This negative relation increases as countries intensify their process of fiscal decentralization. In contrast, Iimi (2005) observes a positive relationship between decentralization and growth in GDP per capita. In an empirical study on Spain, Carrion-i-Silvestre et al. (2007) report ambiguous effects of fiscal decentralization on economic growth depending on whether they consider an aggregated (negative) or regional (positive) level.

Another important topic of discussion is the role of decentralization in the reduction of poverty and inequality. In this vein, the World Bank included decentralization as part of its poverty reduction program. However, under tax competition, the richer regions may be more attractive in respect to mobile factors due to the fact that they offer better human capital or better infrastructure. Under this premise and as Prud'homme (1995) points out, these regions will become richer and the poorer regions poorer. On the other hand, Ezcurra and Pascual (2008), Lessman (2009) and Qian and Weingast (1997) find that decentralization exerts a positive impact on the reduction of regional inequality. Thus less developed regions may offer attractive investment conditions such as more flexible labor markets, lower wages or lower tax rates. These investments could lead to improved processes of regional convergence. In the study by Sepulveda and Martinez-Vazquez (2010), results vary depending on the level of total public expenditure. They conclude that fiscal decentralization could be a good way to reduce poverty if this represents a third or less of total spending. For higher levels, decentralization leads to an increase in levels of poverty.

Recently, there has been growing interest in studying the non-economic dimension of decentralization. Thus, the literature linking decentralization and subjective well-being (SWB) seems to be taking off.[1] The few existing empirical studies found that fiscal

[1] In the literature devoted to study of the determinants of SWB, the terms SWB, happiness and life satisfaction are often interchangeable.

decentralization is important for SWB (Frey and Stutzer, 2000; Bjørnskov et al., 2008, Diaz-Serrano and Rodríguez-Pose, 2012).

As we mention earlier, we think that focusing on the implications of decentralization for overall economic growth and territorial disparities, poverty, interpersonal inequality or even SWB could be somewhat missing the point. While these factors may certainly be an indirect desirable consequence of decentralization, the original aim of decentralization is fundamentally to improve the delivery of public goods and services to individuals by the creation of more legitimate tiers of government, closer to the people and, therefore, more responsive to their needs and wants. Hence, examining the impact of decentralization on citizens' satisfaction with political institutions and the delivery of public services seems a more suitable approach than establishing the link between decentralization and SWB or economic growth. In this regard, Diaz-Serrano and Rodríguez-Pose (2012) studied the effect of decentralization on citizens' perceptions of political institutions (government, economy and democracy), while Diaz-Serrano and Rodríguez-Pose (2014) analyzed the link between decentralization and satisfaction with health and educational systems. On the one hand, they observed that fiscal and some forms of political decentralization have a positive and significant effect on SWB. On the other hand, they also found that fiscal decentralization has a different effect on perception of institutions depending on whether one considers revenues or expenditures. In the same way, political decentralization also has a varied effect on the level of satisfaction with institutions depending on the capacity of local governments to influence national politics or to exert authority over their own citizens.

To our understanding, the link between decentralization and perception of institutions and public services is a more suitable approach for the understanding of the implications of decentralization for citizens than the one adopted in most of the previous studies. However, since satisfaction and perceptions are subjective outcomes, we also think that the analysis we propose here, i.e. the effect of decentralization on the quality and efficiency in the provision of public services using an objective measure as students' outcomes, is undoubtedly better targeted on the problem.

The literature analyzing the impact of decentralization using objective measures of the quality public services is quite scarce and only focuses on fiscal decentralization. To the best of our knowledge, the three studies that deal with this issue resort to educational

indicators. Using data from Swiss cantons, Barankay and Lockwood (2007) studied the impact of fiscal decentralization on the 19-year-old population obtaining university entry qualifications at county level. They observed that the relationship was positive. Using students' performance from the Scholastic Aptitude Test (SAT) and American College Testing (ACT), Akai (2007) carried out the same analysis for the US and found that the effect of fiscal decentralization is not clear in primary levels but positive in secondary levels. Falch and Fischer (2012) were the first to test the effect of fiscal decentralization on students' performance using cross-country data. They used aggregated test scores at a country level from different sources for 23 OECD countries and built a discontinuous panel.[2] They found that decentralization of government expenditure has a positive impact on students' performance.

4 – Empirical framework and data

4.1 – Empirical model

Models on the determinants of academic achievement are generally represented by an Educational Production Function (hereafter, EPF). This function is used as a way to understand the production processes by estimating the effects of various inputs on academic performance. Generally, these inputs include information regarding students' background (individual and family characteristics) and school characteristics. The usual EPF can be represented by the following linear relationship:

$$A_{is} = \alpha + \beta X_{is} + \gamma Z_s + \varepsilon_{is}, \qquad (1)$$

where A_{is} is the academic achievement for student *i*, studying at school *s*; X_{is} contains the variables that characterize the student; Z_s is a set of school characteristics, which are equal for all students attending the same school; ε_{is} is a random error term; and α, β, γ are the set of parameters to be estimated. Since our dataset consists of a pool of cross-sections, regarding different countries and periods, we expand equation (1) as follows:

[2] These authors used scores from the SIMS and SISS tests conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 1980-81 and 1983-85, respectively. The IAE test in 1990-91, IEA's TIMSS tests in 1994-95 and 1998-99 and the OECD PISA test in 2000 were also utilized.

$$A_{isct} = \alpha + \beta X_{isct} + \gamma Z_{sct} + \mu Y_{ct} + \lambda_c + \delta_t + \varepsilon_{istc}, \quad (2)$$

Where Y_{ct} is a set of country characteristics including our variables of interest, i.e. political or fiscal decentralization; δ_t are time effects; and λ_c are unobserved specific country effects. Time effects are included as dummy variables and are considered in order to control for any unobserved temporary shock that can alter the response variable and are not picked up by any of the other variables. On the other hand, λ_c are considered in order to control for unobserved heterogeneity at a country level. Furthermore, the inclusion of λ_c, jointly with the other country specific variables, is also necessary in order to identify the effects of our variables of interest (fiscal and political decentralization), which are also country specific and vary throughout time.

The estimation method selected to estimate equation (2) is a fixed-effects model, where the temporary effects, δ_t, are introduced as dummy variables for each year. Country fixed-effects, λ_c, are considered in order to control for country specific unobserved heterogeneity. If unobserved heterogeneity across countries (each country has its own specific characteristics that might influence the outcomes) is correlated with the covariates, then the fixed-effects model provides unbiased estimates. An alternative estimator would be the random-effects model; however, this estimator is inconsistent in the presence of correlation between the country fixed-effects and the covariates.

4.2 – Data and variables

4.2.1 – Dependent variable

Our dependent variable is students' math scores. This variable is taken from the PISA. The PISA report is an internationally standardized study that provides academic results in the areas of math, science and reading.[3] We focus only on math scores because we

[3] In the PISA database, students' scores are presented in the form of five plausible values for each subject. The plausible values are students' imputed values that are similar to the individual test scores and have approximately the same distribution as the measured latent feature. They were developed in order to obtain consistent estimates of population characteristics in assessing situations where there are not enough resources to make an accurate estimate of their abilities.

think that of the three tests this is the one that provides the most comparable outcome across countries. There are four available waves conducted in a total of 43 countries in 2000, 41 countries in 2003, 57 countries in 2006 and 65 countries in the last edition of 2009. We restrict our analysis to those countries that have participated in the four waves of PISA.

In Table 1 we report descriptive statistics of students' scores in math skills by country. This summary of statistics does not refer to all the countries participating in the PISA, but to the 22 countries in our final sample. We can see that the best five performing countries in mathematics are Finland, Holland, Switzerland, Belgium and Canada. The worst math results are obtained by Portugal, followed by the United States, Italy, Luxembourg and Hungary.

4.2.2 – Independent variables

The PISA data also collects information regarding the school, as well as the student and their family environment. Student and household characteristics considered in this study are gender, age, effort (weekly hours of study), birthplace of the student and their parents, the number of books they have at home and the cultural level of the father and mother.[4] The school characteristics are city size, the type of school (public, private school independent of government and government-dependent private school) and the ratio between the number of students and teachers. In table A1 in the annex we describe the individual variables.

[4] This level is measured by the International Standard Classification of Education , which refers to the standardized classification of the different educational levels established by UNESCO, which allows comparison between countries.

Table 1: Summary statistics for students' scores in math by country

	Maths		
	mean	s.d.	rank
Australia	515.72	90.16	6
Austria	506.25	90.15	9
Belgium	525.91	101.16	4
Canada	519.02	83.03	5
Denmark	503.84	85.10	11
Finland	542.51	77.38	1
France	504.07	91.36	10
Germany	506.74	96.07	8
Hungary	492.08	87.65	18
Iceland	509.20	84.80	7
Ireland	498.60	80.46	14
Italy	485.01	89.07	20
Luxembourg	490.36	90.02	19
The Netherlands	538.52	85.81	2
Norway	494.56	85.19	17
Poland	495.65	85.73	15
Portugal	474.14	85.84	22
Spain	494.84	86.28	16
Sweden	502.56	88.42	12
Switzerland	526.30	91.24	3
United Kingdom	500.88	86.08	13
United States	480.71	87.63	21

Source: Own computations based on PISA data

Decentralization data is divided into political and fiscal decentralization. Political decentralization indexes are taken from Hooghe et al. (2008) (Regional Authority Index). This data covers 42 countries for the period 1950-2006. As a measure of political decentralization we use an aggregated index (self-rule), which is a measure of the authority exercised by sub-national governments over their own citizens. This index is the aggregation of other indexes picking up the level of autonomy in some aspects such as policy-making, taxes or representation. On the other hand, fiscal decentralization variables consist of yearly indicators calculated as the ratio between sub-national and national expenditures or revenues covering the period 1972-2005. The source of these variables is the Government Finance Statistics of the International Monetary Fund. We have to mention that our measures of fiscal and political decentralization are not specific for education. However, we should expect that a more decentralized country in the broader sense will be also more decentralized regarding universal public services such as education or health. In order to identify the effect of fiscal and political decentralization on students' outcomes, in addition to the country-level fixed effects, we also include the GDP per capita at constant 2000 prices as a country-level variable. In table A2 in the annex we describe the decentralization variables.

In Table 2 we show a statistical summary of these variables. We observe that 49% of our sample are female students and the mean age is 15.78 years. Around 7% of the students were born in a country different to that in which they conducted the PISA evaluation and 15% of the sample had parents born in a foreign country. Regarding the number of books they own at home, around 30% of students declared they had between 11 and 50 books. The mean level of parents' education is upper-secondary education (nearly post-secondary, non-tertiary education). One third of the students study in schools located in medium-sized towns (15,000 to 100,000 inhabitants) and the school size/teacher ratio is around 12.4%. The share of public schools is almost 83%, while 14.2% are private but government dependent and only 2% are fully private schools.

In order to test the impact of decentralization on academic achievement we matched the PISA database with the decentralization data. All students surveyed within the scope of PISA data collection and residing in the same country are assigned with the same value of the corresponding decentralization indicator. In this matching, we have not only taken into consideration the spatial but also the appropriate time horizon.

Table 2: Summary statistics of the independent variables

	Observations	Mean	Standard deviation
Female	569,953	0,4998	0,5000
Age	569,953	15,7805	0,2914
Student born in foreign country	560,724	0,0723	0,2590
Mother born in foreign country	558,636	0,1534	0,3603
Father born in foreign country	555,086	0,1524	0,3594
1 - 10 Books	557,882	0,1360	0,3427
11 - 50 Books	557,882	0,3022	0,4592
51 - 100 Books	557,882	0,2008	0,4006
101 - 250 Books	557,882	0,1642	0,3705
251 - 500 Books	557,882	0,1015	0,3020
More than 500	557,882	0,0062	0,0790
Father isced qualification	528,346	3,9647	1,6159
Mother isced qualification	543,691	3,9947	1,5783
Village (less 3.000)	537,575	0,1104	0,3134
Small town (3.000 to 15.000)	537,575	0,2585	0,4378
Town (15.000 to 100.000)	537,575	0,3388	0,4733
City (100.000 to 1.000.000)	537,575	0,2128	0,4093
Large city (more 1.000.000)	537,575	0,0793	0,2702
School size / number of teachers ratio	505,920	12,4313	4,4954
Public	501,396	0,8293	0,3762
Private, government dependent	501,396	0,1422	0,3492
Private, government independent	501,396	0,0284	0,1663
Log GDP pc constant 2000	571,043	9,9633	0,4590
Log GDP pc constant 2000, squared	571,043	99,4799	8,7929
Self Rule	571,043	13,7559	5,8316
Sub-national expenditure	571,043	0,3491	0,1312
Sub-national current expenditure	571,043	0,6038	0,1681
Sub-national revenue	571,043	0,3592	0,1318

We assign to each country the average of the last ten years of the decentralization index prior to each PISA wave. Since decentralization indexes are comprised between 1965 and 2006, for the PISA wave of 2009 we assign the same values of the decentralization indexes as in 2006. Our decentralization data covers a more reduced number of countries than the PISA database; therefore, our final sample is composed of 22 countries. In Table 3 we report sample sizes by country and year.

Table 3: Observations by country and year

	2000	2003	2006	2009
Australia	1.122	12.551	14.170	14.251
Austria	1.091	4.597	4.927	6.590
Belgium	1.563	8.796	8.857	8.501
Canada	6.626	27.953	22.646	23.207
Denmark	957	4.218	4.532	5.924
Finland	1.085	5.796	4.714	5.810
France	1.044	4.300	4.716	4.298
Germany	1.157	4.660	4.891	4.979
Hungary	1.229	4.765	4.490	4.605
Iceland	743	3.350	3.789	3.646
Ireland	849	3.880	4.585	3.937
Italy	1.109	11.639	21.773	30.905
Luxembourg	785	3.923	4.567	4.622
The Netherlands	553	3.992	4.871	4.760
Norway	918	4.064	4.692	4.660
Poland	771	4.383	5.547	4.917
Portugal	1.030	4.608	5.109	6.298
Spain	1.362	10.791	19.604	25.887
Sweden	976	4.624	4.443	4.567
Switzerland	1.385	8.420	12.192	11.812
United Kingdom	2.078	9.535	13.152	12.179
United States	843	5.454	5.611	5.233

5 – Econometric results

5.1 – Fixed-effects estimation

In Table 4 and 5, we show the results of the estimation of equation (2). In order to avoid potential multicollinearity or overlapping effects, we estimated a separate model for each decentralization measure. In Table 4 we report the estimated effects for the student, school and country specific characteristics, except decentralization. In all the specifications, estimated coefficients associated with these variables behave according to expectations and to what other previous studies using PISA data find. Girls do worse than boys in math. A positive link between the number of books at home, the educational attainment of the parents and students' math scores also exists. In contrast, foreign-born students or students with foreign-born parents perform worse. School characteristics also turned out to be statistically significant in determining students' math scores. Students in private and semi-private schools do report higher scores than their counterparts studying in public schools. We also observed a positive link between city size and students' math scores. One interesting result regards the impact of the variable GDP. We observe that this variable is inverted (U-shape) per capita in respect to students' math scores, i.e. the impact of the GDP per capita on students' achievement is positive but decreasing. This may explain why countries on top of the income distribution are not on top of the PISA rankings.

Results regarding the impact of our key explanatory variables, i.e. fiscal and political decentralization, are reported in Table 5. In our linear fixed-effects estimates (FE), our indicator of political decentralization and sub-national expenditure are not statistically significant, while sub-national current expenditure and sub-national revenue exert a positive and significant impact on students' achievements. However, the results provided by the linear fixed-effects model should be taken with caution, since our decentralization variables are likely to be endogenous. It is possible that unobserved factors affecting students' achievement in a given country may also determine the propensity of this country to decentralize. This situation may generate inconsistent estimates of the parameters associated with our explanatory variables of interest. In order to fix this problem we resort to the instrumental variable (IV) estimator, which is explained in more detail in the next subsection. Since the IV estimator provides more suitable results, we will focus our comments regarding the impact of decentralization on this model.

Table 4: Fixed effects estimation of equation (2)

	Coeff.	s.d.
Individual characteristics		
Female	-0.0300***	(0.0024)
Age	0.00656***	(0.0008)
Student born in foreign country	-0.0270***	(0.0047)
Mother born in foreign country	-0.0160**	(0.0060)
Father born in foreign country	-0.0222***	(0.0063)
Books at home (Base: None)		
1 - 10 Books	0.0468***	(0.0032)
11 - 50 Books	0.109***	(0.0057)
51 - 100 Books	0.146***	(0.0071)
101 - 250 Books	0.184***	(0.0081)
251 - 500 Books	0.189***	(0.0087)
More than 500	0.219***	(0.0112)
Father isced qualification	0.00911***	(0.0009)
Mother isced qualification	0.00833***	(0.0009)
Location (Base: village, less 3.000)		
Small town (3.000 to 15.000)	0.0138***	(0.0034)
Town (15.000 to 100.000)	0.0213***	(0.0050)
City (100.000 to 1.000.000)	0.0228***	(0.0050)
Large city (more 1.000.000)	0.0275**	(0.0113)
School size / number of teachers ratio	0.00215*	(0.0011)
School type (Base: public)		
Private, government dependent	0.0196**	(0.0094)
Private, government independent	0.0338**	(0.0136)
Log GDP pc constant prices 2000		(0.3930)
Log GDP pc constant prices 2000, squared	-0.0715***	(0.0228)
Constant	0.58	(1.1760)
Observations		415,467
R-squared		0.188

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

Table 5: Fixed-effects and IV fixed-effects estimation of equation (2), decentralization variables

	Model 1		**Model 2**		**Model 3**		**Model 4**	
	FE	**IV**	**FE**	**IV**	**FE**	**IV**	**FE**	**IV**
Self-Rule	-0.001	-0.0321***						
	(0.0057)	(0.0038)						
	-0.0001	*-0.0051****						
Sub-national expenditure			0.0701	0.919***				
			(0.1980)	(0.1390)				
			0.0112	*0.1479****				
Sub-nat. current expenditure					0.250***	1.089***		
					(0.0239)	(0.0879)		
					*0.0401****	*0.1752****		
Sub-national revenue							0.577***	0.962***
							(0.1730)	(0.2020)
							*0.0927****	*0.1547****
Instruments		Ideology Urban Pop.		Ideology Total Land		Ideology Lag revenue		Ideology Lag expense
Underidentification test		0.0000		0.0000		0.0000		0.0000
Weak identification test		0.0000		0.0000		0.0000		0.0000
Hansen J statistic		0.4774		0.2455		0.1258		0.3092
Endogeneity test		0.0000		0.0000		0.0000		0.0343
Observations	415,467	415,467	415,467	415,467	415,467	405,055	415,467	405,055
R-squared	0.188	0.186	0.187	0.186	0.175	0.184	0.188	0.186

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Elasticity in italics. Time dummy variables included. Robust standard errors estimation.

5.2 – Instrumental variables estimation

Any estimation that relies on IVs is always interesting since it requires the challenging, but not always fruitful, exercise of finding suitable instruments. In our case, in order to find good instruments, we consulted Arzaghi and Henderson (2005). These authors disentangle the underlying factors leading sub-national governments to demand regional decentralization and federalism. They found that the move to decentralization increases with the national income growth, the relative sub-national population, the country size and the degree of democratization. Therefore, we tried to find our instruments from this list of variables. The idea behind this choice is that some of these variables promoting decentralization are correlated with our decentralization key variables but not necessarily with students' academic outcomes. Lagged values of the decentralization variables are also considered as instruments, since lagged values are usually not correlated with the disturbance term (Iimi, 2005). In each wave, for the ten year average values of our decentralization variables used as explanatory, we consider the ten year average of the same decentralization variable, but consider the ten years previous to the ten years used as independent variable. That is, if in the PISA wave of 2004 we average the annual fiscal decentralization values between 1994 and 2004, the corresponding instrument will consist of an average of the same variable but averaging the values between 1984 and 1994.

After running a number of alternative models, from all variables mentioned above we use the land area of the country, the ideology of the central government and the lag of some decentralization variables as instruments. As Arzaghi and Henderson (2005) point out, democratic or political variables influence any decentralization process. Land area of the country represents the degree of spatial dispersion, from central public services to sub-national regions. Urban concentration represents the relative degree of economic and population centralization, measured as ratio between the population of the largest urban area and the total population of the country. Some countries are influenced and dominated by a city, sometimes the national capital, located in the dominant region. In Table 5 we report the results of the IV estimation. For the sake of brevity, we only report the coefficients and elasticity regarding our variables of interest. Political decentralization is instrumented with ideology and urban concentration (model 1), while the instruments of our fiscal decentralization variables are the following: sub-national expenditure is combined with total land area and ideology (model 2); sub-national current expenditure with ideology and the lag of sub-national revenue (model 3); and sub-national revenue with ideology and the lag of sub-national expenses (model 4).

In all models we do not reject the null hypothesis of endogeneity, which strengthens the adoption of the IV approach. According to the Hansen Test of over identifying restrictions we have good instruments in all cases, since we don't reject the null hypothesis that the instruments are uncorrelated with the error term. In addition, we also reject the null hypotheses of under-identification and weak identification. The results of these tests taken together suggest that our IV estimation performs quite well. Indeed, results reported in Table 5 reveal that compared with the consistent estimates provided by the IV estimator, the coefficients obtained through the fixed-effects estimator are biased downwards. All coefficients associated with our four decentralization variables estimated with the IV estimator turned out to be statistically significant at the one percent level. In order to allow for comparisons across alternative models, in Table 2 we also report estimated elasticity. Our results indicate that political decentralization exerts a negative impact on students' outcomes, though this effect is fairly small, whereas the estimated effect of fiscal decentralization is unambiguously positive and more important in magnitude from both the expenditure and revenue sides. Indeed, the three estimated elasticities associated with the fiscal decentralization variables are quite similar in size. A one percent increase in the level of sub-national expenditure, current expenditure and revenue increases students' outcomes by 0.148%, 0.175% and 0.155%, respectively.

6 – Conclusions

This paper goes beyond the traditional economic growth and territorial disparity analyses which have been at the heart of most studies of fiscal – and to a lesser extent political – decentralization until recently. A very limited number of more recent studies have also ventured into the black box of how institutions affect the assessment of the provision of basic public services linked to the welfare state by individuals. However, we think that this paper goes one step beyond, as in Barankay and Lockwood (2007) or Falch and Fischer (2012), by analyzing the impact of decentralization on the efficiency of the provision of public goods such as education. Thus, this paper put the spotlight on the ultimate goal of decentralization: the improvement of the delivery of policies and services to citizens. As far as we know, our study is indeed the first that also considers political decentralization in this type of analysis, in addition to fiscal decentralization.

In our analysis, we proxy the efficiency in the provision of education through students' outcomes. To do so, we resort to four waves of the PISA micro-data (2000, 2003, 2006 and 2009). Given the endogenous nature of the decentralization variables we estimate the impact of decentralization on student outcomes using the IV approach. Our results indicate that fiscal decentralization exerts a positive impact on student outcomes, while the impact of political decentralization is negative. The latter, though it is statistically significant, estimated effect is fairly close to zero.

Our results are quite revealing, since they suggest that the capacity of sub-national governments to deliver is what really matters in terms of more efficient provision of public goods, whereas the capacity to decide plays a limited role. Therefore we highlight that the impact of decentralization on the production of public services is not unambiguous. These results are in line with Diaz-Serrano and Rodríguez-Pose (2014), who found that fiscal decentralization exerts a positive impact on citizens' assessment of the education system,[5] whereas the impact of political decentralization is negative. This coincidence between citizens' subjective perception and the objective performance of the education system suggests that citizens are able to do an assessment of the provision of a public good such as education.

We can conclude that the benefits of decentralization will very much depend on how efficient regional local governments are at delivering their policies. That is, sub-national governments should have a more equitable mix of political and fiscal decentralization. We think our results contributes to what should be a wider approach to a better understanding of the implications of different forms and levels of government on the perception of the delivery of basic public welfare services.

[5] Diaz-Serrano and Rodríguez-Pose (2014) refer to the European Social Survey to carry out this analysis. Citizens' assessment of the education system is measured on an eleven-point Likert scale.

References

Akai, N., Sakata, M., Tanaka, R., (2007), Financial Decentralization and Educational Performance: Evidence form State-level Panel Data for the United States, *Institute of Business and Economic Research*, Conference Paper No. C07-011, University of California, Berkeley

Arzaghi, M., Vernon, J., (2005), Why countries are fiscally decentralizing, *Journal of Public Economics*, 89 (7), 1157-1189

Barankay, I., Lockwood, B., (2007), Decentralization and Productive Efficiency of Government: Evidence form Swiss Cantons, *Journal of Public Economics*, 91(5-6), 1197-1218.

Bardhan, P., Mookherjee, D., (2005), Decentralizing antipoverty program delivery in developing countries. *Journal of Public Economics* 89 (4), 675-704.

Bjørnskov, C., Drehe, A. and Fischer, J.A.V. (2008) On decentralization and life satisfaction. *Economics Letters* 99 (1): 147-151.

Carrion-i-Silvestre, J. Ll., Espasa, M. and Mora, T. (2007): "Fiscal decentralization and economic growth in Spain", *Public Finance Review*, 36, 2, 194-218.

Davoodi, H., Zou, H. 1998. Fiscal Decentralization and Economic Growth: a Cross-Country Study, *Journal of Urban Economics*, 43 244-257.

Diaz-Serrano, L., Rodríguez-Pose, A., (2012), Decentralization, Subjective Well-Being and the Perception of institutions, *Kyklos, forthcoming*.

Diaz-Serrano, L. and A. Rodríguez-Pose (2014): "Decentralization and the Welfare State: What Do Individuals Perceive?, *Social Indicators Research*, forthcoming.

Ezcurra, R., Pascual, P., (2008), Fiscal Decentralization and Regional Disparities: Evidence from Several European Union Countries, *Environment and Planning A*, 40 1185-1201

Falch, T., Fischer, J., (2012), Public Sector Decentralization and School Performance: International Evidence, *Economic Letters,* 114(3). 276-279.

Frey, B.S. and Stutzer, A. (2000) Happiness, Economy and Institutions. *The Economic Journal* 110 (466): 918 – 938.

Marks, G., Hooghe, L., Schakel, A.H., (2008). Patterns of Regional Authority. *Regional and Federal Studies* 18 (2-3): 167-181

Iimi, A. (2005), Decentralization and Economic Growth Revisited: an Empirical Note, *Journal of Urban Economics*, 57 449-461

McGinn, N., Welsh, T., (1999) Decentralization of Education: Why, When, What and How?, *Fundamentals of educational planning* UNESCO, IIEP, Paris.

Oates, W. E., (1972) Fiscal Federalism, New York: Harcourt Brace Jovanovich.

Oates, W. E., (1999) An Essay on Fiscal Federalism, *Journal of Economic Literature*, vol. 37(3),1120-1149

Prud'homme, R., (1995), On the dangers of decentralization, *Policy Research* WP 1252, World Bank, Washington, DC

Qian Y., Weingast B., (1997), Federalism as a commitment to preserving market incentives, *Journal of Economic Perspectives* 11 83-92

Rodriguez-Pose, A., Ezcurra, R., (2010) Is Fiscal Decentralization Harmful for Economic Growth? Evidence from the OECD countries. *Journal of Economic Geography,* forthcoming

Rondinelli, D., Nellis J., Cheema, G., (1984), Decentralization in Developing Countries *World Bank Staff Working Papers* 581 The World Bank Washington.

Sepulveda C F, Martinez-Vazquez J, (2011), The consequences of fiscal decentralization on poverty and income equality, *Environment and Planning C: Government and Policy* 29(2) 321 – 343

Smith, B. (1985), Decentralization: The territorial dimension of the state. *George Allen & Unwin*, London.

ANNEX OF TABLES

Table A1: Description of the variables regarding individuals, schools and country.

Variable	Description
Individual characteristics	
Female	Dummy that takes value 1 if the individual is female.
Age	Age of the student
Student born in foreign country	Dummy that takes value 1 if the student was not born in the country of performance of the test
Mother born in foreign country	Dummy that takes value 1 if the mother of the student was not born in the country of performance of the test
Father born in foreign	Dummy that takes value 1 if the father was not born in the country of performance of the test
Books at home	Number of books that the individual has at home. Can take the values none, 1 to 10, 11 to 50, 51 to 100, 101 to 250, 251 to 500 and more than 500
Father isced qualification	Father ISCED rating 0: preschool 1: primary 2: low secondary education 3: high secondary education 4: postsecondary education 5: low tertiary education, diplomas, degrees and postgraduate 6: high tertiary education, doctoral and master certain, includes part of research
Mother isced qualification	Mother ISCED rating
School characteristics	
Location	It takes the following values depending on where the school is located: Village: less than 3,000 inhabitants Small town: between 3,000 and 15,000 inhabitants Town: between 15,000 and 100,000 City: between 100,000 and 1,000,000 people Large city: more than 1,000,000 inhabitants
School type	Can take the following values: Public: if the school is owned by the government Private: If the school is private and independent of government Private government-dependent
School size/teachers ratio	Ratio between number of students and teachers
Country characteristics	
GDP per capita constant prices 2000	PIB per capita constant 2000 prices

Table A2: Description of the decentralization variables

Self Rule (SR) = ID+PS+FA+RP The authority exercised by a regional government over those who live in the region.	***Institutional depth (ID)*** Extent to which a regional government is autonomous rather than deconcentrated	0: no functioning general-purpose at the regional level 1: deconcentrated, general-purpose, administration 2: non-deconcentrated, general-purpose, administration subject to central government veto 3: non deconcentrated, general-purpose, administration not subject to central government veto
	Policy Scope (PS) Range of policies for which a regional government is responsible	0: no authoritative competencies over economic policy, cultural-educational policy, welfare state policy 1: authoritative competencies in one area: economic policy, cultural-educational policy welfare state policy 2: authoritative competencies in at least two areas: economic policy, cultural-educational policy, welfare state policy 3: authoritative competencies in at least two areas above, and in at least two of the following: residual powers, police, authority over own institutional set-up, local government. 4: regional government meets the criteria for 3, and has authority over immigration or citizenship
	Fiscal Autonomy (FA) Extent to which a regional government can independently tax it's population	0: the central government sets base of rate of all regional taxes 1: the regional government sets the rate of minor taxes 2: the regional government sets base and rate of minor taxes 3: the regional government sets the rate of at least one major tax: personal income, corporate, value added or sales tax 4: the regional government sets base rate of at least one major tax: personal income, corporate, value added or sales tax
	Representation (RP) Extent to which a region is endowed with an independent legislature and executive.	0: no regional assembly 1: an indirectly elected regional assembly 2: a directly elected assembly 3: the regional executive is appointed by central government 4: dual executives appointed by central government and the regional assembly

		5: the regional executive is appointed by a regional assembly or directly elected
Fiscal decentralization	***Subnational Expenditure***	Indicator: Subcentral Expenditure/General Expenditure Definition Expenditure: (State Government + Local Government)/(Central Government-Social Security + State Government + Local Government)
	Subnational Current Expenditure	Indicator: Subcentral Current Expenditure/General Current Expenditure Definition Current Expenditure: (State Government + Local Government)/(Central Government-Social Security + State Government + Local Government)
	Subnational Revenue	Indicator: Subcentral Revenuy & Grants/General Revenue and Grants Definition Revenue & Grants: (State Government+Local Government)/(Central Government-Social Security+State Government+Local Government)

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Chapter 3

Do Schools Discriminate Against Homosexual Parents? Evidence from an Internet Field Experiment

1- Introduction

Although there is an abundance of literature that analyzes a wide range of discrimination issues against women and minorities, studies analyzing discrimination against homosexuals are rare. The few studies that do address this issue document the existence of sexual orientation discrimination. Given the recent implementation of policies in favor of homosexual rights and the normalization of homosexual families in many developed countries, we find this issue to be of special interest. Despite its relevance, we think that discrimination against homosexuals is undoubtedly under- researched. The main reason for this gap is attributable to the lack of reliable register and survey data for identifying sexual orientation.

Some studies that have relied on survey and register data in different countries report statistically significant earnings differentials across individuals/households according to their sexual orientation. However, because of the problems mentioned above in identifying individuals' sexual orientation, internet field experiments seem to be a more reliable method to test for discrimination against homosexuals. Experiments have focused on the labor and the rental housing markets. Studies of the labor market found that, compared to heterosexual applicants with similar characteristics, gay men and lesbians were less likely to be invited for a job interview. In the rental housing market this type of discrimination was observed only for gay male applicants.

In this paper we test whether private schools are more hesitant about interacting with homosexual rather than with heterosexual parents. The experiment was conducted in the region of Catalonia (Spain) during the pre-registration period in schools. Pre-registration is compulsory and has to take place before schools, either public or private, decide on children's admittance. However, parents are only able to make choices among private schools because in the public school sector the assignment of children to schools depends on the geographical proximity of the home address to the school. This is why our experiment only considers private schools.

The primary motivation for this paper stemmed from a news report in the media. On February 24th 2012, the main national Spanish newspaper *El País* published the following news story: "The principal of a school was accused in court of turning down the application by a gay couple for their son". This happened in a private school in Seville. The principal of the school turned down the application, alleging that there were no vacancies. However, the parents of the child knew this to be untrue and, therefore, took the case to the Court of Justice. Of course, one case does not in itself infer that most Spanish schools discriminate against homosexual parents. However, one question that emerges from this case of discrimination asks whether the discriminatory behavior of this school against this homosexual couple is a general problem or whether this can only be taken as anecdotal evidence. This is the question we want to address in this paper. In order to do so, we designed an internet field experiment with schools in the region of Catalonia (Spain). As far as we are aware, this is first paper to analyze whether schools discriminate against homosexual parents. We focus on this type of discrimination not only because it affects homosexual parents, but because it also affects the education of their children; which is one of their most fundamental rights.

Our internet field experiment involved the creation of three different fictitious profiles (heterosexual, male homosexual and female homosexual couples) and sending emails to schools during the pre-registration period. We decided to include female homosexual couples in order to control for the gender of the homosexual parents. We thought that in some cases schools or school principals might penalize not only the sexual orientation of the parents but also the lack of a maternal figure. In these emails our fictitious couples showed interest in the school and made a request for an interview and a visit. In the emails their sexual orientation was made explicit. After processing all the email responses from the schools, we created a database that allowed us to test whether schools were more hesitant to give feedback to homosexual parents than to their heterosexual counterparts. Our results indicate that male homosexual parents were 22.5 percentage points less likely, in comparison with heterosexual couples, to receive a response from the schools. Female homosexual couples were also less likely to receive a response from the schools (almost 4 percentage points less). However, the latter was not statistically significant. These findings are consistent with previous evidence based on internet field experiments that tested for discrimination against homosexuals.

The paper is structured as follows. In section two we describe the institutional setting. In section three we provide an overview of the existing literature regarding homosexual discrimination. The experimental design is described in section four and section five reports the empirical results. The final section summarizes and concludes.

2. Homosexual families and institutional settings

The recognition of homosexual rights is a controversial issue in many countries. In 2001, the Netherlands was the first country in the world to recognize same-sex couples marriage. Since then, this right has also been recognized in other countries.[6] More recently, other countries have granted homosexual couples the right to adopt children.[7] Both measures aim to recognize and normalize homosexual family structures. Despite these advances, there are some countries where homosexuality is still persecuted and punished, in some cases by the death penalty.[8]

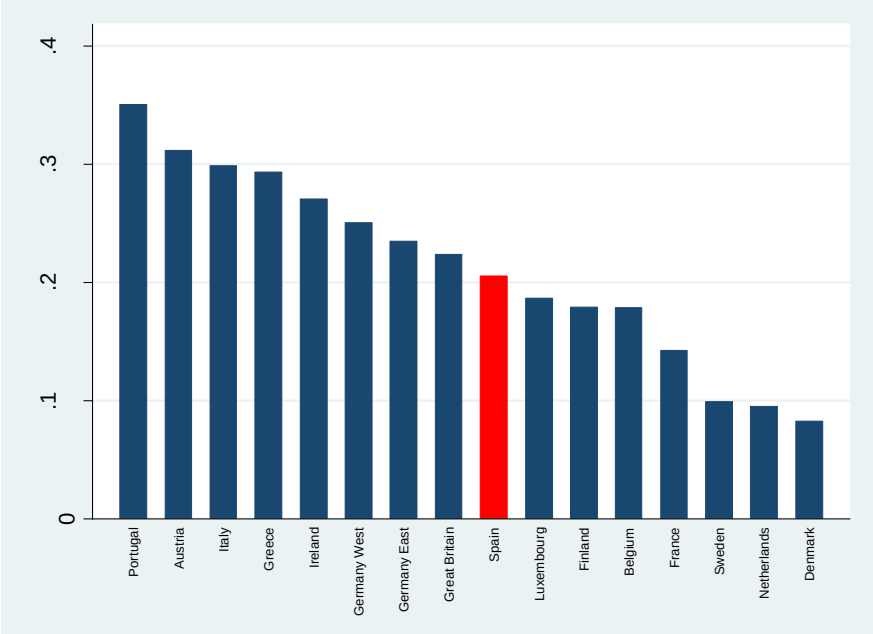
Spain was the third country in the world (after the Netherlands and Belgium) to introduce a law recognizing marriage between same-sex couples. It was promoted by PSOE[9] (the left-wing party in office) and became effective on the 3rd July 2005. It faced opposition from the Catholic Church and the PP (the main right-wing party), who claimed that this law was against the Spanish Constitution and took the case to the Spanish Constitutional Court. However, in 2012 their appeal was rejected. Under the same law, homosexual couples were also granted the same rights to adopt children as heterosexual couples.[10] Since then, with the support of the main right-wing party (PP), the Catholic Church and catholic pro-family conservative associations have organized several demonstrations against the right of homosexual couples to adopt children.

[6] South-Africa, Portugal, Spain, Iceland, Argentina, Denmark, Uruguay, New Zealand, France and Brazil allow homosexual marriages whilst in United States and Mexico it is only allowed in some states.
[7] Andorra, Argentina, Spain, Belgium, Brazil, Canada, Denmark, Norway, South-Africa, Sweden, UK, Uruguay, Finland, Germany, Israel and Slovenia allow homosexuals to adopt children, whereas in Australia, Mexico and the United States it is only allowed in some states.
[8] Countries where homosexuality is punished with the death penalty are Libya, Sudan, Mauritania, Nigeria, Somaliland, Saudi Arabia, Yemen, Afghanistan, Iran and the Maldives.
[9] The House of Representatives approved the law on the first round by 183 votes against 136. In the Senate the law was rejected by 131 votes to 119. In Congress, the veto was lifted and the law finally passed by 187 votes to 147.
[10] Law 13/2005, article 44.

In this context, one question arises: is the polarization reflected in Parliament also reflected in society and institutions? The European Value Study positions Spain in a middle position regarding homosexual acceptance as compared to other EU15 countries.[11] About 20% of the Spaniards interviewed for the study declared that they did not like the idea of having homosexuals as neighbors (Figure 1). Portugal, Austria, Italy, Ireland, Greece and Germany have exhibited higher levels of intolerance, with the Nordic countries, Netherlands, France and Belgium emerging as the most tolerant.

However, when we analyze the question of whether individuals agree with the adoption of children by homosexual couples, the results differ across the board. Some countries that reported a greater tolerance of having homosexuals as neighbors, exhibited a similar or even more negative position than Spaniards towards the idea of homosexuals adopting children (Sweden, France, Finland, Denmark and Belgium). This leaves Spain as one of the most tolerant EU countries regarding this issue (Figure 2).

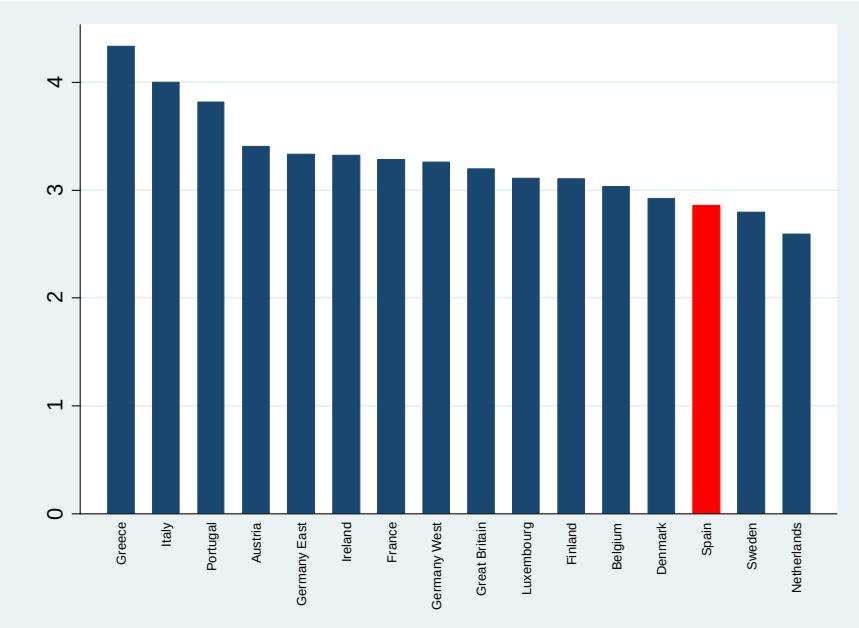
Figure 1: Don't like homosexuals as neighbors



Source: Own elaboration from European Value Study

[11] This study shows that the ex-communist European countries are by far the most homophobic.

Figure 2: Children adoption homosexual couples



Note: 1 strongly agree; 5 strongly disagree.
Source: Own elaboration from European Value Study

3. Literature Review

Although economic literature regarding sexual orientation discrimination is scarce, the existence of discrimination against homosexuals is documented in some countries. The majority of these studies are focused on differences between homosexuals and heterosexuals in the labor market. These analyses generally rely on surveys and register data and, to a lesser extent, on internet field experiments. More recently, internet field experiments have also been used to detect discrimination against homosexuals in the rental housing market. As far as we are aware there is no previous study that explores discrimination against homosexual parents on the specific issue of their children being admitted to schools, or in any other more general issue regarding the school environment.

Using U.S. survey data, Badgett (1995) found that male homosexual and bisexual workers earn between 11% and 27% less than their heterosexual counterparts. However, Allegretto

and Arthur (2001) found that this wage differential can, in part, be attributed to a penalty for being unmarried. They found that unmarried male homosexuals earn 15% less than similarly qualified married heterosexuals but only 2.4% less than unmarried male heterosexuals.

Arabsheibani et al. (2004, 2005) conducted the first study in the UK analyzing earnings discrimination against homosexuals. They found that male homosexuals had lower earnings than similarly qualified heterosexuals whereas female homosexuals earned about the same and, in some cases, more than heterosexuals. This implies that the wage gender gap is larger among heterosexual workers than among homosexuals. Plug and Berkhout (2004) examined whether such differences in incomes in the Netherlands occur at the beginning of working careers or whether it is a more long-term phenomenon. They found that wage differentials due to sexual orientation are lower in entry level jobs — 3% less for male homosexuals and 4% more for female homosexuals — when compared with similarly qualified heterosexual workers.

Laurent and Mihoubi (2012) found that male homosexuals earned about 6.5% less than heterosexual men. However, using German household data, Humpert (2012) found the opposite. He estimated that male homosexual household income was between 9% and 15% higher than that of heterosexual households although no differences were found between female homosexual households and heterosexual households. Plug and Berkhout (2008) observed that gays/bisexuals earned about 3–4 percent less than male heterosexual workers. However, they point out that this result is driven by selection and not by discrimination. More recently, using Australian data, Plug et al. (2014) found evidence that gay and lesbian workers shied away from prejudiced occupations — a finding that supports the prejudice-based theories of employer and employee discrimination against gay and lesbian workers.

The results of labor market outcomes based on survey and register data have limitations for detecting discrimination against homosexuals. First, sexual orientation is not generally observable or declared and, therefore, sexual orientation might not be known to other co-workers or employers. Thus, any potentially discriminatory attitude towards them cannot be observed. Second, although survey and register data often ask individuals to report if

they have had any same-sex sexual relations during their life, this might not provide an accurate identification of homosexuality. With internet field experiments it is possible to overcome these identification problems. Using this approach we can create situations in which people are interacting with fictitious homosexual individuals who clearly reveal their sexual orientation. Existing internet field experiments intended to detect discrimination against homosexuals focus on labor and housing market outcomes. Despite the literature being scarce, all the studies report one unequivocal finding: male homosexuals are discriminated against in the labor and the rental housing markets, whilst in the case of female homosexuals the evidence of discrimination remains inconclusive.

Ahmed et al. (2008b) conducted a field experiment in Sweden to analyze whether homosexual couples showing interest by email in renting a flat were less likely to receive feedback from private landlords than were heterosexual couples. They found that male homosexual couples had a lower response rate from landlords than did heterosexual couples. However, they found no difference in treatment by landlords between female homosexual couples and heterosexuals.

In terms of the labor market, several internet field experiments have aimed at detecting sexual orientation discrimination in the hiring process. These studies report discrimination against both male and female homosexuals. Adam (1981) found evidence of discrimination against male homosexuals applying for articling positions in Ontario law firms. Weichselbaumer (2003) observed that in Germany, female homosexuals received fewer interview requests than female heterosexuals with the same skills. Tilcsik (2011) conducted the first large-scale audit study in the United States regarding sexual orientation discrimination. Fictitious résumés were sent to job postings in different states. In some résumés the individual's homosexual status was randomly signaled by mentioning that the candidate had experience in gay campus organizations. The author found discrimination against those who revealed their homosexuality. Ahmed et al. (2013) found that sexual orientation discrimination exists in the Swedish labor market. They observed that the gay male applicant was discriminated against in typical male-dominated occupations, whereas the lesbian applicant was discriminated against in typical female-dominated occupations.

4. Experimental design

The experiment on which this paper is based was conducted in March 2013 in Catalonia (Spain) during the primary school pre-registration period. We obtained the corporate electronic mail of all Catalan schools from the Catalan Regional Educational Authority. In our experiment we only considered private schools.[12] We did this because the admission of children in public schools is not discretionary and children residing in a given district are automatically assigned to the public school closest to their home address. This left us with a total of 610 schools in the study.

Our experiment consisted of contacting schools by email and requesting an interview or a visit to the school. We resorted to an internet field experiment because we are interested in studying the non-influenced behavior of the participants, a factor that is only possible if participants do not know *ex-ante* that they are participating in the study. This methodology also allowed us to not only contact all the schools with a remarkably low level of effort and time, but it also made feedback from the schools easier.

We created three fictitious couples: one heterosexual, one male homosexual and one female homosexual. Since the experiment was conducted on the internet, for each type of couple we simply needed to create an email address and names for the fictitious applicants and their respective daughters to which the schools could respond. We choose a daughter instead of randomly assigning a son or a daughter to minimize experiment costs and also because of the inexistence of schools that segregate by gender. We also thought that there was no reason to assume that schools would change their behavior dependent on the gender of the child. Choosing a name for the corresponding applicants was an important part of this field experiment. In order to avoid any undesirable bias that might emerge as a result of ethnic origin, we randomly assigned a common Spanish name to each couple and their corresponding daughter.[13] These are typical Spanish names, which are also gender unique. The next step was to create and assign an email address to each fictitious couple. We decided

[12] Among these private schools we can divide the sample into schools receiving public funding (*concertadas*) and schools without public funding.
[13] Names were randomly selected from the ten most common Spanish names, obtained from the Spanish Bureau of Statistics (INE).

to use the same email provider (Gmail) and the three email addresses had the following structure: name.surname.number@gmail.com.

In order to test both male and female sexual orientation discrimination, each school received two emails: one from a heterosexual couple and the other from a gay or lesbian couple. In order to avoid any bias, emails from gay or lesbian couples accompanying the emails from the heterosexual couples where assigned randomly to half of the schools. Although proceeding in this way meant that we lost half of the sample for each type of homosexual couple, we gained experimental credibility and stringency. We thought that schools might be suspicious if they received emails from all three (gay-lesbian-hetero). The order in which each e-mail was sent (heterosexual-homosexual or homosexual-heterosexual) was also randomized. The emails were sent to each school over a three-day period.

We designed templates for the three emails to be sent. We generated three different emails where the sexual orientation of the couple was made explicit. Thus, all emails had the following structure: a heading with a greeting from both members of the couple, a comment pointing out that the child belongs to both parents and that they were interested in enrolling the child in that school, a request for an appointment to have an interview and visit to the school. Finally, a closing statement was included signed by both members of the couple. The sexual orientation of the couple was made explicit by combining male/female, male/male and female/female names in the closing section of the email. All three emails had different content but were written in a way that did not reveal further information that might have influenced the probability of a response. An example is the following:

> Hello,
> We are XXX and YYY and we are looking for a school for our 5 year old daughter ZZZ. She begins the first grade in the next academic year. We are considering this school as an option. Would it be possible for us to meet and visit the school?
> Sincerely,
> XXX and YYY

In order to avoid gender bias, for schools receiving an email from the male homosexual and heterosexual couples, both emails were signed first by a man. On the other hand, for schools receiving emails from female homosexual and heterosexual couples, both emails were signed by a woman. In order to avoid any undesired problem for schools, any invitation received was rapidly declined. When the pre-registration period concluded we processed all the responses and created a database with all the potential outcomes (response and invitations from schools), information regarding schools (private/semi-private, laic/catholic and city size), and information regarding the person signing the response (gender and school position).

5. Results

5.1. Descriptive analysis

In Table 1 we show the distribution of email replies. Twenty-four percent of the schools that received hetero/gay paired emails did not reply to any of the two fictitious couples, whereas this was 30% for the lesbian/hetero paired emails. However, 36% and 42% replied to both fictitious couples in both pairs of emails, respectively. The difference between the proportions of schools that replied to only heterosexual couples and only male homosexual couples was 22.3% (31.1% vs. 8.9%), whilst this difference for the case of hetero/lesbian couples was 3.3% (15.6% vs. 12.3%).

Table 2 shows the distribution of responses/invitations and the test of differences in proportions for these variables between male homosexual and heterosexual couples. In order to obtain a variable "response", we do not distinguish whether the response is positive or negative. We found that those schools that received emails from heterosexual and male homosexual couples (305), seemed to be more hesitant to have correspondence with male homosexual than with heterosexual couples, 67.2% vs. 44.9%. The difference of 22.3% in the response rate was statistically significant at any significance level. The results regarding invitations to parents to visit the school were similar. 63.9% of the heterosexual couples received an invitation, whilst the figure for male homosexual couples was 42.2%. The gap in the invitation rate (21.7%) was again statistically significant at any significant level.

Table 1: Distribution of responded emails

	Paired emails Gay/Hetero	Paired emails Lesbian/Hetero
# of schools	305	301
Neither replied	73	90
	23.9%	29.9%
Both replied	110	127
	36.1%	42.2%
Replied only heterosexual	95	47
	31.1%	15.6%
Replied only homosexual	27	37
	8.9%	12.3%
Both replied (first email sent hetero)	75	57
	24.6%	18.9%
Replied only heterosexual (first email sent hetero)	24	15
	7.9%	5.0%
Replied only homosexual (first email sent hetero)	24	32
	7.9%	10.6%

Table 2: Response rates and invitations to visit the school heterosexual vs. male homosexual parents

Variable	Sample size	Heterosexual	Men Homosexual	Diff.	p - value
Response	305	67.2% (205)	44.9% (137)	22.3%	0.0001
Invitation	305	63.9% (195)	42.2% (129)	21.7%	0.0002

Notes: Number of e-mails within parentheses.

Table 3: Response rates and invitations to visit the school heterosexual vs. female homosexual parents

Variable	Sample size	Heterosexual	Women Homosexual	Diff	p - value
Response	301	57.8% (174)	54.4% (164)	3.4%	0.1380
Invitation	301	55.1% (166)	51.8% (156)	3.3%	0.1321

Notes: Number of e-mails within parentheses.

In Table 3 we show the results of the same analysis but here we compared the feedback of schools to heterosexual and female homosexual couples. In this case, we did not observe statistically significant differences in either the response rate or the invitation rate, although in both variables there was a positive gap in favour of heterosexual couples, 3.4% (57.87% vs. 54.4%) and 3.3% (55.1% vs. 51.8%), respectively.

Other variables, which will be used as independent variables in the econometric analysis, are described and summarized in Table 4. For the sample of schools receiving emails from heterosexual and male homosexual couples, about 66.5% of schools were religious (catholic) and about 96% semi-private. The sample of schools receiving emails from heterosexual and female homosexual couples had similar characteristics. About 62.7% of schools are religious (catholic) and 94% are semi-private. Therefore, it is worth noting that the majority of the schools in the sample are semi-private and more than a half are religious institutions. Around 28% of the schools are located in Barcelona city.

From most of the email responses we were able to ascertain who had responded. This allowed us to create two variables denoting the gender and the administrative position of the respondent (principal or secretary). In Table 5 we report the distribution of gender/position of the email respondent and the test of differences in proportions for these variables between male homosexual and heterosexual couples. The responses from schools that received the hetero-gay paired emails did not reveal any statistically significant differences according to the gender and position of the respondent between emails responded to gay and hetero couples. Results regarding responses from schools that received the hetero-lesbian paired emails are qualitatively the same as the ones sent to the hetero-gay paired emails (see Table 6).

Table 4: Explanatory variables used in econometric analysis

Independent variables	Description	Hetero and Men Homo		Hetero and Women Homo	
		Mean	Sd	Mean	Sd
Religious	1 If the school depends on a religious institution	0.665 (203)	0.472	0.627 (189)	0.484
Non-religious	1 If the school not depends on a religious institution	0.334 (102)	0.472	0.372 (112)	0.484
Semi-private	1 If it is a private schools receiving public funds	0.960 (293)	0.194	0.940 (283)	0.237
Private	1 If it is a private schools not receiving public funds	0.039 (12)	0.194	0.059 (18)	0.237
Less 10.000	1 if the school is located in an area of less than 10.000 inhabitants	0.111 (34)	0.314	0.086 (26)	0.281
10.000 to 50.000	1 if the school is located in an area from 10.000 to 50.000 inhabitants	0.232 (71)	0.422	0.235 (71)	0.424
50.000 to 100.000	1 if the school is located in an area from 50.000 to 100.000 inhabitants	0.134 (41)	0.341	0.1362 (41)	0.343
More than 100.000 excluding Barcelona	1 if the school is located in an area of more than 100.000 inhabitants	0.242 (74)	0.429	0.2425 (73)	0.428
Barcelona city	1 if the school is located in Barcelona	0.278 (85)	0.448	0.2990 (90)	0.458
Number of schools		305		301	

Notes: Number of e-mails within parenthese

Table 5: Summary statistics for the respondent of the email (pairs hetero – gay)

	Hetero		**Gay**			
	Mean	**std**	**Mean**	**std**	**Diff**	**t-stat**
Secretary	0.278	0.448	0.226	0.418	0.052	1.073
	(57)		(31)			
Principal	0.400	0.490	0.387	0.487	0.013	0.244
	(82)		(53)			
Unknown position	0.322	0.467	0.387	0.487	-0.065	-1.235
	(66)		(53)			
Male	0.176	0.380	0.139	0.346	0.037	0.911
	(36)		(19)			
Female	0.532	0.499	0.547	0.498	-0.016	-0.286
	(109)		(75)			
Unknown gender	0.293	0.455	0.314	0.464	-0.021	-0.418
	(60)		(43)			
N	205		137			

Notes: Number of e-mails within parentheses.

Table 6: Summary statistics for the respondent of the email (pairs hetero – lesbian)

	Hetero		**Gay**			
	Mean	**std**	**Mean**	**std**	**Diff**	**t-stat**
Secretary	0.287	0.453	0.293	0.455	-0.005	-0.108
	(50)		(48)			
Principal	0.431	0.495	0.415	0.493	0.016	0.305
	(75)		(68)			
Unknown position	0.282	0.450	0.293	0.455	-0.011	-0.225
	(49)		(48)			
Male	0.236	0.424	0.220	0.414	0.016	0.353
	(41)		(36)			
Female	0.569	0.495	0.610	0.488	-0.041	-0.762
	(99)		(100)			
Unknown gender	0.195	0.397	0.171	0.376	0.025	0.586
	(34)		(28)			
N	174		164			

Notes: Number of e-mails within parentheses.

5.2. Econometric analysis

In Table 7 we show the results of the estimates of the probability of receiving a response (columns 1 and 2) and an invitation (columns 3 and 4), but here we controlled for the type of school (private or semi-private), religious orientation (catholic or lay), and the school's location (city size). To estimate the determinants of these probabilities we resorted to the probit model. In order to facilitate interpretation we reported estimated marginal effects instead of estimated coefficients. The results underline the findings already established in the previous descriptive analysis. After controlling for the set of covariates regarding school characteristics, we observed that for male homosexual couples the probability of a response was 22.5 percentage points lower than for heterosexual couples (column 1). Results regarding the probability of receiving an invitation (column 2) are practically identical. For male homosexual couples the probability of receiving an invitation is 22 percentage points lower than for heterosexual couples. In both cases the estimated marginal effects are statistically significant at any significant level.

When we compared female homosexual with heterosexual couples, we observed that the probability of a response (column 3) and the probability of receiving an invitation (column 4) were 3.4 percentage points lower for the former than for the latter group. However, in both cases estimated marginal effects were not statistically significant. We also observed that none of the covariates that picked up school characteristics (catholic/laic, private/semi-private and city size) are statistically significant in any of the alternative models. Only three of the city size dummies have turned out to be statistically significant at 10 percent significance level (column 1 and 3), but any regular pattern can be inferred from this results. Although it is not shown in the results, we also estimated alternative models that included interactions between the homosexual status of the parents and the characteristics of the schools. However, none of these interactions provided a statistically significant effect.

Table 7: Probit analysis on the determinants of the probability of response and invitation from schools.

	Men Homosexual vs. Heterosexual		**Women Homosexual vs. Heterosexual**	
	(1)		**(2)**	
	Response	*Invitation*	*Response*	*Invitation*
Homosexual	-0.2254***	-0.2203***	-0.0340	-0.0337
	0.0393	0.0397	0.0405	0.0407
Religious	0.0511	0.0486	0.0164	0.0190
	0.0457	0.0459	0.0440	0.0441
Semi-private	0.0955	0.1464	0.0905	0.0681
	0.1108	0.1087	0.0907	0.0907
Population (Base Barcelona)				
Less 10.000	0.1119	0.1260	-0.1340*	-0.0749
	0.0680	0.0692	0.0797	0.0802
10.000 to 50.000	0.0951*	0.1349	-0.0610	0.0019
	0.0561	0.0562	0.0565	0.0562
50.000 to 100.000	0.0237	0.0165	-0.0204	0.0413
	0.0669	0.0679	0.0673	0.0665
More than 100.000	0.1177**	0.1222	-0.1326	-0.1032
	0.0555	0.0564	0.0560	0.0559
Observations	610	610	602	602

We also ran a probit regression with the sample of responded emails. This analysis was intended to explore whether the respondent's gender and his/her administrative position (principal or secretary) was a determinant in the probability of responding to gay or lesbian vs. heterosexual couples. In this regression we also controlled for the characteristics of the schools. As already shown in Tables 5 and 6, we observed that neither the characteristics of the school nor the characteristics of the respondent were significant in determining this probability.

Thus far, our econometric results regarding how schools interact with parents according to their sexual orientation have supported most of the previous evidence regarding discrimination against homosexual individuals in other contexts: wage differentials (e.g.

Plug and Berkhout 2004; Ahmed and Hammarstedt 2010) or housing markets (e.g. Ahmed and Hammarstedt 2008a, Ahmed et al. 2008b). These studies also found evidence of discrimination against male homosexuals but not against female homosexuals.

6. Conclusions

In this paper, we test for the first time whether schools are more hesitant to conduct feedback with homosexual rather than with heterosexual parents. In order to do so we used an internet field experiment with schools during the children's pre-registration period in Catalonia (Spain). We observed that male homosexual parents are 22.5 percentage points less likely to receive an answer from schools than heterosexual couples. However, differences in the response rate from schools to female homosexual and heterosexual couples were not statistically significant. This evidence coincides with the finding from previous studies that have analyzed the existence of discrimination against homosexuals in other fields. Of course, we cannot be sure that if we had formally applied for the admission of the children of our fictitious homosexual parents to these schools, their applications would be turned down in the same proportion that we estimate here. However, it seems to us that the fact that schools are more hesitant to interact with gay couples than with heterosexual couples is indicative that some kind of subtle discrimination from schools or school principals against male homosexual couples may exist. However, this result, combined with the fact that we did not find significant differences between heterosexual and female homosexual couples, suggests that male homosexual couples might be penalized not only because of their sexual orientation but also because of the lack of a maternal figure. This, nevertheless, is a form of discrimination.

References

Adam, B.D., 1981. Stigma and Employability: Discrimination by Sex and Sexual Orientation in the Ontario Legal Profession. *The Canadian Review of Sociology and Anthropology, 18(2), 216-221.*

Ahmed, A.M., Hammarstedt, M., 2008a. Detecting discrimination against homosexuals: evidence from a field experiment on the Internet. Economica 76, 588-597.

Ahmed, A. M., Andersson, L., Hammarstedt M., 2008b. Are lesbians discriminated against in the rental housing market? Evidence from a correspondence testing experiment. Journal of Housing Economics 17, 234-238.

Ahmed, A. M., Andersson, L., Hammarstedt M., 2013. Are gay men and lesbians discriminated against in the hiring process? Southern Economic Journal, 79(3): 565–585

Allegretto, S.A., Arthur, M.M., 2001. An empirical analysis of homosexual/heterosexual male earnings differentials: unmarried or unequal? Industrial and Labor Relations Review 54, 631-646.

Arabsheibani, G., Marin, A., Wadsworth, J., 2004. In the pink. Homosexual-heterosexual wage differentials in the UK. International Journal of Manpower 25, 343-354.

Arabsheibani, G., Marin, A., Wadsworth, J., 2005. Gay pay in the UK. Economica 72, 333-347.

Badgett, L., 1995. The wage effects of sexual orientation discrimination. Industrial and Labor Relations Review 48, 726-739.

Humpert, S., 2012. Somewhere over the rainbow: Sexual orientation discrimination in Germany. University of Lüneburg, Working papers series in Economics n°245.

Laurent, T., Mihoubi, F., 2012. Sexual orientation and wage discrimination in France: The hiden side of the rainbow. Journal of Labor Research 33-4, 487-527.

Plug, E., Berkhout, P., 2004. Effects of sexual preferences on earnings in the Netherlands. Journal of Population Economics 17, 117-131.

Plug, E., Berkhout, P., 2008. Sexual orientation, disclosure and earnings, IZA DP No. 3290, Bonn, Germany.

Plug, E., D. Webbink and N. Martin, 2014. Sexual Orientation, Prejudice and Segregation. *Journal of Labor Economics,* forthcoming).

Tilcsik, A., 2011. Pride and Prejudice: Employment discrimination against openly gay men in the United States. American Journal of Sociology 117(2): 586–626.

Weichselbaumer, D., 2003. Sexual orientation discrimination in hiring. Labour Economics 10 629-642.

UNIVERSITAT ROVIRA I VIRGILI
THREE ESSAYS ON EMPIRICAL RESEARCH IN THE ECONOMICS OF EDUCATION
Enric Meix Llop

Chapter 4

Efficiency vs. equity in education: What do citizens value most?

1- Introduction

The objectives of any welfare state policy are usually twofold, and comprise the efficient allocation and equitable distribution of resources. The extent to which these objectives should be pursued is a matter of political choice. A system is said to be efficient if a given output is obtained from a minimum input or a maximum output is obtained from a given input. The evaluation of efficiency deals with a comparison of benefits and costs. The concept of equity is vague, although there is a consensus among social scientists that equity relates closely to the equality of opportunity or universality of services (Roemer, 1998). In public policy, there will be a trade-off between equity and efficiency. That is, under budget constraints, the implementation of a program aimed at universalizing a public service will be done at the expense of efficiency or vice versa.

For instance, a social security program designed to reduce poverty may also reduce individuals' incentives to work or to save, thereby creating inefficiency. A healthcare program designed to warn citizens about the dangers of smoking increases the average life expectancy of those who are more responsive to the message, leaving behind those who are less so, as a consequence increasing the gap between the two groups: in the end, this creates inequality. Finally, improving the equality of educational opportunities, and thus equity, could damage educational excellence, thereby reducing efficiency.

As in any welfare state policy program, the goals of a state educational policy are usually focused on two sides. On the one hand there is the efficient allocation of resources and on the other hand there is the equitable distribution of these resources. There are several reasons to pursue both objectives, as inequalities and inefficiencies in education increase social costs in terms of lower income tax revenues, and raise issues such as health expenditure and public aid as well as crime rates and delinquency. In contrast, educational policies based on efficiency and equity create the possibility of maximizing long-term benefits, and reducing economic and social costs. This kind of initiative does incur costs, but the costs of inaction are higher. In this regard, the EU helps member states to promote the principles of efficiency and equity in their education system following the Lisbon Strategy and the Education and Training work program.

Despite the clear benefits of promoting both efficient and equitable educational policies, both goals may not always be possible to achieve, as nowadays states are applying budget

reductions that directly affect the welfare state. Promoting educational policies incurs costs and during economic crisis periods governments and policymakers may have to choose between delivering efficient or equitable policies. In this context, a question arises. Is there a trade-off between efficiency and equity in terms of how citizens perceive public services?

In this paper, we test to what extent citizens give more value to efficiency or equity in the provision of the educational service. To the best of our knowledge, the empirical literature analyzing how citizens value the implementation of public policies targeting the welfare state is virtually nonexistent.[14]

To explore this issue, we resort to the European Social Survey (ESS), which is a biannual cross-national survey covering the period 2002–2012, using the six available waves. After controlling for a series of personal and country characteristics that may affect individual levels of satisfaction with the education system, our empirical results show that efficiency proxies have a positive impact on the level of citizens' satisfaction with their respective national education system. However, the results regarding the effect of the equity variables are more ambiguous depending on whether we consider compulsory of post-compulsory education.

With this aim, the remainder of the paper is structured as follows. Section 2 presents the conceptual framework. Section 3 looks at the existing literature regarding efficiency and equity in education. In Section 4 we present the empirical framework. In Section 5 we describe the dataset. The results of the analysis are introduced in Section 6. And finally, Section 7 concludes and discusses some preliminary policy implications.

2- Conceptual framework

Since the variable used in this paper as a proxy for citizens' assessment of their country's education system is a satisfaction variable, this study can be framed within the literature regarding the determinants of subjective well-being. Frey and Stutzer (2000, 2002) give some clues about the determinants of an individual's happiness and life satisfaction. Public institutions may have a remarkable influence on individuals' life satisfaction and

[14] Diaz-Serrano and Rodríguez-Pose (2012, 2014) are two exceptions.

happiness. Therefore, the determinants presented by Frey and Stutzer (2000, 2002) may also be important as determinants of the citizens' perception of public institutions. Indeed, Diaz-Serrano and Rodríguez-Pose (2012, 2015) show that individual and country-level determinants of individuals' happiness and life satisfaction are the same as individuals' satisfaction with political institutions and with the educational and healthcare systems.

As Frey and Stutzer (2000, 2002) point out, the determinants of subjective well-being can be grouped into three categories: first, those factors related to personal and demographic characteristics; second, micro- and macroeconomic factors that may influence the collective perception of an individual's welfare; and finally, a third set of country characteristics based on the institutional or constitutional level.

Using satisfaction with a specific individual or collective life domain (i.e., work satisfaction, satisfaction with the healthcare system, or satisfaction with the education system, among others) has an interesting feature. It allows us to observe the mediating effect of some variables that are closely related to a specific domain (i.e., education, health, democracy) in determining the impact on subjective well-being or satisfaction. Determining satisfaction with objects or experiences is straightforward; however, individuals may not only determine their satisfaction with a public institution based on their own personal experiences, but they may also use their experiences (family, friends) from their personal environment or the situation in their country. This is why we consider the third group of factors especially relevant; that is, constitutional and institutional factors, as mentioned in Frey and Stutzer (2000, 2002), that not only affect the individual, but also their personal environment.

Generally, individuals will be satisfied if how they perceive their actual situation coincides with or is fairly close to their reference situation, while if there is a significant gap between these situations individuals will feel dissatisfied. When we analyze individuals' satisfaction with objects or personal experiences, the comparison or reference situation may not be difficult to determine. For instance, if we are interested in analyzing job satisfaction or satisfaction with school grades, individuals may take work colleagues or schoolmates with similar characteristics as references. Thus, individuals may compare their salary, working conditions, or school grades with these comparable individuals. However, when we want to study the determinants of individuals'

satisfaction with political institutions or public services at an aggregated level, whether that is national or subnational, the reference or comparison situation is more difficult to identify. Do individuals have some knowledge of, for instance, alternative education systems in other regions or countries that may lead them to be (un)satisfied with their own education system?

Our hypothesis is that individuals might use aggregated information from other regions or countries in order to make an assessment of political institutions and public services such as education. For instance, rankings made up from national Programme for International Student Assessment (PISA) scores, which are very visible in the media, might be taken by citizens as an indicator of the quality of their school system compared with the school system in other countries. Hence, citizens can make an assessment of how satisfied they feel with the education system in their country or region.

3- Literature review

Despite the fact that the economic literature evaluating the effect of educational policies or actions aimed at promoting efficiency or equity on students' outcomes is quite abundant, the literature analyzing the assessment that citizens make of these policies is virtually non-existent. With regard to efficiency in early-childhood education, Fuchs and Woessmann (2004) show that preschool reading performance and kindergarten attendance had a positive effect on reading attainment at the end of primary education. Similar effects were found by Schuetz et al. (2005). They observed a positive correlation between the length of the preschool education system and science and mathematics performance in middle school.

At the school level, some research shows that there is no clear relationship between resources spent on schools and student achievement (see Hanushek, 2003, for an overview, and Gundlach et al., 2001, for European evidence). For instance, Leuven et al. (2007) find that spending on computers to improve instruction methods is likely to be less effective than more traditional instruction methods at improving students' performance. Results regarding the analysis of the relationship between class size and student performance is ambiguous. Some authors find no relationship between pupil spending or class size reductions and cognitive skills (Dobbelsteen et al., 2002). However, other authors (Ding and Lehrer, 2005, 2011), find that higher-ability students

receive benefits from class size reductions and no additional benefits for minority or disadvantaged students. On the contrary, Bosworth (2014) finds that students in the bottom of the achievement distribution appear to benefit more from class size reductions than the students at the top of the achievement distribution. The author finds that smaller classes also have lower achievement gaps on average, and that a class size reduction policy may be more effective in closing those gaps than raising average achievement. Rouse (2000), in a study conducted in the United States, finds small achievement gains in mathematics for African-American and Hispanic children attending voucher schools.

Other authors show that school efficiency can be increased by institutional reforms such as accountability and school autonomy. Evidence suggests that the introduction of accountability through external tests leads to gains in educational performance (Betts, 1998; Bishop, 1997, 2006). With regard to school autonomy, cross-country evidence shows that local decision-making (in aspects such as course contents, teachers' salaries, and school budgets) combined with school accountability increases the efficiency of the education system (Wößmann, 2005a). In this regard, Diaz-Serrano and Meix-Llop (2015), using World Bank indicators and PISA data, show that in more fiscally decentralized countries students perform better. Therefore, if regional governments have the autonomy to spend and collect their own economic resources, their students perform better. Other public policies that could be assessed to increase school efficiency are economic incentives for teachers. Atkinson et al. (2004), in a paper conducted in England, found that monetary incentives for teachers had a positive impact on students' achievement. Therefore, policies that set the right incentives for teachers, students, administrators, parents, and schools are able to increase the efficiency of the education system. From all this evidence, we conclude that students' achievement is the most common proxy of efficiency.

With respect to equity in early or preschool education, Schuetz et al. (2005) show that extensive education systems in terms of enrollment and duration improve this objective, as reflected by their lower dependence on the eighth-grade scores and the student's family background. Therefore, early inclusive education programs with disadvantaged children seem to improve both equity and efficiency. Similarly to the efficiency aim, there is very little evidence suggesting that targeted spending on disadvantaged students is effective in increasing equity. In this vein, Leuven and Oosterbeek (2007), with quasi-

experimental evidence from the Netherlands, show no positive or significant impact of interventions targeted at disadvantaged students, such as extra resources for computers, the introduction of qualified staff, or class size reductions. The only intervention that has a clear beneficial effect is lowering the compulsory school attendance age for students from disadvantaged families.

The importance of training qualified teachers is also highlighted by the OECD (2005), since ensuring that all students have access to high-quality teachers will help to improve equity at the school level. However, Bonesrønning et al. (2005) show that an endogeneity problem can emerge, since better teachers may choose "good" schools; therefore, this positive link might be obscured, as problematic neighborhoods may have problems in attracting high-quality teachers. Another policy with an important impact on equity is the size of the preschool education system, however this effect is not clear. An extensive system of early-school education in terms of universal enrollment and duration seems a good option (see Schuetz et al., 2005) in order to achieve equality of educational opportunities at the school level. However, Diaz-Serrano and Pérez-Reynosa (2013) show that for children living in developing countries, one additional grade of primary education increases drop-outs in primary education and also has a negative impact on enrollment rates in secondary education.

In the economics literature, the analysis of the trade-off between educational policies pursuing gains in efficiency and equity provides ambiguous results. Freeman et al. (2010), using the math scores from the Trends in International Mathematics and Science Study (TIMSS), underline the negative relation between cross-country variation in the level and dispersion of test scores. Thus, countries with the highest test scores are those with less inequality in their scores, suggesting what the authors call a "virtuous equity–efficiency trade-off." Bradley and Taylor (2004) suggest that competition has a positive effect on UK secondary school efficiency, without a significant effect on equity. On the other hand, Wößmann (2005b) shows a strong complementarity between efficiency and equity policies based on increasing public funding to private schools.

4- Empirical framework

In order to establish whether cross-country differences in efficiency or equity in education (key independent variables) have an impact on the level of citizens' satisfaction

with their education system (our dependent variable), we follow the same empirical strategy as Diaz-Serrano and Rodríguez-Pose (2012, 2015). We assume that an individual's satisfaction with the education system in his/her country can be determined with the following linear relationship:

$$S_{ic} = \propto + \beta X_{ic} + \gamma Z_c + \varepsilon_{ic} \quad (1)$$

where S_{ic} is the satisfaction of individual i with the education system in country c, X_{ic} is a matrix of variables characterizing citizen i living in country c, Z_c is a set of country characteristics including our variables of interest, which are the same for all the citizens living in the same country, and finally ε_{ic} is the random error term and α, β, and γ are a set of parameters to be estimated. In order to provide our data with a temporal dimension, we pool all available waves of the ESS. We proceed in this way, since we consider that an institutional or economic shock in a country at a given period of time may cause a variation in the outcome variable that cannot otherwise be captured. This is especially important in our case, as our outcome variable is a satisfaction measure. As we mentioned in Section 2, individuals may be highly influenced by their country's environment in the development of their self-satisfaction. This shock may remain unobservable and bias the estimated effects of the country-level variables on the outcome; that is, a statistically significant effect may turn out to be non-significant. Taking this temporal dimension into account allows us to control these changes in individuals' satisfaction and smooth out the potential bias on the estimated parameters.

Considering the temporal dimension in the model implies the introduction of not only specific country effects, but also specific time effects, as the efficiency and equity variables vary by country and year. We thus consider that the propensity of individual i residing in country c to report a specific level of satisfaction with the state of the education system in period t is determined by the following linear relationship:

$$S_{ict} = \propto + \beta X_{ict} + \gamma Z_{ct} + \delta_t + \lambda_c + \varepsilon_{ict} \quad (2)$$

where δ_t are time effects included as dummy variables in order to control for any unobserved temporal shock that could affect our response variable, and λ_c allow us to control for any unobserved country shocks.

In Equation (2), we do not observe S_i^* but instead an indicator variable of the type $S_{ict} = j$ if $\mu_{j-1} < S_{ict}^* \leq \mu_j$ $(j = 1, \dots, J)$. Given the ordinal nature of the outcome variable, one option to estimate Equation (2) is a pooled ordinal probit model. However, with big sample sizes, non-linear models with random effects are highly computationally demanding. In addition, in an 11-point ordinal scale, we estimate ten marginal effects per variable, which makes the analysis a bit tedious. This can be addressed by moving to a linear framework. Moving to a linear framework also facilitates the interpretation of the estimated effects, as it provides only one marginal effect per variable. Van Praag and Ferrer-i-Carbonell (2004) suggest the use of probit ordinary least squares (POLS).[15] This approach enables the use of simple linear ordinary least squares (OLS), instead of ordinal probit methods, without any loss of efficiency.

As our dataset is a pool of independent cross sections by country in order to take into account the specific country effects λ_c, Equation (2) can be estimated resorting to either a random- or fixed-effects model. The choice between the two models will crucially depend on the correlation of λ_c with Z_{ct} and X_{ict}. If this correlation is significantly different from zero, the random-effects model will provide inconsistent estimates of the set of parameters β and γ; therefore, a fixed-effects model offers a more suitable framework. However, if these correlations are not significantly different from zero, then the random-effects estimator provides consistent estimates of the parameters in Equation (2).

5- Data

The data used in this study are primarily drawn from the ESS. The ESS is an academically driven cross-national survey that was conducted every two years, starting in 2002. The survey compiles microdata from citizens of 36 European countries measuring their attitudes, beliefs, and behavior patterns in fields such as politics and social or work

[15] The POLS involves the transformation of the observed ordinal outcome $S_{ict} = j$ as $\ln(Z_{ict}) = [\phi(\mu_{j-1,t}) - \phi(\mu_{j,t})]/[\Phi(\mu_{j,t}) - \Phi(\mu_{j-1,t})]$, where $\phi(\circ)$ and $\Phi(\circ)$ are the normal density function and the cumulative normal distribution, respectively.

environments, among others. The aims of this survey include tracking how European citizens' conditions and attitudes are changing on topics such as moral, political, and social issues in order to help social science researchers with comparative quantitative analysis and also to improve the visibility of the data on social changes among researchers, policymakers, and the wider public.

We resort to this survey because of its easy management and because its wide scope allows us to characterize individuals in some key aspects, such as their beliefs, job status, educational level, and family situation. We take advantage of some ESS variables such as the age of the respondent, their educational level, citizenship, self-reported health,[16] ideology,[17] the number of people living in this household, and job status in order to improve the accuracy of the estimation.

5.1- Dependent variable (Y_{ict})

Our outcome variable is the citizens' satisfaction with their country's education system, taken from the ESS. To the question "Please say what you think overall about the state of education in your country nowadays," those surveyed individuals had to express their satisfaction on a 0 to 10 scale, with 0 being the lowest level of satisfaction and 10 the highest. Table 1 show the average satisfaction with the education system disaggregated by country. The countries where the citizens are most satisfied with their education system are Finland, Denmark, Ireland, Norway, and Belgium, while the least satisfied are Greece, Portugal, the Russian Federation, Bulgaria, and Italy. Table 2 shows the summary statistics for the dependent variable. The average satisfaction of the pool of countries is above 5, and the standard deviation is 2.3, which confirms the notable dispersion among countries observed in Table 1.

5.2- Explanatory variables I: Individual controls (X_{ict})

The individual variables used in this analysis are the same as in Diaz-Serrano and Rodríguez-Pose (2015). From the ESS we use the following individual controls: the age of the respondent, educational level, citizenship, self-reported health,[18] political

[16] Self-reported health is measured on a 1 to 5 scale, with 1 being "very good" and 5 "very bad."
[17] Individual ideology is measured on a 0 to 10 scale with 0 being "left" and 10 "right."
[18] Self-reported health is measured on a 1 to 5 scale, with 1 being "very good" and 5 "very bad."

ideology[19] of the individual, the number of people living in the household, and job status. In Table 2 the summary statistics for this set of variables is presented. We observe that the average age is 47. With regard to the education of individuals, 16% of the sample are educated to below lower-secondary level, 19% have only completed lower-secondary education, 35% completed upper-secondary education, and 24% of the sample completed tertiary education.

Table 1: Summary statistics for satisfaction variable, values are estimated from individual responses and averaged by country

	Satisfaction with the educational system		
	mean	s.d.	rank
Belgium	6.04	2.29	5
Bulgaria	4.53	2.66	20
Croatia	5.16	2.17	15
Denmark	7.03	2.03	2
Estonia	5.45	2.28	10
Finland	7.49	1.71	1
France	5.19	2.20	14
Greece	3.99	2.43	23
Hungary	4.96	2.37	17
Ireland	6.38	2.17	3
Israel	4.88	2.60	18
Italy	4.66	2.09	19
Netherlands	5.79	1.78	6
Norway	6.25	1.90	4
Poland	5.30	2.28	13
Portugal	4.17	2.12	22
Russian Federation	4.34	2.43	21
Slovak Republic	5.34	2.26	12
Slovenia	5.40	2.27	11
Spain	5.72	2.25	7
Sweden	5.56	2.06	8
Switzerland	6.25	2.08	4
Turkey	5.08	3.09	16
United Kingdom	5.46	2.21	9

[19] Individual ideology is measured on a 0 to 10 scale, with 0 being “left” and 10 “right.”

In terms of nationality, 96% of the sample have the citizenship of the country where they have been interviewed. The average level of individuals' self-reported health is 2.20 and on average they have 2.8 people living in their household. The summary statistics also highlight that the political ideology of the ESS respondents is slightly oriented to the right, as the mean value is 5.18 (here we have to consider that a centered ideology is 5). In terms of individuals' job status, 23.2% of the sample are retired, 48% have a paid job, 8% are students, 2% are disabled, 0.1% are in military service, 9% are homeworkers, and 6% are unemployed.

Table 2: Summary statistics for the variables used in the econometric analysis

Variable	Observations	Mean	Std. Dev	Min	Max
Satisfaction with educational system	211.931	5.5475	2.3846	0	10
Age	223.251	47.5540	18.6265	13	91
Less than low-secondary education	223.074	0.1630	0.3693	0	1
Low secondary education	223.074	0.1979	0.3984	0	1
Upper secondary education	223.074	0.3546	0.4784	0	1
Post-secondary education	223.074	0.0354	0.1847	0	1
Tertiary	223.074	0.2486	0.4322	0	1
Citizenship	223.986	0.9598	0.1965	0	1
Self-reported health	223.903	2.2091	0.9338	1	5
Left-right political scale	191.801	5.1893	2.2183	0	10
People living in household	223.929	2.8284	1.5097	1	24
Retired	222.981	0.2320	0.4221	0	1
Paid work	222.981	0.4840	0.4997	0	1
Student	222.981	0.0861	0.2806	0	1
Disabled	222.981	0.0249	0.1557	0	1
Military service	222.981	0.0017	0.0417	0	1
Homework	222.981	0.0996	0.2995	0	1
Unemployed	222.981	0.0600	0.2375	0	1
GDP pc current 2005	224.169	31546.58	18598.77	2030.78	99635.88
Expenditure in education as percentage of GDP	179.893	5.48	1.05	2.4002	8.4376
Unemployment rate	224.169	8.21	3.96	2.6	25.2
Math score	216.848	493.01	28.42	413.44	548.35
Reading score	216.848	491.96	23.67	401.93	546.86
Science score	216.848	497.67	25.70	423.83	563.32
Gross enrollment rate primary	212.763	102.70	4.53	92.37	117.22
Gross enrollment rate secondary	193.273	105.87	12.14	82.95	155.98
Gross enrollment rate tertiary	184.958	64.00	12.60	26.19	95.017

5.3- Explanatory variables II: Country variables (Z_{ct})

Our variables of interest, which are the proxies for efficiency and equity, are measured at a country level. In order to assess the impact of the efficiency in education on the citizens' perception of the education system, we resort to the PISA database. The PISA report is an international standardized study that provides academic results in the areas of mathematics, science, and reading; we use these three scores as a proxy of efficiency in education. As we show in Section 3, different student assessment tests (PISA, the National Assessment of Educational Progress [NAEP], or TIMSS, among others) are usually used as a proxy of efficiency in the educational environment. We chose the PISA data for its easy management and its wide country coverage. Since some of the waves of the PISA report differ in time from the ESS waves, we assigned the PISA scores to the corresponding ESS wave as shown in Table 3.

Table 3: Matching of PISA years with ESS waves

ESS Wave	ESS Year	PISA Year
1	2002	2000
2	2004	2003
3	2006	2006
4	2008	2009
5	2010	2009
6	2012	2012

The first wave of the PISA was conducted in 2000; we assigned the students' achievement results to the corresponding country of the first wave of the ESS, which was conducted in 2002. The PISA 2003 results were matched with the 2004 ESS data; for the year 2006 both PISA and ESS coincide. The 2008 and 2010 waves of the ESS were both assigned with the PISA scores from 2009, and finally, for the year 2012, ESS and PISA coincide. The PISA report, in addition to the microdata, also provides the country score, and we use this in our analysis. Since students work on different test booklets, scores must be scaled to allow valid comparisons. This scaling is done using the Rasch model on item response theory; this method is widely used in other academic achievement reports such as TIMSS and NAEP. We consider country PISA scores to be a suitable measure of efficiency, as they precisely measure the country's students' achievement in three different topics and they are widely used in economics research.

Our equity proxy variables are taken from the World Bank data. We use the gross enrollment rates in primary, secondary, and tertiary education as equity indicators. The gross enrollment rate is calculated as the ratio between the number of individuals who are actually enrolled in a certain grade (regardless of age) divided by the population of the age group that officially corresponds to the same level. This value can exceed 100 because it includes those students that are older than the age at which one individual would usually achieve a given grade. The measure differs from the net enrollment rate, as this is the number of the enrolled population in a certain grade that belongs to the age group that officially corresponds to that grade divided by the total population of the same age group. As our purpose is to measure equity or universality, we think that the gross enrollment rate is a better measure, as it captures all students enrolled in a grade, not only those who correspond to their age. The gross enrollment rate in primary education considers individuals between the ages of 6 and 11, the gross enrollment rate in secondary education considers individuals between 12 and 17 years old, and the gross enrollment rate in tertiary education considers the group of individuals at the age of leaving secondary school, which is 18. We matched each equity variable by year with the corresponding ESS wave.

Table 4: Equity and efficiency measures

Variable	Source
Mathematics score	OECD PISA Report
Reading score	OECD PISA Report
Science score	OECD PISA Report
Gross enrollment rate at primary	World Bank Data, Education
Gross enrollment rate at secondary	World Bank Data, Education
Gross enrollment rate at tertiary	World Bank Data, Education

Because not all efficiency and equity variables were available for all ESS countries, we had to restrict the sample to 24 countries.[20]

As the present study is based on the educational framework, we consider it appropriate to include the government expenditure on education as a percentage of GDP. We also consider the unemployment rate, as it can be an important factor in determining citizens'

[20] Countries included in the analysis: Portugal, the Netherlands, France, the UK, Spain, Ireland, Israel, Turkey, Belgium, the Slovak Republic, Switzerland, Bulgaria, Italy, Denmark, Sweden, Greece, Hungary, Norway, Finland, Estonia, Slovenia, Poland, the Russian Federation, and Croatia.

perception of the education system. Finally, we include the logarithm of the GDP per capita at 2005 prices as an indicator of the state of the country's economy. All these country variables are matched with the ESS, not only taking into consideration the spatial, but also the appropriate time horizon. In Table 2, the summary statistics for the country control variables are presented. We see that countries on average spend 5.4% of their GDP on education, they have an average unemployment rate of 8.2%, and their average GDP is 31,546,58.

As we noted, our key independent variables are the equity and efficiency indicators. On the one hand, we have the efficiency variables. As we stated above, we use the PISA country scores in mathematics, science and reading as efficiency proxies. In Table 2, we see that the aggregate country mean for the PISA mathematics score is 493, while it is 491 for reading and 497 for science. Table 5 reflects heterogeneity scores among countries. For instance, we see that the top three performing countries in mathematics are Finland, Switzerland and the Netherlands while the worst results are obtained by Israel, Turkey and Bulgaria. In terms of the reading scores, the top three performers are Finland, Ireland, and the Netherlands and those that obtain the worst scores are the Russian Federation, Turkey, and Bulgaria. Finally, with regard to the results for science achievement, Finland, Estonia, and the Netherlands are in the top three positions, while Israel, Bulgaria, and Turkey are last. We note that both Finland and the Netherlands are in the top three for all achievements, while Bulgaria is consistently in the last three.

In Table 2 we show a summary of the statistics on the equity variables. The aggregated country mean for the gross enrollment rates is 102.7%, 105.8%, and 64.0% in primary, secondary, and tertiary education, respectively. Table 6 presents the average score at the country level. It can be seen that the three countries with the highest rate in primary education are Portugal, the Netherlands, and France, while the three with the lowest ones are Poland, the Russian Federation, and Croatia. With regard to the gross enrollment rate in secondary education, we see on the one hand that Denmark, the Netherlands, and Spain have the highest rates, and on the other that Bulgaria, Turkey, and the Russian Federation have the lowest. Finally, in tertiary education, Finland, Slovenia, and Sweden have the highest rates, while the Slovak Republic, Switzerland, and Turkey have the lowest.

Table 5: Time averaged efficiency variables by country

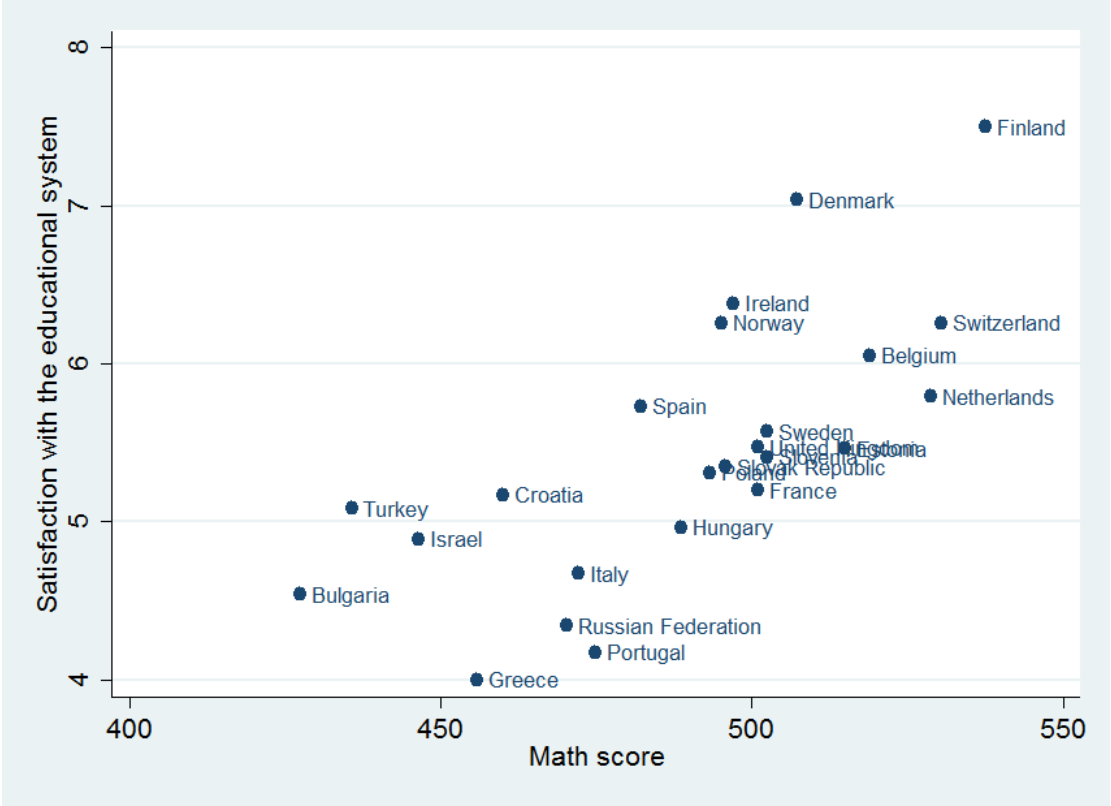
	Math score		Reading score		Science score	
	Score	Rank	Score	Rank	Score	Rank
Belgium	518.96	4	506.04	5	505.36	8
Bulgaria	427.47	24	425.44	24	439.75	24
Croatia	459.94	20	475.75	19	486.37	18
Denmark	507.20	6	495.05	12	492.31	14
Estonia	514.98	5	505.14	6	532.36	2
Finland	537.56	1	538.34	1	550.27	1
France	500.92	10	497.75	11	500.18	12
Greece	455.85	21	477.82	18	470.29	21
Hungary	488.70	15	486.63	14	500.96	11
Ireland	496.93	11	511.77	2	510.55	7
Israel	446.55	22	470.02	21	451.81	22
Italy	472.18	18	484.78	15	487.39	17
Netherlands	528.69	3	509.59	3	523.17	3
Norway	495.15	13	499.77	9	494.14	13
Poland	493.21	14	499.86	8	502.94	9
Portugal	474.96	17	481.31	16	480.08	19
Russian Federation	470.36	19	453.09	23	478.68	20
Slovak Rep.	495.84	12	472.82	20	490.80	15
Slovenia	502.53	7	487.09	13	514.26	5
Spain	482.23	16	480.73	17	490.02	16
Sweden	502.50	8	507.18	4	502.86	10
Switzerland	530.40	2	499.72	10	510.73	6
Turkey	435.88	23	454.11	22	445.36	23
U.K.	500.94	9	501.41	7	517.38	4

Table 6: Time averaged equity variables by country

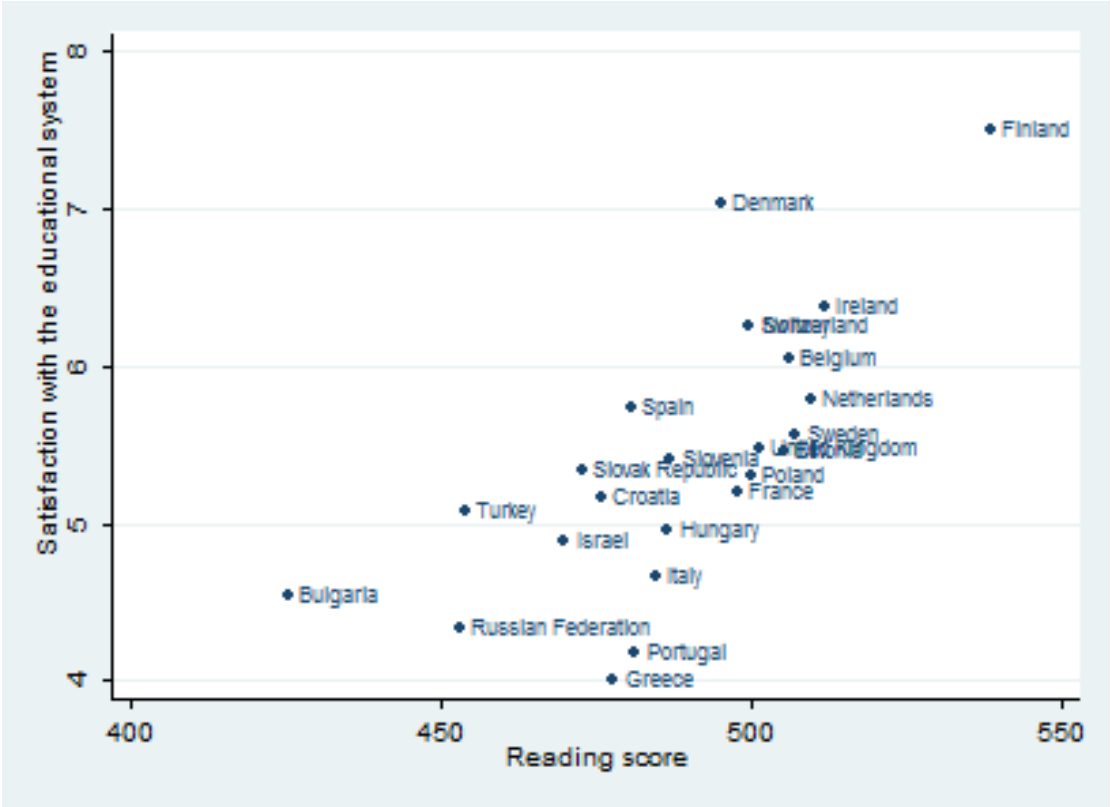
	Gross enrolment primary		Gross enrolment secondary		Gross enrolment tertiary	
	Score	Rank	Score	Rank	Score	Rank
Belgium	103.03	9	117.28	4	62.55	11
Bulgaria	101.14	12	90.72	22	52.74	21
Croatia	92.72	24	97.98	16	53.32	20
Denmark	100.70	15	121.41	1	73.29	6
Estonia	99.58	18	105.42	10	68.77	9
Finland	99.28	20	113.48	6	91.41	1
France	106.40	3	108.85	9	54.13	19
Greece	101.09	13	102.34	18	73.22	7
Hungary	99.95	17	97.78	17	59.14	15
Ireland	104.17	6	112.59	7	59.92	12
Israel	104.15	7	103.63	11	58.25	18
Italy	100.96	14	98.61	15	58.45	17
Netherlands	107.25	2	120.58	2	59.23	14
Norway	99.35	19	113.53	5	75.15	4
Poland	98.17	22	98.78	14	66.58	10
Portugal	114.47	1	102.47	12	58.69	16
Russian Federation	96.03	23	83.14	24	73.97	5
Slovak Rep.	101.98	11	92.61	21	48.06	22
Slovenia	98.59	21	97.16	19	78.92	2
Spain	104.61	5	120.45	3	69.25	8
Sweden	100.39	16	111.02	8	77.00	3
Switzerland	102.83	10	94.85	20	46.46	23
Turkey	103.64	8	87.38	23	35.86	24
U.K.	105.69	4	102.25	13	59.52	13

In Graphics 1 to 6, we plot the satisfaction with the education system vs. the efficiency (Graphics 1, 2, and 3) and equity proxies (Graphics 4, 5, and 6). In Graphics 1, 2, and 3 we see a strong positive linear correlation between individuals' satisfaction with their education system and the average PISA country scores for each country. Thus, the top PISA performers are also countries where their citizens are more satisfied with their education system. In Graphics 5 and 6, we observe a strong positive linear correlation between the gross enrollment rates in secondary and tertiary education and the satisfaction with the education system. However, in Graphic 4 this correlation is less clear.

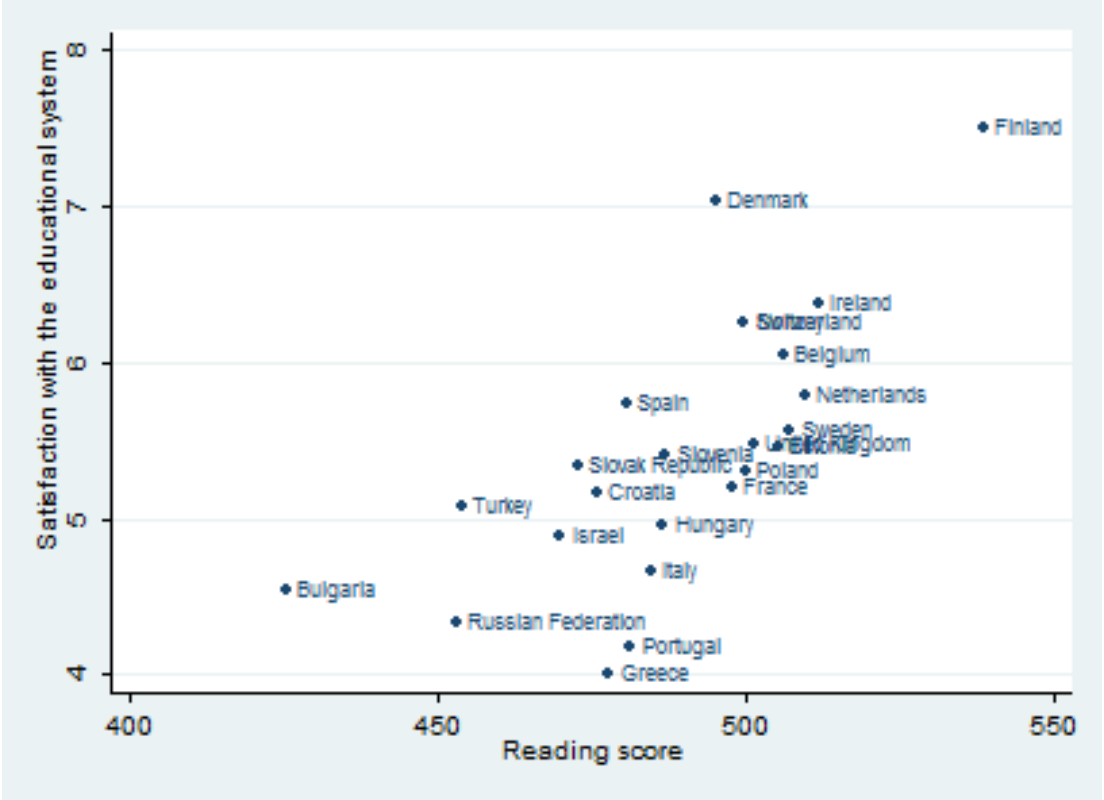
Graphic 1: Satisfaction with the educational system and math scores by country



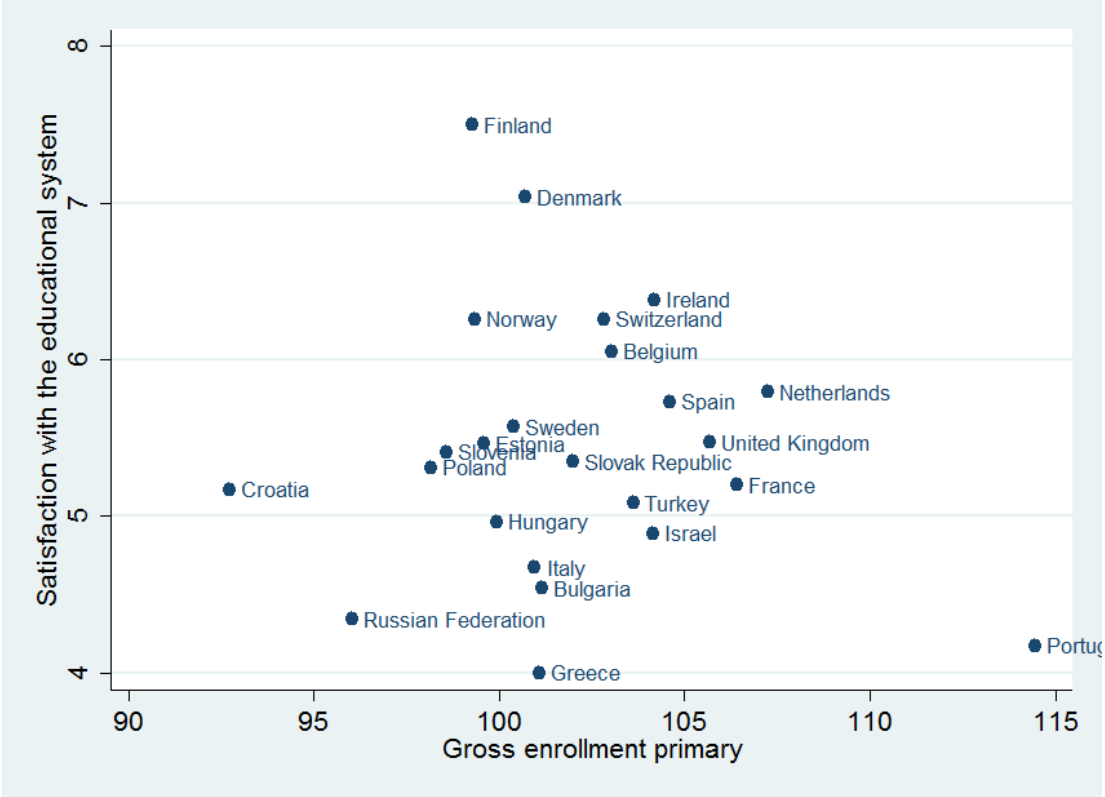
Graphic 2: Satisfaction with the educational system and reading scores by country



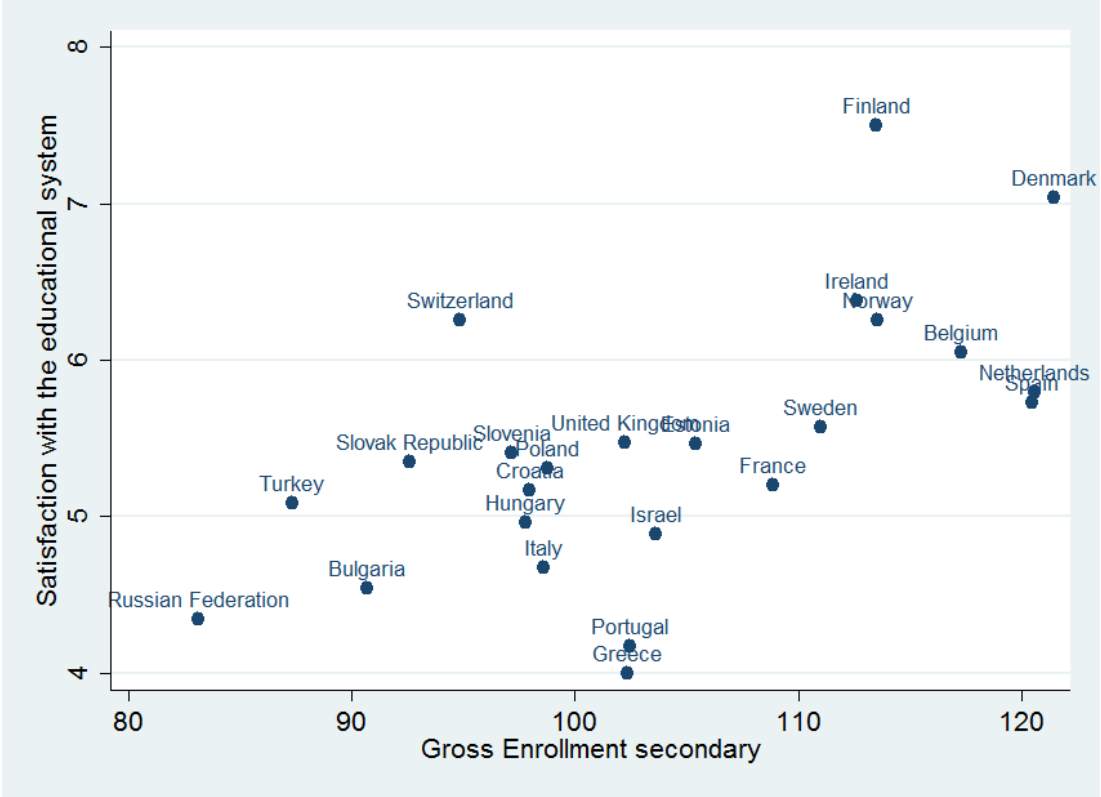
Graphic 3: Satisfaction with the educational system and science scores by country



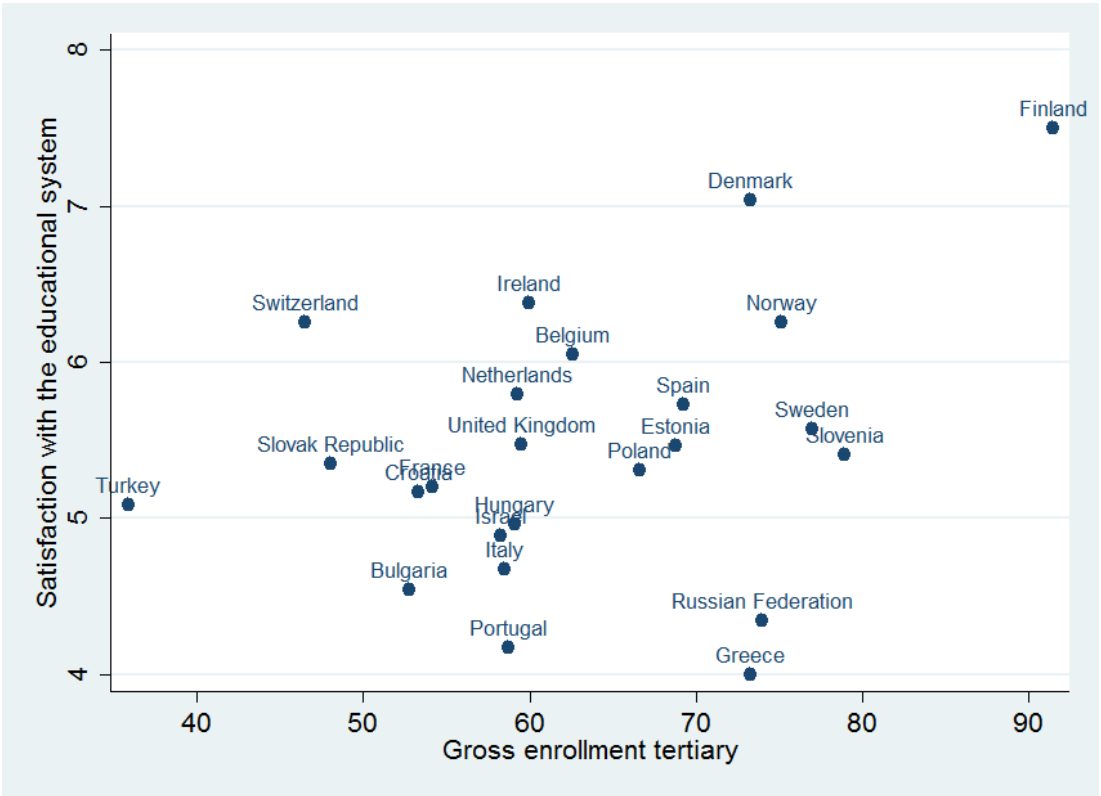
Graphic 4: Satisfaction with the educational system and gross enrolment rates at primary by country



Graphic 5: Satisfaction with the educational system and gross enrolment rates at secondary by country



Graphic 6: Satisfaction with the educational system and gross enrolment rates at tertiary by country



6- Econometric results

In Table 7 we report he estimates of Equation (2). As we noted in Section 4, our model can be estimated with random- or with fixed-effects regressions. In order to make a choice between these two approaches, we first run the fixed-effects regressions and check whether correlations between the country-specific-effects and the covariates are high. We obtained low correlations, around 0.09, which indicates that the random effects model may be suitable for our purposes. Second, to confirm that a random-effects model is appropriate, we conducted the Hausman specification test. In this test we cannot reject the null hypothesis, which indicates that the random effects model will provide consistent estimates of the parameters in Equation (2).

6.1- The effect of individual factors

Estimated coefficients for the individual variables are shown at the top of Table 7. Since all models are based on Equation (2), by simply varying the corresponding efficiency or equity indicator all coefficients are very similar across the board in terms of magnitude, sign, and significance. Estimated coefficients behave according to expectations and tend to reproduce those in previous empirical studies analyzing the determinants of subjective well-being. Thus, the results show that age has a negative effect on the citizens satisfaction with education. We also observe that satisfaction decreases with the level of education of the respondent, with the exception of specifications (5) and (6), where the effect of both levels of secondary education is positive. These results suggest that more educated citizens are more critical of the delivery of the education service. Citizenship also has a negative and significant effect on citizens' satisfaction with their education system, thus foreigners are less satisfied with the educational service than natives. Here we have to take into account the fact that only 3.4% of the sample observations are from individuals without citizenship. The self-reported health status of an individual has a negative impact on citizens' perception of the education system. Right-wing individuals tend to be more satisfied with their education system than their left-wing counterparts. Household size also has a positive and significant effect (only negative and significant in the first specification). In terms of job status compared to unemployed citizens, students, and disabled citizens, being a paid worker, homeworker, or retired has a positive and significant effect on satisfaction with the education system.

Table 6: Results for the estimation of equation (2)

	(1) Sat. Educ.	(2) Sat. Educ.	(3) Sat. Educ.	(4) Sat. Educ.	(5) Sat. Educ.	(6) Sat. Educ.	(7) Sat. Educ.	(8) Sat. Educ.	(9) Sat. Educ.
Age	-0.0216***	-0.0210***	-0.0217***	0.0226***	-0.0217***	-0.0224***	-0..0228***	-0.0219***	-0.0221***
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Age squared	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Education (Base: Primary education)									
Low secondary education	-0.1750***	-0.0245	0.0035	-0.0631*	0.0862*	0.0928***	-0.1011***	0.0303	0.0420*
	(0.0192)	(0.0191)	(0.0190)	(0.0193)	(0.0191)	(0.0191)	(0.0192)	(0.0191)	(0.0191)
Upper secondary education	-0.3193***	-0.1042***	-0.0658***	-0.1783***	0.0337**	0.0521***	-0.2078**	-0.0174	-0.0033
	(0.0180)	(0.0177)	(0.0176)	(0.0181)	(0.0177)	(0.0176)	(0.0181)	(0.0177)	(0.0176)
Post secondary education	-0.4051***	-0.2177***	-0.2146***	-0.2825***	-0.0958***	-0.0908**	-0.3319***	-0.1701***	-0.1701***
	(0.0368)	(0.0369)	(0.0372)	(0.0370)	(0.0370)	(0.0374)	(0.0369)	(0.0369)	(0.0373)
Tertiary education	-0.3641***	-0.1704***	-0.1525***	-0.2521***	-0.0610***	-0.0541***	-0.2869***	-0.1165***	-0.1115***
	(0.0188)	(0.0186)	(0.0185)	(0.0189)	(0.0186)	(0.0186)	(0.0189)	(0.0186)	(0.0185)
Citizenship	-0.2514***	-0.2226***	-0.2605***	-0.3206***	-0.2949***	-0.3080***	-0.2824***	-0.2578***	-0.2741***
	(0.0304)	(0.0306)	(0.0306)	(0.0305)	(0.0307)	(0.0308)	(0.0305)	(0.0306)	(0.0307)
Self reported health	-0.1930***	-0.1881***	-0.1982***	-0.1712***	-0.1659***	-0.1769***	-0.1869***	-0.1830***	-0.1900***
	(0.0066)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)	(0.0067)
Left-Right wing scale	0.0412***	0.0481***	0.0437***	0.0328***	0.0390***	0.0374***	0.0384***	0.0443***	0.0417***
	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)
Number of people living in household	-0.1750***	0.0467***	0.0488***	0.0250***	0.0329***	0.0366***	0.0383***	0.0466***	0.0463***
	(0.0039)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)
Job status (Base: Unemployed)									
Paid work	0.1082***	0.1099***	0.0880***	0.1314***	0.1328***	0.1170***	0.1181***	0.1182***	0.1061***
	(0.0222)	(0.0224)	(0.0224)	(0.0223)	(0.0224)	(0.0225)	(0.0223)	(0.0224)	(0.0225)
Student	0.2317***	0.2730***	0.2294***	0.2401***	0.2794***	0.2576***	0.2366***	0.2712***	0.2474***
	(0.0287)	(0.0289)	(0.0290)	(0.0289)	(0.0290)	(0.0292)	(0.0288)	(0.0289)	(0.0292)
Disabled	0.0501	0.0575	0.0668***	0.0438	0.0504	0.0581	0.0449*	0.0508	0.0490
	(0.0404)	(0.0407)	(0.0409)	(0.0406)	(0.0408)	(0.0411)	(0.0405)	(0.0407)	(0.0410)
Military service	0.4376***	0.4362***	0.4509***	0.2956**	0.2912**	0.3548**	0.3698***	0.3796***	0.3898***
	(0.1273)	(0.1282)	(0.1365)	(0.1278)	(0.1286)	(0.1373)	(0.1276)	(0.1283)	(0.1370)
Homework	0.2143***	0.2050***	0.2010***	0.2398***	0.2315***	0.2265***	0.2277***	0.2188***	0.2149***
	(0.0275)	(0.0277)	(0.0277)	(0.0276)	(0.0278)	(0.0279)	(0.0275)	(0.0277)	(0.0278)

Retired	0.2254***	0.2623***	0.2504***	0.2493***	0.2841***	0.2762***	0.2384***	0.2693***	0.2617***
	(0.0272)	(0.0274)	(0.0274)	(0.0273)	(0.0275)	(0.0276)	(0.0273)	(0.0274)	(0.0276)
GDP per capita current 2005	1.57e-5***	1.49e-5***	1.65e-5***	1.62e-5***	1.47e-5***	1.60e-5***	1.95e-5***	1.75e-5***	1.90e-5***
	(4.76e-07)	(4.55e-07)	(4.45e-07)	(4.75e-07)	(4.60e-07)	(4.58e-07)	(4.62e-07)	(4.48e-07)	(4.41e-07)
Expenditure in education as % GDP	0.1126***	0.1157***	0.0263***	0.0953***	0.0989***	0.0544***	0.1685***	0.1665***	0.1258***
	(0.0062)	(0.0067)	(0.0069)	(0.0063)	(0.0068)	(0.0069)	(0.0062)	(0.0067)	(0.0069)
Unemployment rate	0.0202***	0.0281***	0.0206***	0.0083***	0.0160***	0.0089***	0.0149***	0.0206***	0.0179***
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0019)
Math score	0.0183***	0.0189***	0.0178***						
	(0.0002)	(0.0002)	(0.0002)						
Reading score				0.0212***	0.0222***	0.0199***			
				(0.0003)	(0.0002)	(0.0002)			
Science score							0.0196***	0.0194***	0.0180***
							(0.0002)	(0.0002)	(0.0002)
Gross enrollmet primary	-0.0528***			-0.0514***			-0.0447***		
	(0.0012)			(0.0012)			(0.0028)		
Gross enrollmet secondary		0.0027***			0.0019***			0.0032***	
		(0.0006)			(0.0005)			(0.0005)	
Gross enrollmet tertiary			0.0172***			0.0104***			0.0094***
			(0.0005)			(0.0005)			(0.0005)
Constant	0.3316*	-6.0615***	-5.6192***	-1.1459***	-7.5141***	-6.4794**	-2.0286***	-6.7417***	-5.9169***
	(0.1820)	(0.1186)	(0.1176)	(0.2011)	(0.1392)	(0.1440)	(0.3121)	(0.1256)	(0.1299)
Observations	136.885	136.885	134.989	136.885	136.885	134.989	136.885	136.885	134.989

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

6.2- Country-level variables

Estimated coefficients for the country-level controls, including our key explanatory variables (efficiency and equity), are reported in the bottom half of Table 7. We first comment on the estimated coefficients for the macroeconomic country-level indicators. Our estimations indicate that government expenditure on education has a statistically significant effect on citizens' assessment of the education service. This effect is positive. The overall national unemployment rate has a positive and statistically significant impact on the satisfaction of individuals with the education system. This result is interesting, as it indicates that in Europe the unemployment rate does not affect citizens' opinion of the education system as one may expect. National GDP per capita is also significant and positive.

Now we focus on our variables of interest: the efficiency and equity variables. As we mention above, the econometric analysis comprises nine specifications. In each specification we include one efficiency and one equity indicator. The results for these variables are shown at the bottom of Table 7.

Our results indicate that both efficiency and equity matter for citizens' assessment of the education system. The effect of efficiency proxied as PISA national scores in mathematics, reading, and science exerts an unequivocal positive and statistically significant impact on the assessment of the education system. This indicates that in countries with higher PISA scores their citizens have a better assessment of their education system. Indeed, the estimated marginal effects are similar for the three scores. For mathematics scores (models 1 to 3), marginal effects range from 0.0178 to 0.0189, while these figures are 0.0199 to 0.0222 and 0.0180 to 0.0196 for reading and science scores, respectively.

In contrast to the efficiency indicators, equity variables proxied as the enrollment rate by education level exhibit an ambiguous effect. The direction of the impact depends on the level of education considered. The gross enrollment rate in primary education reports a negative sign, while the effect is positive for the gross enrollment rate in secondary education and in higher education. This result might indicate that citizens do not consider compulsory education as an additional factor that may raise their assessment

of the education system, as they take it for granted that compulsory education has to be made available for everyone. However, citizens positively value the effort made by governments to universalize post-compulsory education (secondary and tertiary), with the magnitude of the impact for secondary education being larger than for tertiary education. This result is robust independent of the PISA score with which the respective enrollment ratio is combined.

In order to allow for comparisons across alternative models, in Table 8 we report the estimated elasticities. The three estimated elasticities associated with the efficiency variables are quite similar in magnitude. A 10% increase in the level of PISA scores in mathematics, reading, and science heightens citizens' perception of the education system by between 19.0% and 20.3%, 21.2% and 27.0%, and 19.4% and 21.2%, respectively. Focusing on the equity variables, a 10% increase in the level of gross enrollment rate in primary education decreases the level of citizens' perception of the education system by between 10.2% and 11.9%. In contrast, a 10% increase in the gross enrollment rate in secondary education increases the level of satisfaction by 0.4% to 0.7% depending on the specification. Finally, if we increase the gross enrollment rate in tertiary education by ten percent, the satisfaction with the education system is increased by a range of 1.2% to 2.3%. Estimated elasticities reveal that citizens value efficiency more than equity in their assessment of the education system.

Table 8: Estimated elasticities for the efficiency and equity variables

Math	1.9733	2.0350	1.908						
	82.72	*83.61*	*77.41*						
Read				2.706	2.3801	2.1293			
				75.95	*77.53*	*66.35*			
Science							1.9870	2.1133	1.9485
							78.51	*82.75*	*70.63*
Primary	-1.1932			-1.1583			-1.0210		
	-43.87			*--42.5*			*-37.22*		
Secondary		0.0613			0.0438			0.0748	
		4.66			*3.30*			*5.69*	
Tertiary			0.2374			0.1438			0.1299
			34.95			*19.82*			*17.91*

z statistic in italics

7- Conclusions

This paper has analyzed the effect of educational efficiency and equity on citizens' satisfaction with their country's education system. To the best of our knowledge, this is the first study to address this question. With this aim in mind, we resort to the six available waves of the ESS and match them with countries' educational efficiency and equity proxies in order to carry out a cross-country analysis controlling for individual and country characteristics.

First, we estimated an econometric model in which the results highlighted that the educational efficiency proxies had an unequivocal positive effect on citizens' satisfaction with their education system. The PISA achievement scores usually appear in the media and are a matter of conjecture among different society and government actors. Because PISA has acquired a certain prestige, these scores are perceived as a reliable indicator of the functioning of education in many countries. As a result of this, governments make efforts to improve in the ranking. For instance, as a consequence of being in the last position of the last PISA ranking, there has been a private initiative in Peru to create an alternative education system to the public one. Bad results in other South American countries such as Colombia, Argentina, and Brazil have also prompted public debate about the state of the education system in these countries. In Spain, the current government has promoted deep reform of the education system. One of the main arguments in favor of this reform was the poor performance of Spanish students in the PISA tests relative to their European counterparts.

The results for the equity measures provide more ambiguous results, depending on what educational level we are analyzing. The equity measure for primary education has a negative and significant effect on the citizens' assessment of the education system, while this effect is positive for secondary and tertiary education. Our results show that for a 10% increase in the level of the gross enrollment rate in primary education, citizens' perception of the education system decreases by between 10.2% and 11.9%. This result suggests that citizens may not attach importance to primary education, as it is compulsory. Primary education is a basic service covered in all developed countries and citizens may not consider it a priority in comparison to secondary and tertiary education. In contrast, citizens have a positive valuation of government efforts to increase the equity of opportunities in secondary and tertiary education, whose levels that are not compulsory. This effect is bigger for tertiary education, where a 10% increase in the gross

enrollment rate increases citizens' satisfaction by between 1.2% to 2.3% in comparison with an increase between 0.4% and 0.7% for secondary education. As we noted in Section 3, this result is counter-intuitive, as the first stages of education are crucial in later stages (i.e., primary education is the input for secondary education), and policymakers should take heed of these factors, especially of long-term effects such as student achievement, grade retention, employment, earnings, crime prevention, health, and family relationships.

8- References

Atkinson, A., Burgess, S., Croxson, B., Gregg, P., Propper, C., Slater, H., Wilson, D., (2004). *Evaluating the Impact of Performance-related Pay for Teachers in England*. CMPO Working Paper No. 04/113. Bristol: Centre for Market and Public Organisation.

Betts, J.R., (1998). *The Impact of Educational Standards on the Level and Distribution of Earnings*. The American Economic Review, 88(1), 266–275.

Bishop, J.H., (1997). *The Effect of National Standards and Curriculum-based Exams on Achievement*. The American Economic Review, 87(2), 260–264.

Bishop, J.H., (2006). *Drinking from the Fountain of Knowledge: Student Incentive to Study and Learn – Externalities, Information Problems and Peer Pressure*. In: Hanushek, E., Welch, F., (Eds.), Handbook of the Economics of Education, Volume 2, pp. 909–944. Amsterdam: North-Holland.

Bonesrønning, H., Falch, T., Strøm, B., (2005). *Teacher Sorting, Teacher Quality, and Student Composition*. European Economic Review, 49(2), 457–483.

Bosworth, R., (2014). *Class Size, Class Composition, and the Distribution of Student Achievement*. Education Economics, 22(2), 141–165.

Bradley, S., Taylor, J., (2004). *The Economics of Secondary Schooling*. In: Johnes, G., Johnes, J., (Eds.), International Handbook on the Economics of Education, pp. 368–414. Cheltenham: Edward Elgar.

Diaz-Serrano, L., Meix-Llop, E., (2015). *Do Fiscal and Political Decentralization Raise Students' Performance? A Cross-country Analysis*. Kyklos, forthcoming.

Diaz-Serrano, L., Pérez-Reynosa, J., (2013). *Impact of Duration of Primary Education on School Outcomes: A Cross-country Analysis*. IZA Discussion Paper No. 7793. Bonn: Institute for the Study of Labor.

Diaz-Serrano, L., Rodríguez-Pose, A., (2012). *Decentralization, Subjective Well-being, and the Perception of Institutions*, Kyklos, 65(2), 179–193.

Diaz-Serrano, L., Rodríguez-Pose, A., (2015). *Decentralization and the Welfare State: What Do Citizens Perceive?* Social Indicators Research, 120(2), 411–435.

Ding, W., Lehrer, S., (2005). *Class Size and Student Achievement: Experimental Estimates of Who Benefits and Who Loses from Reductions*. Queen's Economics Department Working Paper No. 1046. Kingston, ON: Queen's University.

Ding, W., Lehrer, S.F., (2011). *Experimental Estimates of the Impacts of Class Size on Test Scores: Robustness and Heterogeneity*. CLSRN Working Paper No. 77. Vancouver, BC: Canadian Labour Market and Skills Researcher Network.

Dobbelsteen, S., Levin, J., Oosterbeek, H., (2002). *The Causal Effect of Class Size on Scholastic Achievement: Distinguishing the Pure Class Size Effect from the Effect of Changes in Class Composition*. Oxford Bulletin of Economics and Statistics, 64(1), 17–38.

Freeman, R.B., Machin, S., Viarengo, M., (2010). *Variation in Educational Outcomes and Policies Across Countries and of Schools Within Countries*. NBER Working Paper No. 16293. Cambridge, MA: National Bureau of Economic Research.

Frey, B.S., Stutzer, A., (2000). *Happiness, Economy and Institutions*. The Economic Journal, 110(466), 918–938.

Frey, B.S., Stutzer, A., (2002). *Happiness and Economics: How the Economy and Institutions Affect Human Well-being*. Princeton, NJ: Princeton University Press.

Fuchs, T., Woessmann, L., (2004). *Governance and Primary-School Performance: International Evidence*. Munich: Ifo Institute for Economic Research at the University of Munich.

Gundlach, E., Wossmann, L., Gmelin, J., (2001). *The Decline of Schooling Productivity in OECD Countries*. The Economic Journal, 111(471), 135–147.

Hanushek, E.A., (2003). *The Failure of Input-based Schooling Policies*. The Economic Journal, 113(485), F64–F98.

Leuven, E., Oosterbeek, H., (2007). *The Effectiveness of Human-capital Policies for Disadvantaged Groups in the Netherlands*. In: Woessmann, L., Peterson, P.E., (Eds.), Schools and the Equal Opportunity Problem, pp. 191–208. Cambridge, MA: MIT Press.

Leuven, E., Lindahl, M., Oosterbeek, H., Webbink, D., (2007). *The Effect of Extra Funding for Disadvantaged Students on Achievement*. The Review of Economics and Statistics, 89(4), 721–736.

Organisation for Economic Co-operation and Development (OECD), (2005). *Teachers Matter: Attracting, Developing and Retaining Effective Teachers*. Paris: OECD.

Roemer, J.E. (1998). *Equality of Opportunity*. Cambridge, MA: Harvard University Press.

Rouse, C.E., (2000). *School Reform in the 21st Century: A Look at the Effect of Class Size and School Vouchers on the Academic Achievement of Minority Students*. IRS Working Paper No. 440. Princeton, NJ: Princeton University.

Schuetz, G., Ursprung, H.W., Woessmann, L., (2005). *Education Policy and Equality of Opportunity*. CESifo Working Paper No. 1518. Munich: CESifo.

Van Praag, B.M.S., Ferrer-i-Carbonell, A., (2004). *Happiness Quantified: A Satisfaction Calculus Approach*. Oxford: Oxford University Press.

Wößmann, L., (2005a). *The Effect Heterogeneity of Central Examinations: Evidence from TIMMS, TIMMS-Repeat and PISA*. Education Economics, 13(2), 143–169.

Wößmann, L., (2005b). *Public–Private Partnerships in Schooling: Cross-country Evidence on their Effectiveness in Providing Cognitive Skills*. PEPG Research Paper No. 05-09. Cambridge, MA: Harvard University.