

**THE SEGMENTATION OF THE ARGENTINE EDUCATION SYSTEM:  
EVIDENCE FROM PISA 2009**

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**Abstract**

For decades, one of the main goals for policy makers throughout the world has been to provide equal educational opportunities. Nevertheless, many countries still face great challenges in this respect, especially considering equality in the distribution of resources. Since the early eighties, Argentina has focused the fact that the education system is segmented, i.e., divided into groups of institutions of differential quality in which students are distributed according to their socio-economic background. This means that schooling reproduces and reinforces existing patterns of social inequality.

The purpose of this article is to contribute to the comprehension and the diagnosis of the current relevance of this phenomenon. Based on information from the PISA 2009 survey, the aim is to establish the degree of educational segmentation, evaluating the distribution of the schools physical, human, and social capitals, as well as the interaction of these resources with student characteristics. A cluster analysis is performed for visualising how these factors lead to the configuration of different school profiles. This may be a useful tool to assist in designing strategies to level the most disadvantaged schools, thus better mediating the impact of socio-economic background on educational success.

**JEL classification:** I21, H41, C38

**Keywords:** equality, educational resources, clusters.

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**I. Introduction**

Results from the OECD Programme for International Student Assessment (PISA) 2009 study show that countries differ not only in their average performance but also in how equitably educational opportunities are distributed between students (OECD, 2010). Argentina faces great challenges in both respects, since average test scores are low and the impact of socio-economic background on attainment is high. Dispersion of results is significant: variance in student performance in reading is about 50% higher than the average across OECD countries. Additionally, variation in performance between schools represents 60% of total variation, outweighing variation within schools. This suggests an uneven distribution of the quality of schooling conditions between centres.

The present study focuses on this last issue, concentrating on the degree of internal educational equality (Calero and Bonal, 1999) from the resource distribution perspective. Achieving the ultimate goal of equality in the distribution of educational results requires that all students receive equivalent instruction, compensating the effect of initial exogenous inequalities on schooling access, retention and success. Therefore,

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there should be an equitable distribution of the quality of schooling, which might entail giving more and better resources to those coming from underprivileged backgrounds.

However, there is evidence that in many education systems there are endogenous processes at work which are not only reproducing but also reinforcing existing patterns of social inequality. Particularly, during the last few decades attention has been drawn to the fact that in many countries the education systems have been undergoing a process of segmentation or horizontal differentiation of schools. This means that schools may be hierarchised (Maroy, 2004), or that it is possible to identify groups of institutions which differ in the quality of the services they offer and the average socio-economic status (SES) of their student population. This general concept of segmentation was first used in Argentina by Braslavsky (1985), and it is often used in the national specialised literature as a synonym of segregation (in Llach, 2006, for instance). However, for the purposes of this study they are viewed as different notions. Segregation is understood here as a narrower concept which is related to the way students are distributed in different schools. A school system is said to be segregated when the allotment of students according to some social characteristics (gender, race, SES, etc.) differs significantly from the distribution of the same characteristics in a reference population (Maroy, 2004). Student profiles tend to be homogeneous within school centres and heterogeneous between them, so that individual schooling experiences develop almost exclusively between peers of similar social status (Benito & González, 2007; Jenkins et al., 2008). Thus, the concept of educational segmentation encompasses two interrelated processes: (i) student segregation; and (ii) the uneven distribution of resources between centres, which is positively associated with their socio-economic intake.

The existence of educational segmentation has been observed in the developing world as well as in industrialised nations. The OECD (2010) report states that resources are closely and positively related to the socio-economic composition of individual schools in the OECD and partner countries. Along similar lines, the study carried out by the Latin American Laboratory of Educational Quality Evaluation across 16 Latin American countries (Treviño et al., 2010), confirms that primary schools in the region are segregated and that educational resources are unevenly distributed.

Maroy (2008) and Maroy & Van Zanten (2009) argue that the education policies which have enlarged school choice and increased competition in several developed countries for over two decades, have led to more segregation and therefore to greater social inequalities. This is supported by Jenkins et al. (2008), who measure and compare school segregation across 27 OECD countries and conclude that it is moderate-to-high in most of them. In many school systems, an initial source of segregation is derived from the public-private sector dichotomy, since private schools tend to attract the middle and upper classes while disadvantaged groups attend the public sector (OECD, 2011). This seems to be especially the case in Spain, where several studies have corroborated the fact that the private sector generally serves a more privileged population (Fernandez Enguita, 2008; Bernal, 2005), being the likelihood of attending a private school significantly related to student SES (Mancebón

& Pérez-Ximénez, 2007<sup>1</sup>; Escardíbul & Villarroya, 2009). Additionally, segregation seems to prevail within each sector, presenting higher values for the private sub-system (Mancebón & Pérez-Ximénez, 2010).

The literature referring to this problem in Argentina is abundant and dates back to the early eighties –some recommended texts are Braslavsky (1985), Fiszbein (1999), Tiramonti (2004), Oiberman et al. (2004), and Llach (2006)–. The present configuration of the education system is the result of the combination of structural aspects of the Argentine society with the institutional characteristics of the school sector. It is often stressed that the gradual withdrawal of the State from the arena of public-services-provision has prompted the development of quasi-market mechanisms, which are not particularly driven by the goal of improving equality. Thus, while families implement strategies to select centres according to their preferences and purchasing power, schools develop competitive interdependencies and try to attract better resources and select their student population. These practices reinforce the differentiation between schools regarding the quality of their services and their social composition.

As in other countries, evidence has been presented of two important trends: (i) the first instance of educational segmentation stems from the division into public schools and privately managed ones; (ii) the horizontal differentiation of centres is also present within each sector, which has led some authors to speak of the existence of “poor schools for poor children” (Llach, 2006). Regarding the specific topic of student segregation, several studies (Reimers Arias, 2000; Dupriez, 2010; and OECD, 2010) find relatively low levels of social inclusion in the Argentine school system, when compared both to OECD and other Latin American countries<sup>2</sup>.

This problem is considered relevant because it impairs the ability of the education system to compensate original disparities in order to achieve equality of opportunities and results<sup>3</sup>. The previous statement implies that school characteristics –such as resources, governance, and student social composition– are believed to have an independent effect on the definition of successful educational careers. Although consensus over this issue has not yet been reached in the Economics of Education literature, there is evidence that supports this notion, especially in developing countries like Argentina.

For instance, the above-mentioned report on primary education in Latin America (Treviño et al., 2010) identifies clear school-effects on performance in Reading, Math,

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<sup>1</sup> Specifically, the authors consider the choice between public schools and subsidised or ‘concerted’ private schools

<sup>2</sup> These studies measure educational segregation through the percentage of total variance in a SES index explained by variance between schools, so that a value of 0 indicates total absence of social segregation. Using different sets of data, all three of them find values close to 40% for Argentina.

<sup>3</sup> Negative effects on efficiency may also be identified: in a context of scarcity of funding and rising social demands to the education system, the allocation of greater resources to those in already more favourable conditions would seem to have a smaller impact on global educational results. Lee (1993, cited by Mancebón & Pérez-Ximénez, 2007) also argues that as families with greater economic and cultural capital –whose “voice” is more capable of demanding better quality services– exit the centres perceived as low-quality, they reinforce their decapitalisation.

and Science. Even though individual SES stands out as the most important determinant of achievement, the authors find significant adjusted and net school-effects, after controlling for individual and average student SES. A broader study, OECD (2010), finds that in most countries a significant portion of total performance variation is due to the interaction of school characteristics and socio-economic and demographic background. Individual results are found to be influenced by school material and human resources, as well as the learning environment and school responsibility for decision making.

Additionally, different empirical studies have shown that the socio-economic characteristics of the student population can have an independent effect on individual attainment, and that those who stand to gain the most from positive “peer-effects” are the students coming from the least favourable backgrounds (Lauder et al., 1999, 2007; Opdenakker & Van Damme, 2001; Hanushek et al., 2003; Cervini, 2004). Thus, school segregation denies this opportunity for disadvantaged children, increasing the gaps in performance due to initial social disparities.

In sum, schooling is believed to have the ability to reduce, reproduce or reinforce existing patterns of social inequality. Regrettably, the actual configuration of the Argentine school system seems to be accentuating inequalities. Nevertheless, these findings may be interpreted in a somewhat optimistic manner, since they identify potential room for intervention and emphasize the active role that schools may play in improving equality of opportunities.

The design of effective policies however, calls for a thorough diagnosis of the situation, and the identification of those aspects which require the most urgent attention. Thus, the aim of this article is to provide new empirical evidence of the degree of segmentation prevailing in the Argentine education system at the secondary level. To this end, a quantitative research strategy was chosen in order to conduct a study of descriptive and correlational nature. The next section presents and describes the variables of interest and the source of information. Section III gives an overview of the evidence of current segmentation in three stages: (i) it examines the distribution of different educational resources between schools; (ii) it analyses student distribution according to their SES, measuring the degree of social segregation through two synthetic indices; (iii) it studies the association between the quality of schooling and the socio-economic background of the student population. In Section IV a cluster analysis is performed with the aim of identifying and characterising the main school profiles present in the system. Finally, Section V is reserved for conclusions.

## **II. Variables and Data**

The selection of the relevant school variables in this case should be oriented by a definition of school quality. Among the different dimensions of the concept identified by Wolf & Moura Castro (2000), the quality of inputs and of processes were chosen, because unlike the quality of results, they enable the differentiation of school-effects from home-effects. Following Llach (2006), the different aspects of school quality may be classified in three main groups: physical capital encompasses educational materials as well as the state of the buildings and equipment; human capital refers to the experience, qualification, and competence of teachers and authorities; social capital is

related to parental participation, to the quality and strength of social networks –both inside schools and between schools and the community–, and to the internal organisation and environment. As for the students, the concept of interest is their socio-economic status. It represents a combination of home and family background characteristics related to wealth, parental education and occupational status, which influence their possibility of developing a successful educational path.

This study is based on information from the PISA 2009 survey, which evaluates competencies of 15-year-old students in 65 countries. The sample targets the population of students in grades 7 and higher. Since in Argentina two organisational structures for primary and secondary school levels coexist (DINIECE, 2010), two of the centres included had only grades 1 through 7, and thus were dropped. The final sample consists of 197 schools and 4771 students. In addition to the test results, PISA provides contextual information related to family background and school characteristics obtained from questionnaires completed by students and school principals. In order to better achieve the goals of this study the chosen analysis level is the school<sup>4</sup>, so that student background information<sup>5</sup> is averaged and regarded as attributes of the centres. The following table presents the variables selected from the PISA databases which, in this study, are considered relevant indicators of the three types of school attributes and the SES of the student population.

**Table 1: Variables and indices used to characterise the schools in the sample<sup>6</sup>**

<b>Human capital</b>		Student-teacher ratio	STRATIO
		Proportion of fully-certified teachers	PROPCERT
		Proportion of teachers with ISCED5A qualification	PROPQUAL
		Index on teacher shortage	TCSHORT
<b>Physical capital</b>		Computer availability	IRATCOMP
		Computers connected to internet	COMPWEB
		Index on shortage of school’s educational resources*	SCMATEDU
<b>Social capital</b>	<b>Extracurricular activities offered</b>	Index of extracurricular activities	EXCURACT
		<b>Parental involvement</b>	Pressure to set high academic standards
	Accountability to parents		SC21
	Influence on decision making of parent groups		SC25c
	<b>Autonomy</b>	Index of school responsibility for resource allocation	RESPRES
		Index of school responsibility for curriculum and assessment	RESPCURR
	<b>Internal organisation and environment</b>	Index of teacher participation	TCHPARTI
		Monitoring teachers’ practices	SC23
		Index of school principal’s leadership	LDRSHP
		Influence on decision making of teacher groups	SC25d
		Index of teacher-related factors affecting school	TEACHBEHA

<sup>4</sup> Since the study was designed to optimize the resulting sample of students rather than schools (OECD, 2009), this means that there are no guarantees that the sample of schools represents the population. However, no systematic bias is suspected which could interfere with the objectives of this research: to acquire a sense of the sample representativeness, hypothesis tests were carried out to evaluate the difference between some sample estimators and population parameters; results showed statistically insignificant differences in the proportion of private and public schools, and the geographical location of schools, among other variables.

<sup>5</sup> Non-response bias is accounted for by using the final student weights provided in the database.

<sup>6</sup> Definitions and detailed descriptions of these variables and indices are provided in OECD (2010).

		climate*	
		Index of student-related factors affecting school climate*	STUBEHA
		Influence on decision making of student groups	SC25e
		Index of teacher-student relations	STUDREL
<b>Student socio-economic status</b>		PISA index of economic, social, and cultural status	ESCS
		Highest occupational level of parents	HISEI
		Highest educational level of parents in years	PARED
		Index of home possessions	HOMEPOS

\* As all items were inverted for scaling, higher values indicate better quality of educational resources or relations

### III. An overview of the evidence

#### i. Distribution of the schools human, physical, and social capitals

In this section the sample of schools is explored in order to describe the levels and distribution of the different types of resources and compare them across sectors. Tables 2 through 4 summarise the main descriptive statistics of each variable: the sample mean, the standard deviation and the median<sup>7</sup>. Due to a lack of space, other interesting statistics are not reported but will be commented when it seems relevant.

**Table 2: Distribution of the schools human capital**

Variable or index		Global system	Public sector	Private sector		
				Global sector	Subsidised	Independent
Student-teacher ratio	Mean	15.245	16.736	11.914	13.807	9.690 <sup>++</sup>
	S.D.	27.344	32.553	6.489	6.872	5.398
	Median	9.960	10.000	9.857	14.057	8.227
Index on teacher shortage	Mean	-0.093	0.043	-0.411 <sup>***</sup>	-0.348 <sup>++</sup>	-0.422
	S.D.	0.973	0.975	0.898	0.959	-1.022
	Median	-0.261	0.145	-1.022	-1.022	0.854
Proportion of fully-certified teachers	Mean	0.851	0.845	0.862	0.842	0.876
	S.D.	0.303	0.313	0.286	0.319	0.247
	Median	1.000	1.000	1.000	1.000	1.000
Proportion of qualified teachers	Mean	0.139	0.124	0.165	0.129	0.224
	S.D.	0.202	0.211	0.183	0.111	0.256
	Median	0.081	0.064	0.125	0.125	0.160

Source: own elaboration from the PISA 2009 database (OECD)

At a global level, regarding the quantity of human resources, the Argentine sample of schools is well positioned: the student-teacher ratio presents a sample mean that is barely higher than the mean for OECD countries and lower than the mean for non-OECD countries; and the index on teacher shortage presents the lowest (best) average value of both groups. The dispersion of these indices, however, is very high. As for the proportion of certified teachers, 75% of participant schools have more than 88% of

<sup>7</sup> \*\*\*, \*\*, \* indicate that the difference between the means in the private and the public sector is statistically significant at the 1%, 5% or 10% level; <sup>+++</sup>, <sup>++</sup>, <sup>+</sup> indicate that the difference between the means in the private-subsidised and the public sector is statistically significant at the 1%, 5% or 10% level; <sup>\*\*\*</sup>, <sup>\*\*</sup>, <sup>\*</sup> indicate that the difference between the means in the private-independent and the private-subsidised sector is statistically significant at the 1%, 5% or 10% level.

their teaching staff that is fully certified. The mean is even a bit higher than the average for OECD countries, and the dispersion is lower. In contrast, the proportion of ISCED5A qualified teachers is on average 14%, much lower than across OECD countries (75%). The distribution of this variable is also heterogeneous and highly concentrated below the mean: approximately 70% of the schools in the sample have a proportion of qualified teachers lower than the mean.

It is also of interest to compare the distribution of resources between the different school sectors, since the mixed character of the education system has been identified as an initial source of segmentation. The private schooling sector in Argentina has been experiencing constant growth since the early fifties, representing 31% of the centres by 2009 (DINIECE, 2009). This sub-system may be further divided into two main groups of schools: those which receive some subsidy from the government –around 65% of the centres according to Rivas et al. (2010)– and those which are entirely sustained by private funding. In the PISA sample, 28.4% of the centres are privately managed, of which 60% are subsidised or government-dependent<sup>8</sup>. As it may be observed in Table 2, there are no significant sector differences in the sample, except for the index on teacher shortage –which is highest in the public sector–, and the student-teacher ratio –which in private-independent schools is smaller than in private-subsidised schools–. This means that the quality of the teaching staff is similar across all types of schools, but some disparities are perceived regarding the quantity of this resource.

The level of the schools physical capital is evaluated here through the availability of computers for educational purposes, the access to internet, and the quality of the schools educational resources (Table 3). The first two indices present a value that is much lower than the average across OECD and non-OECD countries, and dispersion of these indices between schools is high. Approximately 10% of participant schools do not have computers available, 50% have more than 7 students per computer, and the top 10% of schools have at least one computer every two students. Regarding internet connectivity, it should be stressed that 25% of schools have no computers with internet access. The quality of material resources is also lower than the average for countries in and out of the OECD. Furthermore, the heterogeneity of this index value across the sample is large: while schools in the top decile have an index value that exceeds 0.84, schools in the lowest decile have an index value of -2.65 or lower.

**Table 3: Distribution of the schools physical capital**

Variable or index		Global system	Public sector	Private sector		
				Global sector	Subsidised	Independent
Computer availability	Mean	0.227	0.168	0.355***	0.245 <sup>+</sup>	0.515 <sup>++</sup>
	S.D.	0.271	0.202	0.348	0.191	0.477
	Median	0.136	0.107	0.265	0.253	0.517
Computers connected to internet	Mean	0.618	0.562	0.734**	0.739 <sup>++</sup>	0.684
	S.D.	0.453	0.464	0.409	0.378	0.477
	Median	1.000	0.824	1.000	1.000	1.000
Index on quality of	Mean	-0.743	-0.925	-0.311***	-0.334 <sup>++</sup>	-0.301

<sup>8</sup> PISA defines private schools as those that are not managed by a public authority or agency. Private-subsidised schools are those which receive more than 50% of their core funding from government agencies, they may be identified in the database through the variable SCHTYPE.

school's educational resources	S.D.	1.273	1.206	1.331	1.191	1.584
	Median	-0.706	-1.002	-0.273	-0.273	-0.416

Source: own elaboration from the PISA 2009 database (OECD)

Sampled schools in the private sector benefit from better physical resources than public centres, since all differences between the means are statistically significant. As for the private sub-groups, they differ only in the availability of computers.

**Table 4: Distribution of the schools social capital (quantitative variables)**

Variable or index		Global system	Public sector	Private sector		
				Global sector	Subsidised	Independent
Index of extracurricular activities	Mean	-0.714	-0.827	-0.455***	-0.439 <sup>++</sup>	-0.476
	S.D.	0.995	1.052	0.801	0.830	0.826
	Median	-0.647	-0.647	-0.373	-0.647	-0.189
Index of school responsibility for resource allocation	Mean	-0.586	-0.715	-0.275***	-0.396 <sup>+++</sup>	-0.057 <sup>++</sup>
	S.D.	0.373	0.153	0.5308	0.465	0.593
	Median	-0.714	-0.746	-0.426	-0.546	-0.186
Index of school responsibility for curriculum and assessment	Mean	-0.565	-0.665	-0.327***	-0.517	-0.027 <sup>++</sup>
	S.D.	0.637	0.541	0.777	0.553	1.003
	Median	-0.723	-0.912	-0.533	-0.533	-0.533
Index of teacher participation	Mean	0.005	-0.074	0.197*	0.145	0.192
	S.D.	0.862	0.839	0.895	0.783	1.084
	Median	0.091	0.091	0.091	0.091	0.091
Index of school principal's leadership	Mean	0.538	0.493	0.652	0.646	0.675
	S.D.	0.963	1.002	0.857	0.955	0.664
	Median	0.544	0.386	0.706	0.706	0.706
Index on teacher-related factors affecting school climate	Mean	-0.281	-0.537	0.317***	0.183 <sup>+++</sup>	0.495
	S.D.	1.111	1.082	0.939	0.967	0.936
	Median	-0.268	-0.732	0.331	0.209	0.452
Index of student-related factors affecting school climate	Mean	0.362	0.062	1.059***	1.089 <sup>+++</sup>	1.071
	S.D.	1.096	1.016	0.957	0.895	1.109
	Median	0.048	0.048	1.279	1.279	1.279
Index of teacher-student relations	Mean	0.076	0.082	0.060	0.104	0.010
	S.D.	0.379	0.393	0.346	0.406	0.248
	Median	0.026	0.026	0.026	0.032	0.026

Source: own elaboration from the PISA 2009 database (OECD)

The distribution of the indicators of the schools social capital may be observed in Tables 4 and 5. The offer of activities that link the students to the school and the community after regular class hours may be considered positively related to the quality of the school services and an important aspect of its social capital. The mean value of the index of extracurricular activities is much lower in the Argentine sample than the averages for both OECD and non-OECD countries. Given the large dispersion of this index across schools, however, some institutions benefit their students with a broader variety of these activities, as seems to be the case in the private sector.

Regarding the pressure from parents to set high academic standards, which is an indicator of parental involvement and a priori might indicate better educational quality, the sample is evenly divided (Table 5). Moreover, only 8% of the schools reported high



pressure from many parents, while across OECD and even non-OECD countries this proportion is close to 18%. Again, the difference across the public and the private sector is significant.

**Table 5: Distribution of the schools social capital (qualitative variables)**

Variable	% of affirmative answers				
	Global system	Public sector	Private sector		
			Global sector	Subsidised	Independent
Pressure to set high academic standards**	50.3	45.7	60.7	62.5	61.9
Accountability to parents					
Relative to other students	40.6	43.8	42.1	42.4	38.1
Relative to benchmark	16.8	20.3	12.3	12.1	14.3
Relative to same grade	7.1	8.0	7.1	9.1	5.0
Influence on decision making of parent groups					
Staffing*	5.6	4.3	8.6	12.1	0.0
Budgeting	17.3	15.1	22.4	18.2	27.3
Instructional content	12.2	12.9	10.3	9.1	13.6
Assessment	12.2	13.7	8.6	12.1	4.5
Monitoring teachers' practices					
Student achievement tests**	68.5	65.4	80.7	78.8	81
Peer review	60.4	64.7	54.4	54.5	52.4
Principal staff	83.8	83.3	87.7	84.8	90.5
External observers	27.4	26.7	31.6	30.3	33.3
Influence on decision making of teacher groups					
Staffing	14.2	15.8	10.3	12.1	9.1
Budgeting*	14.2	14.4	13.8	21.2	0.0
Instructional content	50.8	48.9	55.2	60.6	54.5
Assessment	53.8	51.8	58.6	57.6	68.2
Influence on decision making of student groups					
Staffing	8.1	9.4	5.2	9.1	0.0
Budgeting	4.1	3.6	5.2	3.0	4.5
Instructional content	17.3	16.5	19.0	27.3	9.1
Assessment	19.8	19.4	20.7	27.3	9.1

Note: for the variable *pressure to set high academic standards*: the categories 'many parents' and 'minority of parents' were considered positive; and the category 'largely absent', negative.

\*\* and \* reflect a  $\chi^2$  Pearson statistic significant at the 5% and 10% level for the variable SCHTYPE.

With respect to schools accountability to parents, the practice of informing families about students' performance is largely absent in the sample of schools, much more so than in the sample for other countries. Low parental participation is also evident in their scarce influence on decision making. For these variables, differences across sectors do not seem to be significant.

Concerning school autonomy, both indices of school responsibility present lower values than the OECD and non-OECD averages, evidencing significant dispersion between schools. In this case, the difference across sectors is relevant: as expected, independent private schools seem to have the highest margins of action, followed by subsidised private schools.

As for internal organisation and environment, most of the indices analysed are on average similar or higher than OECD and non-OECD means. Yet, average values are not very representative of sampled schools due to high dispersion. In general, teachers have some influence in decisions regarding contents and assessment but scarce control over staffing and budgeting. Student groups have even less influence. Finally, monitoring of teacher practices is quite extended, even more so than in OECD countries. Significantly higher values in the private sector are found in some variables, such as teacher participation, and teacher/student behaviour.

To summarise, public and private schools differ mostly in their mean level of physical capital, in the availability of human resources, in their level of autonomy, and in the quality of their environment. Independent and subsidised private schools do not present many significant differences in terms of resources and governance, according to the data analysed.

After studying the distribution of the schools resources, it is interesting to observe the association between the different attributes. The aim is to evaluate if the components of each type of capital present a similar pattern of behaviour, and if a school that is rich in human capital is likely to be rich in physical and social capital as well, and vice versa. Simple bivariate correlations were calculated for this purpose, obtaining positive values in all cases. Results show significant associations between the indicators within each type of capital –especially between physical and human capital variables–, as well as many significant correlations between the variables across all three sub-groups.

## **ii. Distribution of the students according to their socio-economic status**

This section presents an approximation to the degree of social segregation in the Argentine education system at the secondary level. The methodology consists of two steps: (i) an exploration of the sample of schools through a series of descriptive statistics to analyse the distribution of the students' SES as measured by different indices; (ii) an estimation of two segregation indices, which allow international and sector comparisons.

The PISA survey provides a measure of student SES derived from student context questionnaires: the Index of Economic Social and Cultural Status (ESCS). This index is built from a combination of three other indices: PARED, highest educational level of parents in years; HISEI, highest occupational status of parents; and HOMEPOS, an index of home possessions related to wealth, cultural and educational resources.

The PISA 2009 survey places Argentina in the 50th position in a ranking of 65 participant countries according to their students' average socio-economic background. OECD countries have an ESCS mean of 0, while the average value in Argentina is -0.614, even lower than the average across non-OECD countries (-0.566). Dispersion of this index within the country is also large: the gap between the 95th and the 5th percentiles in Argentina is of 3.9 points, whereas the OECD average gap is of 2.92 points.

For the purposes of this article, the SES indices at the student level were averaged in each centre to provide a measure of their social composition. Table 6 presents some

descriptive statistics of the ESCS series and its components:

**Table 6: Descriptive statistics of SES indices at the school level**

Variable or index		Global System	Public sector	Private sector		
				Global sector	Subsidised	Independent
Mean ESCS	Mean	-0.755	-1.131	-0.138***	-0.198***	0.134
	S.D.	0.868	0.599	0.893	0.592	1.147
	Percentile 25	-1.373	-1.544	-0.814	-0.657	-0.644
	Median	-0.848	-1.131	-0.042	-0.042	0.233
	Percentile 75	-0.294	-0.784	0.400	0.295	1.231
Mean HISEI	Mean	42.984	38.534	50.279***	48.657***	54.417 †
	S.D.	10.316	6.165	11.564	7.978	14.440
	Percentile 25	35.980	34.650	41.080	42.835	41.230
	Median	41.080	37.520	49.080	49.080	55.270
	Percentile 75	47.700	42.800	59.340	55.760	67.635
Mean PARED	Mean	12.175	11.877	12.664***	12.187	13.266†
	S.D.	2.435	2.375	2.279	1.911	2.355
	Percentile 25	10.627	10.410	11.163	11.229	11.242
	Median	12.198	12.265	12.035	12.032	13.094
	Percentile 75	13.676	13.621	14.472	13.151	15.209
Mean HOMEPOS	Mean	-1.029	-1.379	-0.457***	-0.545***	-0.245
	S.D.	0.731	0.496	0.681	0.472	0.929
	Percentile 25	-1.522	-1.629	-0.990	-0.932	-0.787
	Median	-1.122	-1.339	-0.334	-0.335	-0.292
	Percentile 75	-0.597	-1.030	-0.031	-0.226	0.544

Source: own elaboration from the PISA 2009 database (OECD)

The socio-economic background of the sampled schools, as measured by their mean ESCS value, is low on average (-0.76), evidencing great dispersion between centres. 25% of the schools with a more disadvantaged student population have an average index value lower than -1.37, whereas schools in the top quartile have an average value of -0.29 or higher. There is also great dispersion between schools when considering the indices of occupational status, educational level and home possessions.

Turning to sector comparisons, the evidence supports the hypothesis that privately managed schools have a student population that on average presents higher SES indices than public school students (all differences are significant at a 1% confidence level). Across the private sub-sectors, significant differences were only found for HISEI and PARED, at the 10% level. These findings are coherent with preceding literature in pointing to the public-private division as a main source of segregation in the Argentine school system. Also, they downplay the role of state subsidies in the distribution of students between private schools –which has been found in countries such as Spain to be of great importance (Mancebón & Pérez-Ximénez, 2010)–. Finally,

dispersion of the indices between schools seems to be greater in the private sector, since the CV and interquartile ranges are consistently higher, suggesting that students tend to concentrate in different schools according to their SES.

In order to provide a more rigorous analysis, the degree of social segregation in the education system may also be evaluated through the estimation of a synthetic index. Although there is an ongoing debate in the literature over the issue of which of the available indices of segregation is best, authors such as Allen & Vignoles (2007) recommend the use of the Index of Dissimilarity (Duncan & Duncan, 1955) and the Square Root Index (Hutchens, 2004).

The most popular index of segregation is undoubtedly the Index of Dissimilarity (Mancebón & Pérez-Ximénez, 2010). As most segregation measures, the index requires the division of the student population into two groups: a minority or socially disadvantaged group, and a majority or advantaged group. The expression for this index is given by:

$$(1) \text{ Index of Dissimilarity} \quad D = 0.5 \times \sum_{i=1}^N \left| \left( \frac{A_i}{X} \right) - \left( \frac{B_i}{Z} \right) \right|$$

$A_i$  and  $B_i$  are, respectively, the number of students in the disadvantaged group and the number of students in the advantaged group in school  $i$ .  $X$  and  $Z$  are, respectively, the total number of minority students and the total number of majority students in the entire school sample. The index may be interpreted as the proportion of students from the minority group which should be transferred to more advantaged schools so that all centres have an equal share of disadvantaged students. Maximum segregation is reached as the index approaches the value of 1 and minimum segregation corresponds to a value of 0. Cutler et al. (1999) maintain that segregation may be considered low when the index value is between 0 and 0.3, moderate when it is between 0.3 and 0.6, and high when it exceeds 0.6.

An equally important or even better index is, according to Allen & Vignoles (2007), Hutchens' Square Root Index, given by:

$$(2) \text{ Square Root Index} \quad H = \sum_{i=1}^N \left[ \left( \frac{A_i}{X} \right) - \sqrt{\frac{A_i}{X} \times \frac{B_i}{Z}} \right]$$

Again, the value of this index ranges from 0 to 1. It presents the advantages of satisfying all possible requirements for a "good segregation index", including the transfer principle, and of being additively decomposable (Jenkins et al., 2008). This property is useful to compare the degree of segregation across two sectors or types of schools. The index may be decomposed in two parts: within-sector segregation and between-sector segregation. The within-sector  $H$  is a weighed sum of the segregation inside each sector. The weights  $W_g$  reflect the sectors relevance. Between-sector  $H$  is obtained as the gap between  $H$  and  $H_{within}$ . Expressed as a fraction of  $H$ , this measure may be interpreted as the share of total segregation that is attributable to the unevenness associated with differences in SES across school types (Jenkins et al.,

2008.).

**(3) H decomposition**  $H = H_{within} + H_{between}$  ; where

$$H_{within} = \sum_{g=1}^G w_g H_g$$

The next issue after the selection of the segregation index is the decision regarding the indicator of SES to be used and the threshold level that will divide the student population into an advantaged and a disadvantaged group. In this case, the SES of the students was represented by the PISA ESCS index, and two alternative thresholds were considered: the median and the 25<sup>th</sup> percentile. Estimations of the indices are presented in the following table<sup>9</sup>:

**Table 7: Estimation of social segregation in the school system**

Segregation Index	Threshold level	Estimated Index Value				
		Global system	Public sector	Private sector		
				Global sector	Subsidised	Independent
<b>Dissimilarity Index (D)</b>	Median	0.4639	0.3648	0.4982	0.3887	0.6570
	25 <sup>th</sup> percentile	0.4355	0.3259	0.6234	0.5975	0.6417
<b>Square Root Index (H)</b>	Median	0.2061	0.1239	0.2404	0.1266	0.4013
	25 <sup>th</sup> percentile	0.2247	0.1233	0.3723	0.3385	0.4095

Source: own elaboration from the PISA 2009 database (OECD)

Through the comparison of these results with similar studies for different countries (Jenkins et al., 2008; Mancebón & Pérez-Ximénez, 2010; and Alegre et al., 2008), it is possible to assert that the degree of segregation in the Argentine education system at the secondary level is moderate-to-high. This conclusion is consistent across both estimated indices and the alternative threshold levels. For instance, considering as disadvantaged those students whose ESCS index value is below the 25<sup>th</sup> percentile, it would be necessary to transfer 43.5% of them to better positioned centres so that all schools serve the same share of the minority population. The H index presents slightly smaller values, although this is consistent with its tendency to display low values when the level of segregation is moderate (Allen & Vignoles, 2007).

Additionally, separate indices were estimated in each school sub-system. These measures are independent of the relevance of the minority group in each sector. However, it should be mentioned that: when using the median as a threshold, the disadvantaged group in the public sector comprises 61.7% of its student population, whereas in the private sector it represents only 29.4%; the respective percentages are 32.3% and 12.1% when the threshold is defined as the 25<sup>th</sup> percentile<sup>10</sup>. Evidently, as is the case of Chile and Spain (Valenzuela et al., 2008; Mancebón & Pérez-Ximénez,

<sup>9</sup> All statistics were estimated using the final student weights provided in the PISA database, in order to correctly estimate population values, as recommended in OECD (2009).

<sup>10</sup> 30.2% and 10.2% are the respective values in the subsidised sector, and 29% and 15% in the independent sector.

2010), segregation is more pronounced in the private sector, where centres have a greater chance of developing competitive strategies to attract and select the most privileged students. Nevertheless, it should be emphasized that there is a moderate degree of segregation in the public sector as well. This suggests that formal and informal mechanisms are operating to distribute students unevenly within this school segment, where a more democratic environment would be expected. The values which clearly stand out are those corresponding to the private-independent sector, where segregation can be considered very high. This indicates that while both private sub-sectors have a student population with a similar SES, students are allocated much more unequally between non-subsidised schools.

**Table 8: Decomposition of the Square Root Index by public and private sector<sup>11</sup>**

	Median		25th percentile	
<b>H within</b>	0.1561	(75.8%)	0.1866	(83.0%)
<b>H between</b>	0.0499	(24.2%)	0.0381	(17.0%)

Source: own elaboration from the PISA 2009 database (OECD)

Segregation between both types of schools ( $H_{between}$  as a proportion of  $H$ ) is of 24.2% when using the median as the threshold and of 17% when using the 25<sup>th</sup> percentile. Thus, the total segregation level is explained both by the differential distribution of students across sectors and by the uneven distribution inside each sector. Nevertheless, the relevance of within-sector dispersion is much higher, so school segregation in the country cannot be reduced to the dualisation of the education system. Although there are significant differences in the SES of the student population served by the public and private sectors, the main source of inequalities is the distribution of students between the centres in each sector.

### iii. Association between the schools resources and the SES of their students

So far, the evidence presented supports the notion that schools differ in their levels of human, physical and social capitals, as well as in their social composition. In addition, the segmentation of the system entails a systematic positive association between the schools social intake and the quality of their services. To evaluate this aspect, simple bivariate correlations were estimated between each of the school quality indicators and the schools mean ESCS index.

Significant positive associations were found between the schools social composition and: (i) human capital variables, such as the proportions of certified and qualified teachers, and the inverse of the index on teacher shortage; (ii) all of the physical capital indicators analysed; (iii) different social capital variables like the index of extracurricular activities, parental pressure to set high academic standards, school accountability, and teacher and student behaviour affecting school climate. Within the public sector, correlations were not quite as strong, although a general positive association was still visualised across all types of capitals.

<sup>11</sup> As in Jenkins et al. (2008), weights are given by the percentage of 15-year-old students enrolled in each sector. Results of the decomposition when sub-dividing the private sector were only marginally different, and thus were omitted.

In conclusion, in all cases either positive or zero correlations were found between school quality indicators and mean student ESCS. Positive associations may be interpreted as regressive, since they favour the most socio-economically privileged students. Zero or insignificant correlations may be interpreted in two alternative ways, depending on how equality of opportunity is regarded (Iatarola & Stiefel, 2003). From a neutral position, it could be argued that there is equality of opportunities if the level of resources invested in students' education is independent of their social characteristics. On the other hand, an affirmative action position would maintain that equality can only be achieved when more and better resources are available for socially disadvantaged children. With the latter notion in mind, results imply that the Argentine education system –as represented by this particular sample of schools– is either reproducing or reinforcing original social inequalities.

To study these associations in a more rigorous manner, an econometric model was run for estimating the probability of attending a well-endowed school conditional on socio-economic status. Since significant differences in all types of resources were found across the public and private sectors, attending a private school was used as a proxy for receiving high quality services<sup>12</sup>. As in Mancebón & Pérez-Ximénez (2007) a probit model was employed<sup>13</sup>, in this case to estimate the likelihood of attending a private school versus a public one.

The exogenous variable of interest is the PISA ESCS index, and control variables were chosen following Escardíbul & Villarroya (2009) to represent personal traits, home characteristics, and geographic traits of schools –those available in the 2009 survey–. Thus, the model includes the following independent variables: ESCS; student age; student gender; student preschool attendance; student age at the start of primary education; family structure nuclear family or not; student is a first generation immigrant; student is a second generation immigrant; school competes for students with one other school; school competes for students with two other schools or more; school is located in a city –between 100,000 and 1,000,000 inhabitants–; school is located in a large city –over 1,000,000 inhabitants–.

Results show that the model is fairly adequate, since the variables included are globally significant, and the Hosmer-Lemeshow test indicates that it fits the observations sufficiently well (p-value = 0.1389). The percentage of observations correctly predicted is close to 72.3% –specificity is high (88.9%) although

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<sup>12</sup> As a complement, other models were employed to estimate the probability of attending a school with a relatively high level of different resources. The school quality indicators were transformed into binary variables, using their median value as a threshold, to obtain the following dependent variables: high proportion of qualified teachers; low index on teacher shortage; high index on quality of material resources; high availability of computers; high level of extracurricular activities; and high level of the index of teacher behaviour. The same control variables as in the school sector model were included. In all cases, the estimated coefficient for the ESCS index was positive and significant, although marginal effects were somewhat lower than in the reported model.

<sup>13</sup> For reasons of space, and being this a well-known empirical method, this section does not review the theory behind binary response models. The reader may find further details in Econometric Analysis handbooks such as Greene (2003) or Wooldridge (2002).

sensitivity is quite low (39.9%)–, and the directions of the effects for the control variables are generally consistent with previous expectations.

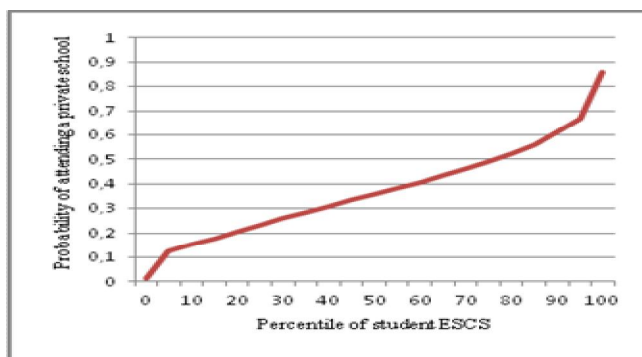
As for the variable of interest, the indicator of socio-economic and cultural status of the students has a significant and positive coefficient (Table 9). This means that as the SES of a student rises, so does his probability of attending a private school, and indirectly, a school with higher levels of human, physical and social capitals. A graph is presented to illustrate this association, showing how the likelihood of attending the private school sector rises from one percentile of student ESCS to the next.

**Table 9: Probit model predicting the likelihood of attending a private school vs. a public one**

Exogenous variable	Coefficient	Robust Standard Error	Marginal Effect
ESCS	0.407***	0.023	0.152
Student age	0.111	0.084	0.043
Student is a girl	0.154***	0.048	0.057
Student did not attend preschool	-0.136	0.139	-0.049
Student age at the start of primary education	-0.124***	0.039	-0.046
Nuclear family	0.154***	0.055	0.057
1st generation immigrant	0.236	0.238	0.091
2nd generation immigrant	0.065	0.181	0.025
School competes with one other school	-0.230**	0.116	-0.083
School competes with two or more schools	-0.200**	0.079	-0.076
School is located in a city	0.362***	0.052	0.138
School is located in a large city	0.604***	0.069	0.234
Constant	-1.414	1.321	-

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, or 10% level; LogL=-242540.3; Pseudo R<sup>2</sup>=0.142; N=4324.

**Likelihood of attending a private school according to student SES**



Note: control variables are fixed in their mean values.  
 Source: own elaboration from the PISA 2009 database (OECD)



#### IV. Identification of school profiles through a cluster analysis

To conclude the analysis of educational segmentation in Argentina, a non-parametric statistical technique known as cluster analysis was applied. This term comprises an ample variety of methods that reorganise a sample of elements into groups which have a high degree of “natural association” (Aldenderfer & Blashfield, 1984). This technique is particularly adequate for the purpose of the study because it has an exploratory nature and does not aspire to make inferences from the sample to the population (Romesburg, 2004). Thus, the objective is to obtain a compact description of the data, offering a potential classification of the centres which participated in the PISA project in Argentina. The grouping of observations by their similarity provides a plausible characterization of the educational segments present in the system.

The variables included in this analysis are all the factors related to schools resources evaluated so far, as well as the schools mean ESCS index to represent their social intake. All variables were transformed in several ways to meet the study objectives and the method requirements: (i) qualitative variables were transformed into quantitative indicators; (ii) all variables were standardised so that they had a mean of 0 and a standard deviation of 1, in order to remove the influence of measurement units and dispersion; (iii) weights were assigned to each variable so that all four school characteristics (human capital, physical capital, social capital, and student social composition) had the same relevance in the analysis<sup>14</sup>.

To define the pairwise distance between observations, one of the most popular and simple measures was chosen: the Euclidian distance or metric-L2. For each pair of objects  $(x_i, x_j)$  the squared differences between each of the  $n$  variables is aggregated:

$$(4) \text{ Euclidian distance } D_2(x_i, x_j) = \left[ \sum_{n=1}^N |x_{ni} - x_{nj}|^2 \right]^{1/2}$$

A non-hierarchical clustering algorithm was chosen: MacQueen’s k-means method, which is currently the most popular between social researchers. Given its simplicity, flexibility and efficiency, it was considered the most adequate for the study objectives. This algorithm begins with an initial partition of  $k$  items which form initial centroids or means. It then assigns each object to the group with the closest centroid by minimising the distance between them. Cluster membership is modified successively until within-group variance is minimised and between-group variance is maximised (Anderberg, 1973). In order to achieve maximum efficiency, the analysis was performed in two stages: a subgroup of observations was initially chosen and a cluster analysis was performed to determine group centres, those centres were then used as seed points to cluster-analyse the entire sample.

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<sup>14</sup> The practice of assigning weights after standardising the variables is recommended by Anderberg (1973). He claims that the analyst must assume the responsibility of deciding how each factor should influence the definition of groups according to the study objectives. In this case, all four factors were given an equal weight of 0.25, and then each variable within these four groups was assigned the same weight. For example: the index on teacher shortage was given a weight of  $0.25 * 0.25 = 0.0625$

The next decision in the procedure involves the a-priori selection of the number of clusters, a difficult task since there is no universally accepted criterion to serve as guidance. The use of the Pseudo-F Index of Calinski & Harabasz (1974) was adopted here, because the works of Milligan & Cooper (1985) and Savova et al. (2006) proved its superiority over most available mechanisms. The optimisation of this index indicated an optimal partition of two school clusters. The stability of the solution was checked by comparing the results of using different permutations of the initial cluster centres, and primary and secondary validity were confirmed through several mechanisms<sup>15</sup>.

The software IBM SPSS Statistics 19 was used to identify two well-differentiated clusters of schools, which may be referred to as the ‘poor’ and ‘rich’ segments for simplicity. The first one is composed of 141 centres (71.6% of the sample) and the second one of 56 institutions (28.4%).

Table 10 presents the mean values and standard deviations of all the variables that are useful in characterising both school profiles.

**Table 10: Characteristics of school clusters**

Variables		Poor segment		Rich segment	
		Mean	S.D.	Mean	S.D.
<b>Human capital</b>					
	Student-teacher ratio	<b>16.117</b>	32.433	<b>13.299</b>	8.397
	Proportion of fully-certified teachers	<b>0.829</b>	0.321	<b>0.897</b>	0.259
	Proportion of qualified teachers	<b>0.105</b>	0.175	<b>0.203</b>	0.232
	Index on teacher shortage	<b>0.003</b>	0.976	<b>-0.329</b>	0.932
<b>Physical capital</b>					
	Computer availability	<b>0.183</b>	0.239	<b>0.334</b>	0.314
	Computers connected to internet	<b>0.485</b>	0.466	<b>0.880</b>	0.284
	Index on quality of educational resources	<b>-1.109</b>	1.153	<b>0.169</b>	1.094
<b>Social capital</b>					
	<b>Extracurricular activities offered</b>				

<sup>15</sup> The primary validity of a clustering solution is related to how well it achieves research goals and generates interesting and useful conclusions. The secondary validity involves the meeting of certain more “objective” requirements (Romesburg, 2004). These are, for example, the agreement of classifications based on split samples of data; the demonstration of stability and robustness; and the agreement with the researcher’s prior expectations.

As a check for the internal consistency of the solution, the sample was split into different random subsamples and the same method of analysis was performed in each one. The same two clusters appeared in every solution, with only minor modifications in the final centroids. Aldenderfer & Blashfield (1984) recommend the application of an additional procedure to validate a clustering solution: the performance of significance tests that compare the clusters on variables not used to generate the solution. To provide such test, several variables like total school enrolment, grade repetition, number of full-time teachers over total teachers, school community, and school sector were chosen. Significant differences were found for most of them between both clusters. Also, the stability and robustness of the solution were checked through the addition and removal of different attributes and observations, which produced no significant alteration in the results. Finally, the characteristics of each group of schools were not in disagreement with previous analysis and expectations. Consequently, primary validity is believed to have been achieved.

	Index of extracurricular activities	<b>-0.908</b>	0.983	<b>-0.244</b>	0.865
	<b>Parental involvement</b>				
	Pressure to set high academic standards	<b>1.486</b>	0.594	<b>1.833</b>	0.694
	Accountability to parents	<b>0.676</b>	0.856	<b>0.711</b>	0.848
	Influence on decision making of parent groups	<b>0.461</b>	0.732	<b>0.500</b>	0.688
	<b>Autonomy</b>				
	Index of school responsibility for resource allocation	<b>-0.669</b>	0.226	<b>-0.377</b>	0.549
	Index of school responsibility for curriculum and assessment	<b>-0.626</b>	0.601	<b>-0.413</b>	0.702
	<b>Internal organisation and environment</b>				
	Index of teacher participation	<b>0.031</b>	0.884	<b>-0.058</b>	0.810
	Monitoring teacher's practices	<b>2.346</b>	1.091	<b>2.673</b>	0.924
	Index of school principal's leadership	<b>0.472</b>	1.019	<b>0.708</b>	0.787
	Influence on decision making of teacher groups	<b>1.262</b>	1.087	<b>1.500</b>	1.062
	Index of teacher-related factors affecting school climate	<b>-0.465</b>	1.080	<b>0.169</b>	1.064
	Index of student-related factors affecting school climate	<b>0.114</b>	1.034	<b>0.970</b>	1.012
	Influence on decision making of student groups	<b>0.489</b>	0.762	<b>0.500</b>	0.914
	Index of teacher-student relations	<b>0.082</b>	0.381	<b>0.058</b>	0.377
	<b>Student socio-economic status</b>				
	School's average PISA ESCS index	<b>-1.089</b>	0.437	<b>0.298</b>	0.510
	Highest occupational level of parents	<b>38.483</b>	4.983	<b>55.523</b>	7.860
	Highest educational level of parents in years	<b>11.325</b>	1.665	<b>14.748</b>	1.192
	Index of home possessions	<b>-1.315</b>	0.428	<b>-0.201</b>	0.478

Source: own elaboration from the PISA 2009 database (OECD)

Clearly, in the poor segment there is a concentration of schools with a more disadvantaged student population, since all SES indices are lower. Moreover, these schools have on average lower indices of human, physical, and social capitals<sup>16</sup>, offering their students services of less quality. The clusters also present differences regarding their type of management and funding:

**Table 11: Sector membership of school clusters**

	Public sector	Private sector		
		Global sector	Subsidised	Independent
Poor segment	121 (87%)	19 (34.5%)	11 (33.3%)	8 (36.4%)
Rich segment	18 (13%)	36 (65.5%)	22 (66.7%)	14 (63.6%)
Total	139 (100%)	55 (100%)	33 (100%)	22 (100%)

Source: own elaboration from the PISA 2009 database (OECD)

Most schools in the public sector belong to the poor segment, although an elite group of centres (13%) belongs to the rich or high quality segment. In the private sector, the proportion of schools belonging to the poor segment is much lower.

The policy relevance of this analysis is derived from the possibility of characterising different school profiles, and of identifying the aspects that require the most urgent intervention. It is useful to consider that not all of the included variables

<sup>16</sup> With the exception of the index of teacher participation and the index of teacher-student relations.

have had a relevant role in the configuration of the clusters<sup>17</sup> (partly because of the weight each one was given, and partly because their values do not differ as much between observations). The variable which contributed the most to the definition of the groups is the schools mean ESCS, followed by physical capital factors like the index on the quality of educational resources and the availability of computers connected to internet. Considerable importance had also some variables related to social capital, such as the schools responsibility in resource allocation, the indices of teacher and student behaviour, the availability of extracurricular activities and parental pressure to set high academic standards. Among human capital variables, the only significant ones to define the clusters were the proportion of certified teachers and the index on teacher shortage.

## V. Conclusions

The evidence provided throughout this paper indicates that the segmentation of the Argentine education system at the secondary level continues to be a relevant phenomenon. The main results derived from the PISA 2009 survey are: (i) there is significant heterogeneity in the distribution of the schools material, human and social resources; (ii) students are unevenly distributed throughout the system according to their SES: social segregation is moderate-to-high; (iii) schooling quality is positively related to socio-economic background; (iv) there are important differences across the private and public school sectors: private schools have a more privileged student population, benefit on average from better resources, and are more segregated; (v) independent and subsidised private sub-sectors serve similar student profiles and do not significantly differ in their resources, although segregation is much higher between independent schools; (vi) segmentation in the public sector is less pronounced but still relevant; (vii) the cluster analysis performed identified two school profiles which differ as expected in their levels and quality of resources as well as in their social intake.

The limitations of the analyses performed are not ignored, however. For instance, the representativeness of the sample at the school level is not guaranteed. Additionally, since cluster analysis involves a high degree of subjectivity from the analyst, there is no unique way of grouping the data. Finally, the PISA survey does not consider variables of relevance in other studies of educational inequality in the country, such as the experience and working conditions of teachers, or the quality of buildings and equipment.

Nonetheless, it is believed that these shortcomings do not invalidate the results of the study, which are consistent with preceding qualitative and quantitative research. Further proof was given of the school system responsibility in reinforcing social inequality. This fact, although somewhat discouraging, could be viewed as an opportunity for policy intervention. Even though the paper focuses on diagnosing the problem, leaving the identification of its causes for the future research agenda, it is possible to derive some general policy implications.

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<sup>17</sup> This is derived from the value and the significance of the F statistics for each variable found in the ANOVA table, which is one of the post-estimation results available for cluster analysis. They are not reported here for reasons of space, but they may be requested to the author.

The first observation that can be made from the analysis of PISA data is that Argentine schools present average low levels and quality of many resources when compared to other countries in the study. This is true of the proportion of qualified teachers, the access to computers and internet, the quality of material resources, the offer of extracurricular activities, etc. The precise impact of these resources on student attainment is still under discussion. However, this situation should at the least give rise to a renewed debate on the priority level that Education is given in the current economic and political agenda.

In addition to low average values, most of the indicators of educational quality present high levels of dispersion between schools. As was revealed by the cluster analysis, disadvantaged schools suffer mainly from: a low quality of educational resources; insufficient access to computers and internet; and deficiencies in social capital indicators related to the offer of extracurricular activities, school autonomy, internal organisation, and the learning environment. This calls for a revision of the channels of resource-distribution throughout the system. The goal should be to find ways to improve and homogenise the level of inputs between schools, so that they may all develop high quality educational processes.

Another important issue is that most public schools in the sample belong to the segment identified as poor or low-quality, while private schools belong mainly to the high-quality group. This brings to attention one of the main sources of segmentation: the private-public division. The situation sets forth the need to further study the quality and quantity of resources allocated to public centres. This should be complemented by aid in the development of governance capabilities to better manage those resources, improving the internal school environment and the integration with the local community. Additionally, the private-public dichotomy brings to mind the fact that a great proportion of private schools receive substantial financial aid from the State. These subsidised schools present on average better resources than their public counterparts. This is another issue that demands regulation, in order to level off conditions for both types of schools. There is a need for a revision of the subsidy system, since different authors are issuing warnings about its lack of transparency and equity (Rivas et al., 2010; Morduchowicz, 2002).

Finally, there is the issue of the socio-economic background of the student population. Again, an initial observation is that the SES indicators present in the Argentine sample much lower values than in most of the participant countries. Dispersion is also relatively high due to persistent social inequality. This situation, of course, exceeds the realm of educational policy and calls for the implementation of systemic measures. Educational policies should be coordinated with social welfare and development policies in recognition of the natural feedback among different social spheres.

Still, the analyses carried out suggest that there are specific endogenous mechanisms at work in the education system which reinforce initial inequalities. Such is the case of social segregation of the students between school sectors. This problem is mainly caused by the constant flight of middle and upper income families from the public to the private system. The reason is related to the former being perceived as offering lower quality services and a less favourable learning environment. These dynamics constitute a vicious cycle: the factors that influence negatively the quality of

services favour school segregation, which in turn undermines the capacity of disadvantaged schools to acquire better resources and to benefit their students with positive peer effects. This cycle needs to be broken. An initial step could be to make great efforts to improve the quality of the services offered by disadvantaged centres, trying to slow down the exit of families with greater socio-economic and cultural capital. Then, complementary measures should be applied to prompt a more democratic distribution of students. Of course, this requires deep and progressive changes, in order to modify the actors' expectations and perceptions.

An interesting conclusion of this study is that, although between-sectors segregation is relevant, total segregation is mostly explained by inequalities within each sector. This is important because there seems to be more room for intervention in the public and private-subsidised sectors, where the government has greater faculties. To derive policies that foster a more equitable student distribution, modifying the current incentive structures, it is necessary to study the institutional mechanisms and strategies behind segregation. Both the demand and supply side of schooling should be revised, to understand the formal and informal rules behind school admission, and the preferences and choices of families. For instance, the interplay between school and residential segregation is a key issue. It may be possible to design ways of assigning students to schools which do not reproduce original patterns. The goal should be to create more socially heterogeneous school zones, perhaps by developing a safer and more accessible school transport system, or by modifying admission fees, etc. In short, there is a need to strengthen regulation and governance inside the education system, to increase its transparency, to improve the information accessed by disadvantaged families, and to obtain the different actors' compromise to work towards a more democratic setting.

Certainly, more research is still needed, both quantitative and qualitative, to identify the best ways to design true affirmative action policies. Each one of the aspects behind educational segmentation deserves special attention, but the complexity of the problem calls for a comprehensive approach. Complementary measures must be applied in different fronts to work on the interrelated dynamics that form this sort of inequality trap. It is the author's hope that this diagnosis, although limited in scope, may serve as a starting point for further research and may assist in the design of strategies to target the most disadvantaged schools, reducing the impact of socio-economic background on educational success.

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