Immigration, Public Education Spending, and Private Schooling

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This article examines the impact of immigration on private school enrollment through the mechanism of public education spending. It finds that the immigrant share of population raises private school enrollment across countries by leading to a decrease in the share of public education spending. The decrease is driven by responses to immigrants from culturally similar and developed countries. This suggests that the role of public schools in promoting social cohesion among diverse populations is weighted against other concerns in education funding decisions in places with immigrant populations. The endogeneity of immigrant share is accounted for by using an instrument constructed from gravity model estimates.

JEL Classification: H52, I21, O15

1. Introduction

Immigration may contribute to private school enrollments. This is suggested by recent micro-level studies that document “native flight” from public to private schools in response to inflow of immigrants (Betts and Fairlie 2003; Mavisakalyan 2009; Gerdes 2010), thereby bearing implications for the effect of immigration on school segregation. However, not much is known on the nature of contribution in spite of its significance for identification of policies which could affect the relation.

In the meantime, there has been much debate over the link between immigration and public education spending in many of immigrant receiving countries. The debate evolved in the United States around making public education available to children of illegal immigrants as part of the 1982 Supreme Court decision of *Plyer v. Doe* exemplifies the popular view that immigrants are costly in terms of public expenditures. The view on public education as a socializing force appeared as central to Supreme Court’s decision, stating,

The deprivation of public education is not like the deprivation of some other governmental benefit. Public education has a pivotal role in maintaining the fabric of our society and in

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sustaining our political and cultural heritage; the deprivation of education takes an inestimable toll on the social, economic, intellectual, and psychological well-being of the individual, and poses an obstacle to individual achievement. (Fobbs 2006)

However, the view that public welfare spending actually decreases in response to immigrants is prevalent in many places. For example, “white flight” from public schools in Australia was recently referred to as an “officially sanctioned abandonment” (Noonan 2008). According to the *Sydney Morning Herald* article, private schools enjoy better facilities and lower student-to-teacher ratios as a result of “the deliberate effort by federal and state governments to pour billions and billions of dollars into supporting private schools and making them more and more attractive options for the well-off.”

If governments indeed alter their allocation of resources in favor of public education in response to an inflow of immigrants, public education spending may be a mechanism through which immigration affects private school enrollment. Motivated by the debate on the effect of immigrants on public education spending in immigrant receiving countries, this article contributes to understanding the nature of the relation between immigration and private school enrollment by exploring the role of government spending on public education as a mechanism linking the two variables.

The direction of the effect of immigration on public education spending and, through it, on private school enrollment is theoretically ambiguous. On the one hand, given the role of public education in instilling common norms and values that lower transaction costs and reduce social tensions between different population groups (Gradstein and Justman 2000, 2002), immigration may induce increased support to its provision. On the other hand, the inflow of immigrants to public schools may result in turning the public system into a less attractive option for natives through, among other things, negatively affecting their expected quality of education.¹ If so, political actors may respond by reallocating less in favor of public education. In addition, smaller allocations to “softer targets” like public education will take place if immigration requires larger expenditures on other publicly provided goods, such as infrastructure or public housing (Ryan 2008).

Existing empirical evidence examining the determination of redistributive policies in the context of immigration reflects the theoretical ambiguity. According to some studies, the direction of the impact of immigration on public spending varies across immigrants with varying skills (Razin, Sadka, and Swagel 2002; Boheim and Mayr 2005). In addition, there is a view whereby nonnational pupils trigger higher investment in education because of their greater need for supplementary education (Grob and Wolter 2007). In other cases, no conclusive evidence on the impact of immigration on public spending is found (Gerdes 2009).

A different body of literature studies the implications of public education expenditures on private school enrollments. James (1987, 1993) argues that low public spending creates an “excess demand” from people who would prefer to use the public schools but are unable to find a place. The lower public spending is documented to be the major reason for the higher proportion of private enrollments in developing as compared with developed countries.² Others

¹ Theoretical expositions include Dottori and Shen (2008), who propose that increase in low-skilled immigration leads to a reduction of the average tax base, leading to a decrease in public expenditures per pupil, and Mavisakalyan (2009), who assumes that public schools respond more to immigrants by reallocating budgets towards their needs than private schools do.

² While the cultural heterogeneity is suggested to explain the variation in private enrollment across countries, its impact on private enrollment through the channel of public education expenditures is not considered.

focus on the public school quality resulting from public spending, providing mixed results. While some find a positive link between public school quality and private school enrollments (e.g., Long and Toma 1988; West and Palsson 1988; Figlio and Stone 2001; Cohen-Zada and Justman 2003), others do not come up with a conclusive evidence on the relationship (e.g., Lankford, Lee, and Wyckoff 1995; Buddin, Cordes, and Kirby 1998; Fairlie and Resch 2002; Betts and Fairlie 2003).

This article is the first attempt to provide a unified exploration of questions pertaining to these two separate bodies of literature. It specifically considers whether immigration affects public education spending and whether public education spending affects private school enrollment by estimating a two-equation system with a sample of more than 80 countries.

First, immigrant share of population is found to lead to decrease in the share of government spending on public education. The results suggest that the response to immigrants from culturally similar and developed countries accounts for the negative effect. Furthermore, there is an indication that there could be a weak increase in public education spending in response to immigrants from culturally distant and developing countries. This suggests that the role of public schools in promoting social cohesion among diverse population groups is weighted against other concerns in decisions on public education funding in places with immigrant population. Finally, the decrease in the share of public education spending is associated with increase in private school enrollments.

Interpreting a correlation between immigrant share and education outcomes as causality from the former to the latter is problematic because of potential sources of endogeneity. To account for this, the immigrant share is instrumented by first estimating a variant of a gravity model, where bilateral immigrant shares are regressed on exogenous characteristics of countries. The fitted immigrant share values are then aggregated across partners to create an instrument for immigrant share. This approach to constructing an instrument is new to the migration literature, while it is inspired by studies on trade and economic outcomes that have used gravity model estimates to generate an instrument for trade (pioneered by Frankel and Romer 1999).³ The instrumental variable method makes it credible to assert that the link between immigration, public education spending, and private school enrollment is causal.

The remainder of the article is organized as follows. The following section outlines the empirical approach. Section 3 presents the results. The final section concludes.

2. Empirical Strategy and Data

Given that public education expenditures and immigrant share do not often change much over short periods of time, the empirical analysis employs a cross section of countries instead of a panel data set. This has the advantage of having a larger and more diverse data set of countries to work with.

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³ The problem of endogeneity has often remained intractable in studies on immigration (e.g., Razin, Sadka, and Swagel 2002; Boheim and Mayr 2005).

A system of equations determining private school enrollment and the channel variable, public expenditures on education, is formulated as follows:

$$privsh_i = \alpha_1 + \alpha_2 pubed_i + \alpha_3 X_i + \varepsilon_i \quad (1)$$

$$pubed_i = \beta_1 + \beta_2 immigr_i + \beta_3 X_i + \beta_4 k_i + \omega_i, \quad (2)$$

where i indices countries, $privsh_i$ is the share of students enrolled in private schools, $pubed_i$ denotes the share of expenditures on public education to gross domestic product (GDP), $immigr_i$ is the share of overseas-born population, X_i denotes the exogenous control variables, and k denotes an exogenous variable that determines the public education expenditures but that does not affect the private share of school enrollment. Finally, ε and ω are unobservable components each having a zero mean and finite variance.

Public and private schools may differ in many of their features and if some features are valued more at one level of schooling than the other, the factors that influence the choice of schools may differ between primary and secondary levels (Long and Toma 1988). Therefore, the two levels of education are treated as different equations in the system. The differences across countries in resources devoted to public education are captured by the share of expenditures on public education to GDP, consistent with studies that consider government education policy in other contexts (e.g., James 1993; Sylwester 2000). This can affect the demand for private schooling through affecting the quantity and/or the quality of public schools. Given that expenditures on public schools often benefit both levels, no distinction between expenditures directed to each level is made.

It is assumed that immigrant share of population helps to determine education expenditures, but it does not otherwise affect private school enrollment. Generally, it is not an unusual approach on behalf of researchers to consider one potential transmission mechanism linking different variables at a time (Sylwester 2000). Studies on other subjects have used a similar approach considering an effect of one variable over another operating through specific policies or conditions but not directly (e.g., Alesina and Perotti 1993; Sylwester 2000; Tavares and Wacziarg 2001).

The list of exogenous controls includes variables comparable to those used in previous studies of the determinants of public education expenditures and private school enrollments. Richer countries can afford to devote more resources to education. Therefore, measures of public education expenditures and private school enrollments are defined to depend on income differences (captured by logarithm of GDP per capita) as well as on stages of development (captured by dummy for OECD membership status). Unequal societies may have more incentives to maintain different educational arrangements for different social groups. To reflect this, Gini coefficient is included in the list of controls. Measures of size (logarithm of population age 0–14) and density of population are included to capture the effective demand and the costs of supporting education systems. Catholic share of population is controlled for to reflect the differentiated demand for education as well as differences in preference for redistribution. For similar reasons, urban share of population is also included in the list of controls. To express historical differences across countries that could potentially affect their preferences for schooling and redistribution, dummies for countries' communist past as well as former British or French colony status are controlled for. Finally, to minimize the possibility of omitted variable bias, openness, measured as the sum of exports and imports in GDP, is included in the list of controls. Exposure to external risk, as captured by openness, may have

broad impacts on demand as well as on the size of government (Rodrik 1998). In the meantime, it is potentially linked to immigrant share of population.

Equations 1 and 2 are estimated jointly as a system of simultaneous equations. The main parameters of interest are the coefficients on *immigr_i* in Equation 2 and on *pubed_i* in Equation 1. The product of the two indicates whether and how immigrant share affects private school enrollment through the channel of public education spending. While public education spending is expected to decrease the share of private school enrollments through positively affecting the quality or the quantity of public schools, the impact of immigration on public education spending is ambiguous. As discussed in the introduction, immigration may induce increased support to public education provision because of its expected positive effect on social capital. However, the expected negative effect of immigration on human capital formation may result in less favor for public education. In addition, public education spending may decrease if immigration requires larger expenditures on other publicly provided goods. These two effects go in opposite directions, and the overall effect of the total immigrant share on public education spending will depend on their relative strength.

Given this, alternative models where immigrant population is disaggregated into groups on the basis of their expected exposure to the effects are also considered. The importance of the social capital motive in favoring public education spending should be applicable to culturally distant immigrants. Therefore, estimations are carried out including immigrant shares disaggregated on the basis of their possession of a common language with the host country. In addition, immigrants from poor countries may pose a stronger threat to social cohesion if deprived from public education. Therefore, models with immigrant shares disaggregated on the basis of the developed/developing status of their countries of origin are also estimated.

Estimation of Equations 1 and 2 is econometrically difficult for several reasons. First, if the choice of a country for immigration is nonrandom, estimates will yield biased results. In particular, the welfare systems in a host country, including public education provision, may be important pull factors in international migration (e.g., Borjas 1999; Dodson 2001). Second, immigration may correlate with several other variables, often uncaptured, that may affect the public expenditures on education and share of private school enrollment. Third, there may be a substantial measurement error in the immigrant share because of, among other things, the exclusion of illegal immigrants. Public education expenditures also may be endogenous in Equation 1, in particular because the demand for private schooling may decrease the funding that goes to public education. If so, estimates will be biased upward.

Since seemingly unrelated regressions estimates will suffer from endogeneity bias, 3SLS estimates are used as baseline estimation strategy. 3SLS treats all the exogenous variables in the system as instruments for the endogenous variables. In addition, 3SLS allows for cross-equation covariance in the error terms, generating potential efficiency gains.

The new instrumental variable proposed in this study to deal with the endogeneity of immigrant share originates from a simple gravity model of bilateral trade that at the core predicts that the trade flows between two countries should increase with their size and decrease with transport costs by analogy to the formula for the gravitational attraction between two masses. The gravity model has proven to be quite flexible in a number of empirical applications to test for the determinants of bilateral trade between countries. In addition, the gravity model has been applied to explain varying types of other flows, more recently migration (e.g., Karemera, Oguledo, and Davis 2000; Mayda 2005; Clark, Hatton, and Williamson 2007).

In contrast to conventional gravity equations, the specification used here includes only largely exogenous list of controls, including the log of distance, the log of partner country population, the log of the product of areas of countries, and dummy variables for common language and common land border. In addition, considering the crucial importance of economic opportunities for migration decisions, the difference in income per capita between the two countries is also included in the list of controls. These variables make potentially good instruments given their explanatory power over migration. In addition, it is not easy to think of ways that these variables would affect public school expenditures other than through their impact on how much a country's residents interact with foreigners. Given the predictive power of the same variables over international trade, the openness measure included in the regressions further minimizes the concern of their influence on education systems through channels other than migration. In addition, acknowledging the possibility for endogeneity of the measure of differences in GDP per capita between two countries, an alternative gravity equation specification excluding the term is also tested.

The generation of instruments following this approach, while new to migration literature, is closely related to the work on the influence of trade on economic outcomes where a similar approach has been used to construct instruments for trade (Frankel and Romer 1999; Frankel and Rose 2002).⁴ In contrast to traditional gravity models, immigrant stock rather than flow is used as the dependent variable (as in Beine, Docquier, and Rapoport 2006; Acupana and Agbola 2007). The data on bilateral migrants stocks come from a recently compiled database for 226 countries and territories based on the 2000 round of censuses.⁵

The results of estimation of models with and without GDP per capita differences are shown in Table 1. All the controls are statistically significant at 1% level with signs corresponding to underlying theoretical intuition of the gravity model. Longer intra- and intercountry distances result in less migration due to higher transport costs involved. Countries with better relative economic opportunities attract more immigrants. Finally, the immigrant stock of a country is increasing with the sending country size and the presence of a common language with it. The R^2 of the regression is 0.37 (0.34 when the measure of GDP per capita differences is omitted), indicating that these variables are important determinants of bilateral migrant shares.

After estimating the model, the exponent of the fitted values is aggregated across bilateral partners to arrive at an estimate of a total immigrant share for a given country. Table 2 shows actual stocks of immigrants with their predicted values based on gravity model estimations with and without GDP per capita differences terms. The three countries with the highest predicted immigrant shares are Austria, Switzerland, and Belgium. Not only do these countries have higher GDP per capita with respect to the majority of other places, but they are places with smaller inter- and intracountry distances, multiple shared borders, and official languages. At the other extreme are countries with zero predicted immigrant shares, including Cambodia, Lao PDR, Mauritania, Mongolia, Namibia, Sierra Leone, and Yemen. Among other things, high GDP per capita differences of these countries with the rest of the world appear to be important

⁴ The right-hand-side variables from Frankel and Rose (2002) are used in the gravity equation here, with the exceptions of landlocked status of countries, due to its weaker relevance for migration costs, and of the differences of income per capita between the two countries, which is included here but not in their study. The data come from Rose (2005).

⁵ Parsons et al. (2007) provide a detailed description of the data.

Table 1. Instrumental Variable Generation

Variable	A	B
Difference in GDP per capita	0.0328*** (0.0014)	
Ln distance	-1.1437*** (0.0246)	-1.1597*** (0.0246)
Ln pop (sending country)	0.722*** (0.0121)	0.7278*** (0.0121)
Common language	1.1637*** (0.0492)	1.106*** (0.0488)
Common border	1.7631*** (0.1276)	1.7707*** (0.1292)
Ln product areas	-0.1243*** (0.0068)	-0.1226*** (0.0067)
Constant	-6.346*** (0.2502)	-6.3699*** (0.2508)
No. of observations	14,263	14,786
R^2	0.3689	0.3448

A and B refer to estimations with and without GDP per capita difference measures.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

in yielding zero immigrant share predictions (thus nonzero values for predictions that exclude the term).

The gravity model specifications with and without GDP per capita differences terms do not produce great differences in the predicted values of the immigrant shares. The correlation coefficient between the two is as high as 0.97, as shown in the bottom of Table 2. In the meantime, both predicted immigrant shares measures are correlated around 0.3 with the actual immigrant share. The associations are highly statistically significant. In sum, as hypothesized, predicted immigrant shares appear to have an explanatory power over the actual immigrant shares.

Endogeneity of public education expenditures in studying their impact on education outcomes is an additional problem, yet often not dealt with in previous studies.⁶ This study considers several alternative instruments for expenditures on public education, including average number of frost days per unit of land area, share of land that is tropical, and share of cropland that is irrigated.⁷ The use of the instruments is motivated by an intuition similar to that suggested by recent research on the link between the size of the public education sector and landownership. On the one hand, it suggests that the elite in land-abundant economies may have an incentive to invest in human capital, as the production of some services requires the input of educated workers (Galiani et al. 2008). On the other hand, there is a view that given that human skills provide no benefits for landlords because of a low degree of complementarity

⁶ For instance, Chaudhuri and Maitra (2008) try to tackle the endogeneity of government expenditure on education in their study of its effect on school completion and attainment by simply using its one-period lagged value, which, as they acknowledge, is not sufficient to capture the effect of government expenditure on schooling.

⁷ The data are obtained from McMillan and Masters (2001), Rose and Spiegel (2009), and World Bank (2004), respectively.

Table 2. Actual and Constructed Immigrant Shares

Country	Immigrant	Constructed Immigrant	
		A	B
Armenia	10.2	0.9	1
Australia	21.4	0.2	0.1
Austria	11.4	3	2.6
Azerbaijan	2	0.7	0.7
Bangladesh	0.8	0.7	0.8
Belarus	12.8	0.8	0.8
Belgium	8.5	5.2	4.8
Bolivia	1.1	0.4	0.5
Brazil	0.4	0.1	0.1
Bulgaria	1.3	0.9	0.9
Cambodia	1.9	0	0.5
Cameroon	1	1.4	1.4
Canada	18.1	0.4	0.3
Chile	1.2	0.5	0.4
Colombia	0.3	0.6	0.6
Costa Rica	7.9	0.8	0.8
Croatia	13.7	0.8	1.0
Czech Republic	4.4	1.3	1.4
Denmark	5.7	1.5	1
Dominican Republic	1.6	0.3	0.3
Ecuador	0.8	0.6	0.6
El Salvador	0.4	1.8	1.7
Estonia	18.3	0.5	0.5
Finland	2.6	0.6	0.4
France	10.6	1.3	1.2
Georgia	4.6	0.7	0.7
Ghana	7.6	0.6	0.7
Greece	6.7	0.9	0.7
Guinea	8.7	0.8	0.9
Hungary	2.9	1.2	1.2
India	0.6	0.8	0.8
Indonesia	0.2	0.1	0.1
Ireland	10.1	2.2	1.7
Italy	2.8	0.9	0.8
Ivory Coast	14	0.9	0.9
Jamaica	0.7	0.3	0.3
Japan	1.3	0.3	0.2
Jordan	39.1	1.8	2.2
Kazakhstan	19.1	0.3	0.3
Kyrgyzstan	7.5	0.5	0.6
Lao PDR	0.5	0	0.7
Latvia	22.7	0.8	0.8
Lesotho	0.3	0.3	0.3
Lithuania	6.1	0.8	0.9
Malaysia	6.1	0.5	0.4
Mauritania	2.4	0	0.3
Mauritius	1.3	0.7	0.5
Mexico	0.5	0.2	0.3
Mongolia	0.3	0	0.6

Table 2. Continued

Country	Immigrant	Constructed Immigrant	
		A	B
Morocco	0.4	0.5	0.6
Namibia	7.5	0	0.2
Nepal	2.9	1.1	1.2
Netherlands	9.8	2.5	2.3
Nicaragua	0.6	0.9	0.9
Niger	1	0.7	0.8
Norway	6.6	0.7	0.5
Panama	2.9	0.8	0.7
Paraguay	3.2	0.4	0.4
Peru	0.2	0.5	0.5
Philippines	0.4	0.3	0.3
Poland	2.1	0.8	0.9
Portugal	6.2	0.7	0.6
Republic of Korea	1.2	0.5	0.4
Republic of Moldova	11.1	1	1.2
Romania	0.6	0.7	0.8
Rwanda	1.1	2.8	2.7
Senegal	2.9	0.6	0.6
Sierra Leone	1	0	0.5
Slovakia	2.2	1.5	1.5
Slovenia	8.9	2.0	1.9
South Africa	2.2	0.3	0.3
Spain	4	0.7	0.6
Sweden	11.2	0.6	0.4
Switzerland	21.8	5.1	4.2
Thailand	1.4	0.4	0.4
Tunisia	0.4	0.6	0.6
Ukraine	14.1	0.6	0.6
United Kingdom	8.1	0.8	0.6
United States	12.2	0.4	0.2
Uruguay	2.7	0.5	0.5
Yemen	1.4	0	0.2
Zimbabwe	5.2	0.7	0.7
Correlations			
	Immigrant	Constructed Immigrant A	
Constructed immigrant A	0.3117***		
Constructed immigrant B	0.3047***		0.9744***
Descriptive statistics			
Mean	Standard Deviation	Min	Max
0.8606	0.9102	0	5.2158
0.8593	0.79	0.1207	4.8063

A and B refer to immigrant shares constructed based on estimates of gravity model with and without GDP per capita difference measures.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Table 3. Instruments for Public Education Expenditures

	Correlations			Descriptive Statistics			
	Education Spending	Average Frost Days	Tropic Share	Mean	Standard Deviation	Min	Max
Average							
frost days	0.2774**			11.915	11.045	0	29.7972
Tropic share	-0.2846***	-0.8302***		38.9507	46.7008	0	100
Land use	-0.2704**	0.1287	-0.2070*	16.3134	19.0909	0.1887	82.7887

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

between human capital and land, the landlords would block or delay the growth of public education if they have veto power over policies (Galor, Moav, and Vollrath 2005). The use of the above measures to instrument for public education spending provides suggestive evidence on the direction of the impact of the quality of land on public education spending. In the meantime, the Gini coefficient included in the regressions minimizes the possibility of the direct impact of land quality measures on private school enrollments through its association with an elite–lower-class dichotomy.

As Table 3 shows, the correlation of the three land quality measures with public education expenditures is quite high. The correlation with the share of land that is tropical is of the highest statistical significance. However, since this variable takes the values of either 0% or 100% for the vast majority of countries, average number of frost days per unit of land area is used as an instrument in baseline regressions. Its correlation with the tropical land variable is as high as 0.83 while it has the advantage of being a more refined measure. Models with alternative combinations of all three instruments are also tested.

The data set assembled from different sources covers up to 82 countries in 2000 in the baseline specification.⁸ In the case of some variables, the data are spliced on the basis of multiple sources.⁹ These include measures of private school enrollment and public education expenditures out of the endogenous variables in the model. While splicing data introduces the possibility of measurement error, which is critical for obtaining consistent estimates on the coefficient for public education expenditures, the strategy of instrumenting it addresses that concern.

As the second column of Table 4 shows, most variables come from standard sources widely used in macro-level empirical studies, including Heston, Summers, and Aten (2006); OECD (2007); UNESCO (2007); United Nations (2007a, 2007b); and World Bank (2004, 2007). In some cases, data sets compiled by other researchers based on standard sources and used in published papers are used (e.g., Fearon and Laitin 2003; Barro 2007; Rose and Spiegel 2009). The table also contains summary statistics for the main variables.

The average share of private primary school enrollment in the sample of countries is around 11%, ranging from no private school enrollment to the maximum of 88.11% (Zimbabwe). Around 24% of countries in the sample have private primary school enrollment shares below 1%, while only 3 out of the 82 countries have private primary school enrollment

⁸ Table 2 lists the countries in the sample.⁹ Details on the way data was obtained are provided in the appendix.

Table 4. Descriptive Statistics

Variable	Source	Mean	Standard Deviation	Min	Max
Primary private enrollment	OECD (2007), UNESCO (2007), World Bank (2007)	10.6109	15.3357	0	88.11
Secondary private enrollment	OECD (2007), UNESCO (2007), World Bank (2007)	16.3607	20.0963	0	95.73
Education spending	Rose and Spiegel (2009), World Bank (2004, 2007)	4.5616	1.7171	1.32	10.11
GDP per capita	Heston, Summers, and Aten (2006)	8.7607	1.0485	6.242	10.4448
OECD Gini	Rose and Spiegel (2009)	0.2439	0.4321	0	1
Population 0–14	UNESCO (2007), World Bank (2004, 2007)	39.0781	10.4714	21.7	70
Density	UNESCO (2007), World Bank (2004, 2007)	15.0053	1.356	12.4008	19.6445
Urban	Heston, Summers, and Aten (2006), Rose and Spiegel (2009)	4.0541	1.2981	0.5079	6.8086
Catholic share	UNESCO (2007), United Nations (2007a), Rose and Spiegel (2009)	57.3646	19.5224	13.6	97.1
Communist	Barro (2007)	33.8963	36.4223	0	94.3
British colony	Barro (2007)	0.2805	0.452	0	1
French colony	Fearon and Laitin (2003)	0.1951	0.3987	0	1
Openness	Fearon and Laitin (2003)	0.1341	0.3429	0	1
Immigrant share	Rose and Spiegel (2009)	86.1594	39.9461	20.1767	228.8752
Same-language immigrant	United Nations (2007b)	5.878	6.8674	0.2	39.1
Different-language immigrant	Rose (2005), Parsons et al. (2007)	1.6182	3.3713	0	20.099
Developed-country immigrant	Rose (2005), Parsons et al. (2007)	4.3032	5.3373	0.0263	25.4891
Developing-country immigrant	Rose (2005), Parsons et al. (2007)	1.0917	2.3073	0	12.2807
	Rose (2005), Parsons et al. (2007)	4.8297	6.0856	0.0932	36.2293

shares strictly equal to zero. At the secondary level, the average share of private school enrollment is higher, around 16%, ranging from no private school enrollment to the maximum of 95.73% (Bangladesh). In this case, the share of countries with less than 1% of their student population enrolled in private schools is around 22%, while only 3 countries have exactly 0% of their students enrolled in private schools.

The share of immigrants across countries ranges from 0.2% to 39.1% (Jordan), with the average share of around 6%. Around 22% of countries in the sample have an immigrant share of population under 1%. The average share of immigrants from places that share the host country's language is 2%, while the remaining 4% originate from linguistically distant places. The average share of immigrants from developed countries is low at around 1%, with 5% of immigrants originating from developing countries.¹⁰ Finally, the average public expenditures on education constitute around 4.5% of GDP, ranging from 1.32% (Ecuador) to 10.11% (Lesotho).

3. Empirical Results

Baseline Regressions

Panel A of Table 5 reports the estimates of Equations 1 and 2 using 3SLS. The coefficients on the variables of interest are statistically significant. As discussed earlier, immigration may induce increased support to public education provision because of its expected positive effect on social capital. However, the expected negative effect of immigration on human capital formation may result in less favor for public education. In addition, immigration may require larger expenditures on other publicly provided goods, resulting in smaller allocations to public education. The negative coefficient on immigrant share in Equation 2 indicates the relative strength of the later effects. The coefficient on public education spending in Equation 1 is negative, consistent with an intuition on its expected positive effect on the relative attractiveness of public school system.

The results are economically significant too. They imply that a 1% increase in immigrant share leads to a 0.125-percentage-point decrease in public education expenditures, and this in turn increases the private primary school enrollment by 1.01% (8.0692×0.125) and private secondary school enrollment by 1.07% (8.537×0.125).

The magnitude of the negative impact of public education expenditures on private school enrollment is underestimated when endogeneity is not accounted for.¹¹ This suggests the importance of reverse causality due to the negative effect of demand for private schooling on public education expenditures. The same is the case in estimation of the impact of immigrant share on public education expenditures. Not only is the coefficient on immigrant share statistically significant in 3SLS estimations, but the magnitude of its negative impact on public education expenditures also is larger. This suggests the relative importance of measurement error in immigrant share variable over the other sources of endogeneity, as discussed in the previous section.

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¹⁰ Data on the share of immigrants in population, calculated on the basis of immigrant stocks aggregated from bilateral data in Parsons et al. (2007) with respect to a population measure (from Heston, Summers, and Aten 2006), is very similar to the data on the aggregate immigrant share of population from the United Nations (2007b) used in the baseline model. The correlation coefficient between the two is above 0.98, and the regression results using each of the measures are very similar. Disaggregation of immigrant shares by common language and developed/developing status of sending countries is done using the former source, which explains the slight differences between the disaggregated and total immigrant shares reported in Table 4.

¹¹ Results available on request.

Table 5. 3SLS Regressions of Equations 1 and 2

Variable	Panel A: 3SLS			Panel B: First Stage	
	Private Enrollment		Education Spending	Immigrant Share	Education Spending
	Primary	Secondary			
GDP per capita	1.7927 (3.9657)	3.1064 (4.4304)	0.217 (0.3145)	0.6405 (1.36)	0.1617 (0.3476)
OECD	2.0761 (7.3935)	-2.6902 (8.2599)	-0.0306 (0.6373)	-0.3829 (2.766)	-0.1412 (0.7069)
Gini	0.1129 (0.2431)	0.0014 (0.2716)	0.0038 (0.0215)	-0.0705 (0.0894)	0.0158 (0.0228)
Population 0–14	-1.0784 (1.7885)	-0.0965 (1.9981)	-0.2539* (0.1421)	-0.2759 (0.5969)	-0.1876 (0.1525)
Density	-1.2848 (2.0382)	2.1538 (2.2771)	-0.3527** (0.1428)	-1.609** (0.6247)	-0.1942 (0.1596)
Urban	0.051 (0.1496)	-0.0751 (0.1671)	0.0005 (0.0133)	0.0867 (0.0523)	-0.011 (0.0134)
Catholic share	0.0125 (0.0613)	0.004 (0.0685)	-0.0016 (0.0053)	-0.0374 (0.0233)	0.0021 (0.006)
Communist	-16.3537** (6.6461)	-24.5677*** (7.4249)	-1.6998*** (0.5888)	2.6177 (2.5829)	-2.0161*** (0.6601)
British colony	10.0106* (5.7419)	5.7851 (6.4147)	1.1953** (0.5388)	5.3228*** (1.9555)	0.5725 (0.4997)
French colony	-8.0319 (7.5572)	-11.0504 (8.4428)	-0.4101 (0.57)	0.5821 (2.4301)	-0.443 (0.621)
Openness	0.09 (0.0694)	0.0597 (0.0775)	0.0125*** (0.0047)	0.0006 (0.02)	0.0116** (0.0051)
Immigrant share			-0.125** (0.0587)		
Education spending	-8.0692** (3.8978)	-8.537** (4.3545)			
Average frost days			0.0799*** (0.0269)	0.0221 (0.1142)	0.0809*** (0.0292)
Constructed immigrant share				3.0764*** (0.9045)	-0.1843 (0.2311)
Constant	40.7935 (45.9063)	27.6837 (51.2859)	6.7897* (3.5238)	5.2608 (14.9119)	5.425 (3.8108)
No. of observations	82	82	82	82	82
R ²				0.4322	0.4069

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

In addition, public education spending is lower in larger and more densely populated countries, indicating the existence of increasing returns to public education provision. According to the results, as expected, countries with history of communist regime have lower private enrollment shares. They also spend less on public education, which could be due to changed prioritization of public spending targets due to postcommunist transition. There is also evidence that former British colonies have higher private primary school enrollment rates and spend more on public education. Finally, openness is associated with higher public education

spending. This is broadly consistent with the idea of the risk-reducing role of government spending in economies exposed to external risk due to openness, suggested by Rodrik (1998). The coefficients on the remaining controls are not significantly different from zero.

Panel B of the table gives the results of first-stage regressions showing a strong relationship between the instruments and endogenous variables. As expected, the constructed immigrant share is positively correlated with the actual immigrant share variable. In addition, countries with more frost days per unit of land area appear to invest more in public education. The associations are highly statistically significant.

An important criterion for an instrument is also for it to be uncorrelated with the residual. Since a single instrument for immigrant share is used, there are no overidentifying restrictions to test. To allow for that, the instrument is disaggregated into underlying gravity components, following Frankel and Rose (2002). First, each of the six variables, including differences in GDP per capita, distance, population, area, common language, and border dummies, are used as single gravity determinants leading to six independent instruments. Second, exclusion tests are conducted by excluding from Equation 2 the difference between the baseline instrument and a generated instrument and using the other five generated instruments to instrument for immigrant share. The *t*-statistics for all six exclusion tests conducted on the basis of this approach are insignificantly different from zero.¹²

In addition, to minimize the concern for the endogeneity of the instrument for immigrant share (and, in the meantime, to test the sensitivity of the results to the baseline instrument), the model is re-estimated using an instrument based on the gravity equation excluding the measure of differences in GDP per capita. Results reported in Table 6 are very similar to what was obtained before.

In addition, among other things, the exclusion of immigrant share from Equation 1 poses a potential threat for exogeneity of the instrument on public education expenditures given the possibility of correlation between the two. Therefore, a model augmented with an additional land quality variable, the share of cropland that is irrigated, is estimated.¹³ The results reported in Table 7 are qualitatively similar to those from the baseline model, while both the economic and the statistical significance of coefficients on the variables of interest is larger. In addition, as panel C of the table reporting the *p*-values of a formal test indicates, the overidentifying restrictions do not appear violated. Regressions adding the share of tropical land to the list of instruments for public education spending yield broadly similar results, while the accuracy of the first-stage estimates suffers because of its high correlation with the baseline instrument as discussed in the previous section.¹⁴

In summary, looking at immigration-channel and channel-private school enrollments jointly, some insights into the way immigration affects private school enrollment across countries are obtained. The data provide strong evidence that immigration leads to increase in private school enrollment through negatively affecting expenditures on public education. The instruments used to deal with endogeneity issues in the model appear to be valid. Next, robustness checks to further confirm this finding are provided.

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¹² Results available on request.

¹³ As Table 3 shows, the correlation coefficient between the two instruments is insignificant at 0.13.

¹⁴ Results available on request.

Table 6. 3SLS Regressions of Equations 1 and 2: Using an Alternatively Constructed Instrument for Immigrant Share

Variable	Panel A: 3SLS			Panel B: First Stage	
	Private Enrollment		Education Spending	Immigrant Share	Education Spending
	Primary	Secondary			
GDP per capita	1.8212 (3.9839)	3.1051 (4.4341)	0.2176 (0.3134)	1.2158 (1.3801)	0.1365 (0.3554)
OECD	2.0951 (7.4213)	-2.6911 (8.2599)	-0.0293 (0.635)	-0.548 (2.7524)	-0.1458 (0.7088)
Gini	0.1132 (0.244)	0.0014 (0.2715)	0.0038 (0.0213)	-0.0646 (0.0889)	0.0157 (0.0229)
Population 0-14	-1.0935 (1.7974)	-0.0958 (2.0005)	-0.2536* (0.1411)	-0.2416 (0.5939)	-0.186 (0.1529)
Density	-1.3107 (2.0517)	2.155 (2.2835)	-0.3526** (0.1417)	-1.6042** (0.6168)	-0.2005 (0.1588)
Urban	0.0503 (0.1502)	-0.0751 (0.1671)	0.0005 (0.0132)	0.079 (0.052)	-0.0106 (0.0134)
Catholic share	0.0121 (0.0616)	0.004 (0.0685)	-0.0017 (0.0053)	-0.0392* (0.0233)	0.002 (0.006)
Communist	-16.4227** (6.6834)	-24.5645*** (7.4386)	-1.696*** (0.5872)	2.1413 (2.5405)	-1.9782*** (0.6542)
British colony	10.0484* (5.7673)	5.7833 (6.419)	1.192** (0.5303)	5.2481*** (1.9405)	0.5801 (0.4997)
French colony	-8.115 (7.6014)	-11.0465 (8.4604)	-0.4131 (0.5679)	0.6001 (2.4133)	-0.446 (0.6215)
Openness	0.0908 (0.0698)	0.0596 (0.0777)	0.0125*** (0.0046)	-0.0007 (0.0199)	0.0116** (0.0051)
Immigrant share			-0.1244** (0.056)		
Education spending	-8.1476** (3.9409)	-8.5333* (4.3862)			
Average frost days			0.0795*** (0.0268)	0.0259 (0.1132)	0.0803*** (0.0291)
Constructed immigrant share				3.538*** (0.9942)	-0.1846 (0.256)
Constant	41.2182 (46.1455)	27.664 (51.3598)	6.7833* (3.5025)	-0.1876 (15.1546)	5.6322 (3.9026)
No. of observations	82	82	82	82	82
R ²				0.4399	0.4059

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Robustness Checks

To rule out the concern for omitted variables, the model is augmented to include additional controls that could potentially affect the endogenous variables in the model. Institutional features of countries are potentially related to their education systems but can also affect immigrant presence in those countries. Therefore, measures for democracy, system of

Table 7. 3SLS Regressions of Equations 1 and 2: Using an Additional Instrument for Public Education Spending

Variable	Panel A: 3SLS			Panel B: First Stage	
	Private Enrollment		Education Spending	Immigrant Share	Education Spending
	Primary	Secondary			
GDP per capita	2.2817 (4.0429)	3.4699 (4.4703)	0.2204 (0.2974)	0.6711 (1.3786)	0.1227 (0.3304)
OECD	8.5807 (8.1557)	3.7121 (9.0177)	0.422 (0.6179)	-0.0056 (2.8692)	0.2207 (0.6876)
Gini	0.1416 (0.2557)	0.0374 (0.2827)	0.007 (0.0203)	-0.0691 (0.0911)	0.0223 (0.0218)
Population 0–14	-1.4399 (1.8098)	-0.395 (2.0011)	-0.2612* (0.1351)	-0.3159 (0.6072)	-0.174 (0.1455)
Density	-2.2771 (2.0117)	1.2602 (2.2243)	-0.2888** (0.1383)	-1.5226** (0.6754)	-0.0924 (0.1619)
Urban	-0.0262 (0.1587)	-0.1484 (0.1755)	0.0009 (0.0126)	0.0816 (0.0533)	-0.0136 (0.0128)
Catholic share	0.0609 (0.0645)	0.0543 (0.0714)	-0.0044 (0.0054)	-0.0395 (0.0252)	0.0023 (0.006)
Communist	-16.6629** (6.5147)	-24.6295*** (7.2032)	-1.5779*** (0.5492)	2.2669 (2.6514)	-2.0165*** (0.6354)
British colony	15.8282** (6.4551)	11.6598 (7.1374)	1.3356*** (0.5137)	5.1434** (2.1259)	0.5927 (0.5095)
French colony	-7.4571 (7.2751)	-10.3483 (8.0441)	-0.6847 (0.5372)	0.3005 (2.5345)	-0.5864 (0.6074)
Openness	0.161** (0.0753)	0.1305 (0.0832)	0.0125*** (0.0046)	-0.0001 (0.0215)	0.0121** (0.0052)
Immigrant share			-0.1653*** (0.0565)		
Education spending	-9.9355*** (3.2315)	-10.3668*** (3.5731)			
Average frost days			0.0857*** (0.0248)	0.0397 (0.1166)	0.0889*** (0.028)
Land use			-0.0306*** (0.0083)	-0.0287 (0.0403)	-0.0223** (0.0097)
Constructed immigrant share				2.9148*** (0.934)	-0.26 (0.2238)
Constant	48.0568 (45.8688)	33.8103 (50.7169)	7.1422** (3.3462)	6.1896 (15.1316)	5.2985 (3.6263)
No. of observations	80	80	80	80	80
R^2				0.4428	0.4811
Panel C: Results of Overidentification Test					
p -value from χ^2 test	0.1918	0.5898			

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

government, and citizenship rules are added to the list of controls.¹⁵ In addition, immigrant share of population can affect other public expenditure categories that in their turn can be related to education systems. To account for this, public health and military expenditures as shares of GDP are included in the regressions (data come from Rose and Spiegel 2009). An infant mortality measure from the same source is included in the regressions as an additional need measure that would affect both the prioritization of education systems and immigrant intake. Nonlinearity in the effect of GDP per capita is allowed for by including its squared term. Dummy variables for Latin America, sub-Saharan Africa, East Asia, and North Africa and the Middle East are added to control for region-shared effects that are related to both education systems and immigrant presence. Finally, a direct, in addition to an indirect, effect of immigrant share on private enrollment is allowed for by adding the omitted immigrant share variable into Equation 1.

The results reported in Table 8 come at the cost of a reduction in the sample size.¹⁶ As panel A of the table indicates, the impact of immigrant share on public education expenditures remains significantly negative while smaller in magnitude. However, simultaneous inclusion of immigrant share and public education expenditures in Equation 1 leads to insignificance of the coefficients on both terms. Moreover, the large size of the coefficients on immigrant share suggests that the immigrant share may affect private school enrollment directly and/or through other channels in addition to that of the public education expenditures considered in this study. Identifying those is an important direction of future research. However, clearly, no association of immigrant share with private school enrollment is identified once its direct and indirect effects are considered jointly, therefore justifying the approach in this study of following those of others to consider one potential transmission mechanism linking different variables at a time (Sylwester 2000).

Once immigrant share is restricted from affecting private enrollment directly, the result on the positive impact of immigrant share on private school enrollment through its negative impact on public education expenditures is restored, as panel B of Table 8 demonstrates. Inclusion of additional controls, some of which appear significantly related to the dependent variables in the model, does not alter the nature of these relationships.

An additional robustness check involves changing the sample. First, the sensitivity of the results to the OECD membership status of countries is checked by reestimating the model after splitting the sample into OECD and non-OECD countries. However, the results appear inconclusive since the signs on the variables of interest remain the same in both groups while the significance suffers in some cases.¹⁷ An alternative approach to checking whether the results are driven by OECD or non-OECD countries is to include an interaction term of immigrant

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¹⁵ Democracy is a dummy for regimes taking polity scores of 6 to 10 based on Marshall and Jaggers (2009). System of government is a dummy taking 1 if a country has a parliamentary system (data come from Enikolopov and Zhuravskaya 2007). Citizenship rules is a dummy taking 1 for assimilative laws (data come from Dahlin and Hironaka 2008). The assimilative laws are defined as the ones in which either parent must be a citizen in order for the child to be granted citizenship regardless of the child's actual country of birth as compared to differentialist laws where both parents must be citizens for the child to become a citizen.

¹⁶ The significance of the association between instruments and endogenous variables in the first stage is preserved throughout the estimations in this section, which are not reported in order to conserve space.

¹⁷ Results available on request.

Table 8. Including Additional Controls

Variable	Panel A: With Immigrant Share in Equation 1			Panel B: Without Immigrant Share in Equation 1		
	Private Enrollment		Education spending	Private Enrollment		Education spending
	Primary	Secondary		Primary	Secondary	
Democracy	2.2759 (7.7566)	8.9862 (8.691)	-0.3625 (0.4049)	-2.1695 (7.481)	4.7802 (8.4459)	-0.3633 (0.4049)
System	15.8807* (8.7528)	11.6752 (9.8072)	0.6746* (0.393)	21.883*** (8.0977)	17.3543* (9.1421)	0.6053 (0.3896)
Citizenship laws	5.3655 (11.8139)	4.1198 (13.237)	-0.8987*** (0.3051)	-8.0115 (7.7515)	-8.5369 (8.7513)	-0.9743*** (0.2999)
Health spending	-0.0475 (4.2865)	-0.8905 (4.8028)	0.3682*** (0.1327)	3.8123 (3.5281)	2.7615 (3.9831)	0.3486*** (0.1319)
Military spending	0.6388 (2.9534)	-1.6691 (3.3092)	-0.1996 (0.1282)	-1.0057 (2.8633)	-3.225 (3.2326)	-0.175 (0.1269)
Infant mortality	0.1222 (0.1728)	0.162 (0.1937)	-0.0016 (0.0103)	0.0932 (0.1802)	0.1346 (0.2035)	-0.0019 (0.0103)
GDP per capita	89.5945* (53.9247)	77.8963 (60.4208)	-0.8975 (3.1262)	63.689 (53.4206)	53.3857 (60.3107)	-1.3646 (3.1069)
GDP per capita squared	-5.1391* (3.1192)	-4.1623 (3.495)	0.0405 (0.1826)	-3.7698 (3.1213)	-2.8667 (3.5239)	0.0679 (0.1815)
OECD	13.4235 (14.0799)	20.4885 (15.776)	0.1666 (0.8299)	15.6622 (14.6935)	22.6067 (16.5887)	0.1731 (0.8299)
Gini	0.0252 (0.6065)	-0.2609 (0.6795)	0.055*** (0.0179)	0.6227 (0.4673)	0.3044 (0.5276)	0.0527*** (0.0179)
Population 0–14	2.7648 (2.3878)	2.1333 (2.6755)	0.0564 (0.1437)	2.498 (2.4996)	1.8809 (2.822)	0.0266 (0.142)
Density	3.0223 (4.7134)	6.5029 (5.2812)	-0.3585*** (0.1252)	-2.6604 (2.7512)	1.1262 (3.106)	-0.3994*** (0.1214)
Urban	0.0772 (0.2744)	0.0119 (0.3075)	0.0141 (0.0126)	0.3322 (0.2212)	0.2533 (0.2497)	0.0167 (0.0125)
Catholic share	0.0293 (0.084)	0.0139 (0.0942)	0.0047 (0.0047)	0.0714 (0.0828)	0.0537 (0.0935)	0.0043 (0.0047)
Communist	6.3661 (11.8772)	14.4674 (13.308)	-0.674 (0.717)	-0.0506 (11.5727)	8.3962 (13.0653)	-0.6179 (0.7158)
British colony	-0.0005 (9.0592)	0.6772 (10.1506)	-0.2849 (0.4917)	-1.7575 (9.426)	-0.9852 (10.6418)	-0.2313 (0.4901)
French colony	7.3258 (26.6363)	-2.5041 (29.8451)	-1.8783*** (0.6993)	-22.8227 (17.4879)	-31.0292 (19.7435)	-2.1047*** (0.6789)
Openness	-0.0096 (0.1402)	-0.0785 (0.1571)	0.0112*** (0.0044)	0.1403 (0.0995)	0.0634 (0.1123)	0.0116*** (0.0044)
Immigrant share	2.0081 (1.3845)	1.8999 (1.5512)	-0.0885* (0.0506)			-0.1175*** (0.0458)
Education spending	0.0627 (10.425)	-1.2811 (11.6808)		-12.127* (6.4763)	-12.8145* (7.3116)	
Average frost days			0.0366 (0.0229)			0.0226 (0.0205)
Constant	-481.5295* (257.0405)	-436.1272 (288.0052)	5.6783 (14.4576)	-313.2018 (240.7974)	-276.8631 (271.8552)	8.772 (14.2745)
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes

Table 8. Continued

Variable	Panel A: With Immigrant Share in Equation 1			Panel B: Without Immigrant Share in Equation 1		
	Private Enrollment		Education spending	Private Enrollment		Education spending
	Primary	Secondary		Primary	Secondary	
No. of observations	71	71	71	71	71	71

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

share with an OECD membership dummy in the list of controls.¹⁸ As Table 9 shows, the coefficient on it is insignificant, while its inclusion does not affect the coefficients on the variables of interest. In addition, the results reported in Table 10 appear insensitive to excluding the United States and the countries that were created since 1990 (countries created as a result of the dissolution of the Soviet Union and Yugoslavia as well as the Czech and Slovak republics, Namibia, and South Africa).¹⁹

The differences across countries in resources devoted to public education finance were captured by the share of expenditures on public education to GDP, consistent with studies that consider government education policy in other contexts (e.g., James 1993; Sylwester 2000). As it was assumed, it could affect the demand for private schooling through affecting the quantity and/or the quality of public schools (the size of student population was controlled for in the regressions). However, if this approach to measuring public education finance was imperfect, it could affect the consistency of estimates in Equation 1, where it appears as the independent variable of interest (while the approach of instrumenting is aimed at addressing similar concerns). An alternative approach would be to consider the public expenditure per pupil as a share of GDP per capita to examine the impact of public school quality on private school enrollments.

In addition, given that expenditures on public schools often benefit both levels, no distinction between expenditures directed to each level was made in the baseline regressions. However, alternatively, what might be relevant for each level of education is only the expenditure for that level.

To consider these possibilities, the model is reestimated using measures of public education expenditures per pupil as shares of GDP per capita by primary and secondary school levels (the data are obtained from the same sources as the baseline measure of public education finance). As the results reported in Table 11 demonstrate, the signs on the coefficients of variables of interest remain the same, while they are not significant in this case.²⁰ However, the reduction of sample size required to test this could explain the loss of significance.

¹⁸ While estimating the model by 3SLS, the interaction term of OECD membership dummy with immigrant shares is treated as endogenous. Following the literature (Bollen 1995; Wooldridge 2002, p. 237), the endogenous variable in the product term (immigrant share) is regressed on all exogenous variables in the first stage, and its predicted value, $\widehat{immigr}$, is calculated. Then $z \times \widehat{immigr}$ is formed as an additional instrument for the model, where z is the exogenous variable in the interaction term, the OECD membership dummy.

¹⁹ The results are also insensitive to excluding Jordan, a country with a much higher share of its population immigrant than any other country in the sample (available on request).

²⁰ The same is the case when a per capita measure of public education expenditures is used without disaggregation by school levels.

Table 9. Sensitivity to OECD Membership Status

Variable	Private Enrollment		Education Spending
	Primary	Secondary	
GDP per capita	1.832 (3.9853)	3.1108 (4.432)	0.2212 (0.3148)
OECD	2.1023 (7.4305)	-2.6873 (8.2633)	0.0364 (0.9119)
Gini	0.1134 (0.2443)	0.0015 (0.2717)	0.0042 (0.0215)
Population 0–14	-1.0993 (1.7973)	-0.0989 (1.9987)	-0.2499* (0.1431)
Density	-1.3205 (2.0479)	2.1498 (2.2775)	-0.3541** (0.1437)
Urban	0.0501 (0.1503)	-0.0752 (0.1672)	0.0001 (0.0134)
Catholic share	0.012 (0.0616)	0.0039 (0.0685)	-0.0015 (0.0054)
Communist	-16.4488** (6.6783)	-24.5785*** (7.4268)	-1.6873*** (0.5915)
British colony	10.0627* (5.7703)	5.791 (6.417)	1.1915** (0.5324)
French colony	-8.1465 (7.5937)	-11.0633 (8.4447)	-0.4098 (0.5701)
Openness	0.0911 (0.0697)	0.0598 (0.0775)	0.0125*** (0.0047)
Immigrant share			-0.1197* (0.0631)
Immigrant share*OECD			-0.0077 (0.076)
Education spending	-8.1773** (3.9149)	-8.5491** (4.3536)	
Average frost days			0.0788*** (0.027)
Constant	41.3792 (46.1307)	27.7497 (51.3007)	6.69* (3.5634)
No. of observations	82	82	82

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Responses to Different Types of Immigrants

The inflow of immigrants to the given public school system may result in turning it into a less attractive option for natives through negatively affecting their expected quality of education. This may result in less favor for public education. In addition, immigration may require larger expenditures on other publicly provided goods, resulting in smaller allocations to “softer targets” like public education. The obtained negative sign on the coefficient on immigrant share in the estimation of Equation 2 suggests the possibility of similar scenarios. However, as discussed in the introduction, immigration could also induce increased support to public education provision because of its expected positive effect on social capital. Therefore,

Table 10. Results for Subsamples

Variable	Panel A: Excluding the United States			Panel B: Excluding New Countries		
	Private Enrollment		Education Spending	Private Enrollment		Education Spending
	Primary	Secondary		Primary	Secondary	
GDP per capita	2.0693 (3.9544)	3.5556 (4.4078)	0.2412 (0.3198)	0.9896 (4.549)	1.8152 (5.0391)	-0.1321 (0.3772)
OECD	2.5358 (7.3049)	-1.9733 (8.1424)	-0.0121 (0.6415)	2.7953 (8.8404)	-2.1722 (9.7929)	0.4664 (0.7584)
Gini	0.1408 (0.2428)	0.044 (0.2706)	0.0063 (0.0222)	0.1714 (0.3106)	0.0417 (0.3441)	0.0025 (0.0274)
Population 0–14	-0.746 (1.7741)	0.3917 (1.9775)	-0.2367 (0.1472)	-0.6242 (1.9491)	0.279 (2.1591)	-0.173 (0.1543)
Density	-1.1526 (1.9835)	2.3274 (2.2109)	-0.3509** (0.1438)	-0.63 (2.221)	3.4155 (2.4603)	-0.2589 (0.1587)
Urban	0.0532 (0.1465)	-0.0726 (0.1633)	0.0001 (0.0134)	0.0866 (0.1785)	-0.0132 (0.1977)	0.0073 (0.0163)
Catholic share	0.0133 (0.0601)	0.0048 (0.0669)	-0.0015 (0.0053)	-0.0032 (0.0776)	-0.0068 (0.0859)	-0.0006 (0.0062)
Communist	-14.8582** (6.6261)	-22.3714*** (7.3858)	-1.6716*** (0.5964)	-13.0669 (7.984)	-18.97** (8.8442)	-1.8543*** (0.6654)
British colony	10.7448* (5.8388)	6.9379 (6.5082)	1.2566** (0.5562)	10.2874 (6.3287)	6.8042 (7.0105)	1.2738** (0.6396)
French colony	-6.8395 (7.396)	-9.3284 (8.244)	-0.3484 (0.5835)	-7.49 (8.3434)	-9.9378 (9.2423)	-0.3342 (0.6221)
Openness	0.0791 (0.0677)	0.0441 (0.0754)	0.0122*** (0.0047)	0.0629 (0.0747)	0.0155 (0.0827)	0.0109** (0.0052)
Immigrant share			-0.1236** (0.0602)			-0.1105* (0.0613)
Education spending	-7.5456** (3.7376)	-7.8245* (4.1662)		-7.0107* (3.8804)	-7.0668* (4.2984)	
Average frost days			0.0826*** (0.0273)			0.0806*** (0.0284)
Constant	29.4639 (46.3382)	10.9426 (51.6509)	6.1976* (3.7458)	31.2204 (51.8619)	19.327 (57.4491)	7.6722** (3.8613)
No. of observations	81	81	81	65	65	65

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

the documented negative effect of immigrant share on public education spending could be due to the relative strength of the former motives over the social capital motive. Alternatively, the suggested concern for social capital is not a motivating factor in responses to immigrants.

Public education has an important role in instilling common norms that lower transaction costs and reduce social tensions between different population groups. Therefore, the importance of social capital motive in favoring public education spending should be particularly applicable to culturally distant immigrants, while the other mechanisms suggested to motivate the responsiveness of public education spending to immigrant share of population should be broadly applicable to all immigrant types. To consider this, estimations are carried

Table 11. Results with Alternative Public Education Spending Measures

Variable	Private Enrollment		Education Spending	
	Primary	Secondary	Primary	Secondary
GDP per capita	2.0311 (6.6049)	−1.1245 (4.9657)	2.8557** (1.433)	−0.7798 (3.31)
OECD	5.2723 (8.6731)	−3.9347 (9.4483)	0.8956 (2.6959)	0.957 (6.2279)
Gini	0.0629 (0.2927)	−0.2219 (0.3137)	0.0448 (0.0826)	0.0839 (0.1885)
Population 0–14	−0.5287 (1.8557)	−0.4039 (2.1403)	−0.497 (0.5363)	−1.7298 (1.2358)
Density	0.5191 (2.0124)	5.1727** (2.1571)	−0.5148 (0.5804)	−0.9348 (1.3332)
Urban	0.0269 (0.1924)	−0.0735 (0.1849)	−0.0789 (0.0534)	−0.1816 (0.1251)
Catholic share	0.0491 (0.0666)	0.0307 (0.0732)	0.0082 (0.0207)	0.0231 (0.0473)
Communist	−12.7329* (7.07)	−27.0456*** (8.0937)	−5.8213** (2.3707)	−19.1836*** (5.4084)
British colony	8.5378 (6.1031)	6.8765 (6.4376)	0.6059 (2.0584)	2.7789 (4.8096)
French colony	2.8204 (8.559)	5.0787 (10.251)	5.1058** (2.4087)	19.2823*** (5.5045)
Openness	0.0083 (0.0603)	−0.0428 (0.0658)	0.012 (0.0179)	0.0302 (0.041)
Immigrant share			−0.1861 (0.2144)	−0.1695 (0.5287)
Education spending	−1.4768 (1.2436)	−0.5705 (0.4729)		
Average frost days			0.2952*** (0.1013)	0.8129*** (0.2311)
Constant	14.0391 (47.053)	46.1423 (56.5743)	−1.5629 (15.2694)	55.5855 (35.5265)
No. of observations	67	67	67	67

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

out, including immigrant shares disaggregated on the basis of their possession of a common language with that of the host country. This is generated on the basis of the same data that was used to estimate a gravity model to generate an instrument for immigrant share. As the results reported in Table 12 indicate, the negative effect of immigrant share on public education expenditures is driven by the response to immigrants who share a language with the host country. This could happen, as discussed earlier, because of an expectation of decreased public expenditures per pupil or because of the requirement for larger expenditures on other publicly provided goods as a result of the inflow of immigrants. The coefficient on the share of immigrants speaking a different language is insignificant while positive, confirming the intuition on the dominance of the motive of social capital in public education funding in the case of culturally distant immigrants.

Table 12. Responses to Different Immigrants

Variable	Private Enrollment		Education Spending	Private Enrollment		Education Spending
	Primary	Secondary		Primary	Secondary	
GDP per capita	0.788 (3.3499)	3.6674 (4.1793)	−0.0392 (0.3581)	0.6793 (3.3507)	3.4693 (4.1813)	0.2119 (0.3253)
OECD	1.4065 (6.4208)	−2.3163 (8.0225)	0.1904 (0.6915)	1.3341 (6.421)	−2.4484 (8.0229)	1.0808 (0.8411)
Gini	0.1011 (0.2117)	0.008 (0.2645)	0.0033 (0.0229)	0.0999 (0.2117)	0.0057 (0.2645)	0.0159 (0.0219)
Population 0–14	−0.5444 (1.4915)	−0.3947 (1.8594)	−0.1878 (0.1453)	−0.4866 (1.492)	−0.2894 (1.8607)	−0.1548 (0.1449)
Density	−0.3723 (1.5978)	1.6442 (1.9846)	−0.2403 (0.1474)	−0.2735 (1.5992)	1.8242 (1.9882)	−0.3094** (0.1486)
Urban	0.0755 (0.1287)	−0.0888 (0.1608)	−0.0027 (0.0143)	0.0782 (0.1287)	−0.0839 (0.1608)	−0.0137 (0.0136)
Catholic share	0.0255 (0.0523)	−0.0033 (0.0653)	0.0073 (0.0069)	0.0269 (0.0523)	−0.0007 (0.0653)	0.0047 (0.0059)
Communist	−13.9236*** (5.4117)	−25.9248*** (6.7375)	−2.2882*** (0.6798)	−13.6607** (5.4146)	−25.4455*** (6.7449)	−1.5849*** (0.6058)
British colony	8.6791* (4.8758)	6.5287 (6.0848)	1.1382* (0.6027)	8.535* (4.8768)	6.266 (6.0873)	0.8358 (0.5288)
French colony	−5.105 (6.0984)	−12.6849* (7.5883)	0.0156 (0.6688)	−4.7884 (6.1021)	−12.1076 (7.5979)	−0.4918 (0.5852)
Openness	0.06 (0.0548)	0.0764 (0.0682)	0.0095* (0.0049)	0.0568 (0.0549)	0.0705 (0.0683)	0.0112** (0.0048)
Same-language immigrant			−0.2261* (0.1351)			
Different-language immigrant			0.1589 (0.1026)			
Developed-country immigrant						−0.2995** (0.1355)
Developing-country immigrant						0.0961 (0.064)
Education spending	−5.3074** (2.4513)	−10.0792*** (2.9897)		−5.0087** (2.4596)	−9.5345*** (3.0113)	
Average frost days			0.0411 (0.0293)			0.0444 (0.0274)
Constant	25.8295 (37.9378)	36.0401 (47.2729)	7.2153* (3.8304)	24.2107 (37.9536)	33.0887 (47.3132)	4.7419 (3.6137)
No. of observations	82	82	82	82	82	82

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

In addition, immigrants from poor countries may pose a stronger threat to social cohesion if deprived of public education. Given this, models with immigrant shares disaggregated on the basis of developed/developing status of their countries of origin are also estimated. The results reported in Table 12 demonstrate a strong negative response of public education spending to immigrants from developed countries. The sign on the coefficient on immigrants from developing countries is positive; however, it is insignificant. This suggests that the perceived threat to social capital may be particularly applicable to those coming from developing countries. In all specifications, the decrease in expenditures on public education leads to higher enrollments in private schools.²¹

4. Summary

Using a data set of a large sample of countries, this article quantified the implications of immigrant share on education outcomes. The key finding is that immigrant share leads to an increase in private school enrollment through negatively affecting expenditures on public education. The results also suggest that public spending reacts to the presence of culturally similar immigrants and to those from developed countries. No decrease in spending toward culturally distant immigrants and to those from developing countries is found. This is arguably due to the recognition of the stronger threat imposed by the later groups to social cohesion and the role of public school systems in addressing it.

Since the data are at the cross-country level, it might have been that immigrant share and public expenditures on education were caused by some unobserved variables. A novel identification strategy to study the causal impact of immigration was proposed to deal with that concern. The results at each step have been robust and significant both statistically and economically.

The findings in this article are important for a number of reasons. They suggest that immigrant intake is likely to diminish the level of public education provision. If the resulting flight from the public school system does not compensate for the loss of per person resources for those who remain at public schools, this is likely to negatively affect the quality of education and through it the labor market outcomes of those who remain at public schools. Given that it may often be the most able students, typically from families with high socioeconomic status, who shift to private schools, those at public schools will also remain with fewer opportunities to gain from peer groups. In addition, even though the decrease in public education spending is

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²¹ A set of six instruments are used to deal with the endogeneity of two immigrant shares in each of the regressions. They are generated using the approach by Frankel and Rose (2002) described earlier. Each of the six variables, including differences in GDP per capita, distance, population, area, common language, and border dummies, are used as single gravity determinants leading to six independent instruments. The difference between the baseline instrument and a generated instrument and the other five generated instruments is used to estimate the models. The results reported in Table 12 are those where the difference between the baseline instrument and the generated instrument based on border dummy is combined with generated instruments with the remaining five gravity controls. This choice is motivated by the quality of the first-stage estimation results. In particular, the first-stage *F*-statistics of joint significance of the coefficients on instruments for immigrant shares are 2.81 and 4.73 in the case of disaggregation by language and 8.96 and 3.97 in the case of disaggregation by developed/developing status of immigrant sending countries. Moreover, in both cases, the results of the simple overidentification test imply that the hypothesis of a zero correlation between instruments and error term cannot be rejected. The results are qualitatively similar but have varying significance levels when a different combination of instruments is used.

not in response to more “distant” immigrants, the socializing role of the public school system is of significance in more homogeneous settings and will suffer because of the decrease in funding.

This is particularly problematic for immigrants because of the resulting costs of decreased opportunities to develop the social skills necessary for their successful career at school and beyond. It, in turn, may threaten the success of immigration policies, as immigrants who do not achieve their potential and have problems in adapting to the local setting may cost more than they may contribute to the economy. Of course, it may well be possible that a decrease in public education funding is for the benefit of providing support in other directions relevant to immigrant adaptation. Therefore, more research needs to be conducted on the effects of immigrants on other policies in order to draw more generalizable conclusions about the impact of immigration on public welfare.

Appendix

The data set covers up to 82 countries in 2000. In the case of some variables, the data are spliced on the basis of multiple sources. First, the data from the source with the largest number of observations are taken as the base. Second, for each country, over a period for which data were found, the average of the ratio of that data and the data coming from each of the other sources is taken, and the missing values are replaced with the data from those sources adjusted with the respective ratios. The order of replacement of the adjusted data from other sources is based on the degree of correlation of that data with the one from the main source. Finally, for each variable where any missing values remain, they are replaced with data from the preceding or the following year. The final data set is available on request.

Out of the endogenous variables in the model, measures of private school enrollment and public education expenditures are obtained following this procedure. The possibility of its introducing a measurement error in variables is of particular importance for the measure of public education expenditures since it is one of the independent variables of interest for this study. In this case, the data from the World Bank (2007) are used as the base, and the missing values are replaced with adjusted data from, first, the World Bank (2004) and, second, Rose and Spiegel (2009), leading to the addition of missing observations for four and five countries, respectively. In all cases, correlation coefficients for data across different sources are well above 0.9. In the final round, missing values for six countries are replaced using the data from the preceding and following years. When regressions are run avoiding this step for all variables involved, the results look similar, while they lose in significance because of a reduction of the sample size.

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