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Impact of Duration of Primary Education on School Enrollment, Graduation and Drop-outs: A Cross-Country Analysis

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Impact of Duration of Primary Education on School Enrollment, Graduation and Drop-outs: A Cross-Country Analysis *

Luis Díaz-Serrano and Jessica Pérez-Reynosa †

Abstract

Using a panel data for non-OECD countries covering the period 1970-2012, this chapter analyzes the impact of the duration of primary education on school enrollment, drop-out and completion rates. The empirical results show that for children in elementary school one additional grade of primary education have a negative impact on the enrollment rate, while the effect on drop-outs is positive. Analogously, it is obtained that an additional grade in primary education reduces the enrollment rate in secondary education. These results are in line with the fertility model approach, that is, in developing and underdeveloped countries parents do not have incentive to send children to school given the high perceived economic value of children.

1 Introduction

The acquisition of education is a significant and indivisible investment, where individuals incur in costs at the present time in return for rewards in the future. Consequently, individual schooling attainment is largely constrained by family resources and influenced by factors affecting the costs and benefits to households of sending children to school. For developing and underdeveloped countries, parental preferences play a crucial role in these schooling decisions, since families have to choose between sending children to work or keeping them in the school (Bursztyn and Coffman, 2012). Hence, costs to the family include not only the direct costs of school attendance but also the opportunity cost, namely, foregone earnings of time spent in school instead of in alternative productive activities.

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Since the relative costs incurred by families can constitute an impediment to acquiring education because of the presence of borrowing constraints, mainly in developing countries, empirical evidence suggests a direct link between schooling costs and school attendance. For example, some of them report dramatic increases in school enrollment with initiatives to eliminate school fees (Kremer, 2003) and to reduce costs associated with accessing schooling (Kremer et al., 1997; Duflo, 2001). However, to the best of our knowledge, previous studies do not pay attention to the implications of the opportunity cost which is an important factor influencing the decision to send children to school, specially in developing countries.[1] One reason why families might choose not to send children to school is low perceived returns of attending school (Edmonds and Pavcnik, 2005).

In this context, an increase in the duration of primary education makes enrollment decision more difficult for parents and foregone earnings to have a greater say in the decision. Educational reforms that a government can carry out in order to delay leaving school can be translated into both, an increase in direct expenditures on tuition, books or transportation and in the opportunity cost by staying an extra year in primary school, especially affecting students from a certain age that may have the option to work. Thus, a reform in the number of years an individual must spend in the school system could imply an increase in the drop-out rate (or decrease in school enrollment in the following educational level, i.e., secondary), since an additional year not only involves a greater allocation of resources to education by government but also by families. On one hand, schools are required to deal with a significantly enlarged student body and this can create logistical problems with staff and classroom numbers. On the other hand, families "loose" another economically active member for one more year. The latter is especially problematic if family income is near to a subsitence level.

Considering that from a empirical point of view little is known on the extent to which a reform of the number of years (grades) of schooling could have an impact in terms of attendance for primary and secondary education, the aim of this paper is to evaluate the impact of duration of primary education, which is compulsory in most of the countries, on school enrollment, graduation and drop-out rates. We use enrollment rates given that student attendance in school is a key indicator of whether countries or regions are improving educational systems and also, are good proxies for measuring school quality.

[1]The literature analyzing the impact of the opportunity cost is mainly focused on high school graduates who face the decision to enroll in college or get a job (Hansen, 1963; Catsiapis, 1987; Cameron and Taber, 2004). Therefore, students are who plan their investment in education, contrary to what is considered in this paper where parents are the decision makers.

In our study we exclude developed countries since they use other mechanism in order to avoid drop-outs and parent's decision of sending children to school is based on different criteria to that of developing and underdeveloped countries, where child labor is more common. We focus on developing and underdeveloped countries where the context is different and the opportunity cost for families can be substantial because most of working children are employed by their parents (especially in rural areas) rather than in manufacturing establishments or other forms of wage employment (Edmonds and Pavcnik, 2005). Furthermore, empirical evidence supports the importance of borrowing constraints for developing countries affecting children's progression through the primary school system and cause them to withdraw from school earlier (Jacoby, 1994). Although education is compulsory and free for almost all children, the law in these countries is loosely enforced.[2]

Using cross-country panel data covering the period 1970-2012, we find that for children in elementary school one additional grade of primary education have a negative impact on the enrollment rate, while the effect on drop-outs is positive. We also observe that an additional year (grade) in primary education reduces the enrollment rate in secondary education. These results are in line with fertility models and indicate that families in developing and underdeveloped countries do not have incentive to educate their children, because they need them for providing resources to the household. Therefore, to the extent that children represent a high economic value and families face the decision to invest in their education or send them to work and gain from their earnings in a setting of borrowing constraints, policies increasing the duration of primary education may not have the desired effect as in developed countries. Although previous literature provides evidence that increasing compulsory schooling in developed countries have positive returns in terms of earnings and non-pecuniary outcomes (school externalities), this may not apply for developing and underdeveloped countries where children earnings are one component of the household income and in many cases represent the support of the entire family.

The rest of the paper is structured as follows. The next section provides the conceptual framework of our study. Section 3 presents an overview of related literature. Section 4 describes the econometric strategy and data. Section 5 presents the empirical results. Finally in Section 6, we discuss our main findings.

[2]For instance, in Brazil "...Although working is only legal at the age of 16, over 15 percent of 15-year-old children from the bottom quartile households in the income distribution were not enrolled in school in 2006, and over 22 percent reported having a job during the week they were interviewed for the 2006 PNAD..." (Bursztyn and Coffman, 2012, p. 365)

2 Conceptual Framework

Schooling decisions occur largely while the person is still a child and living with her parents. From the theoretical point of view, the standard approaches for schooling decisions consider either a single decision-maker, parents making the decision for their children or dynasties with unified utility functions. Ota and Moffatt (2007) identifies three broad approaches to the modeling of the determinants of children's schooling: *human capital investment model*, *demographic models* and *fertility decision models*.

The first approach is the *human capital investment model*, parents are assumed to make the decision by maximizing their lifetime utility which depends on consumption in two periods, subject to an inter-temporal budget constraint.[3] This model is often used to explain the lower school enrollment for girls than for boys (see Psacharopoulos and Woodhall, 1985; Haddad et al., 1997). Since the choice between schooling and work is assumed to be made by an individual agent, the effect of the household situation, particularly those of an individual child's position within the household, are not fully taken into account.

The second approach is that of *demographic models*. These establish link between the demographic characteristics of a child (e.g. number of siblings, birth order) and their educational attainment (as measured by test scores, completed years of schooling or earnings). In these models, two theories are tested. The first is the "resource dilution effect" which predicts that the more children there are in the household, the lower the educational quality, since the resources of the household, in terms of both material resources and parents' attention, are diluted. The second theory, the "teaching effect", predicts that the presence of siblings has a positive influence on educational achievement through the benefit of either teaching younger siblings or being taught by older siblings. Empirical studies which include the number of children in the household as an explanatory factor tend to support the resource dilution effect, which is also suggested by the fertility decision model. However, when birth order is included as a variable, the results are mixed for both resource dilution and teaching effects (see Kessler, 1991; Travis and Kohli, 1995). Using data from Peru, Patrinos and Psacharopoulos (1997) find that having a greater number of younger siblings implies less schooling, more age-grade distortion in the classroom and more child labor. Related studies are

[3] In the first period, they either invest in children's education or send them to work and gain from their earnings. In the second period, parents become economically inactive and rely on the economic support of their children, whose incomes depend on educational level.

Knodel et al. (1990) and Knodel and Wongsith (1991).[4]

The third approach, *fertility decision model*, is precisely the conceptual framework we adopt in this paper. This model is based on household production models and assumes that high fertility in developing countries results from the high perceived economic value of children and investigates what drives a transition in parents' preference of children. Following from this theoretical contribution some empirical work has been undertaken. These studies typically examine a household's joint decision on how many children to have; how children's time is allocated between schooling, wage work and family work; and how resources are distributed among household members (see e.g. De Tray, 1980; Mueller, 1984). This approach can be used to identify which types of household are more likely to choose to educate their children, particularly to the case of the schooling choice in rural areas. Our paper can be framed in this third approach.

3 Literature Review

A large literature investigates the causal effect of years of compulsory schooling (either primary or secondary) on pecuniary and non-pecuniary outcomes. Using compulsory laws as an instrument to analyze this effect, several papers have consistently documented gains to adult outcomes from an additional year of schooling in developed countries. In terms of earnings, Angrist and Krueger (1991) and Acemoglu and Angrist (2001) using data from United States (U.S.), estimate that annual adult earnings are about 10 percent higher for students compelled to stay a year longer in compulsory education. Harmon and Walker (1995) and Oreopoulos (2006) find about 14 percent higher earnings from school compulsion in the United Kingdom. Regarding non-pecuniary outcomes (schooling externalities), Lochner and Moretti (2004) estimate that compulsory schooling in U.S. lowers the likelihood of committing crime or ending up in jail. Black et al. (2004) find that compulsory schooling reduces the chances of teen pregnancy in the U.S. and Norway. Meanwhile, Lleras-Muney (2005) estimates an additional year of compulsory schooling substantially lowers the probability of dying among elderly people in the United States.

Despite of the fact that there is an extensive literature that addresses the issue of the impact of an additional year of schooling on future outcomes in the long-run (earnings or lifetime wealth), previous papers have not yet considered which is the effect in the short-run in terms of school attendance and drop-outs. As far as we are aware, this paper is the first analyzing the potential

[4]These literature is framed into the demographic approach.

effect of the changes in the duration of primary education on school enrollment, graduation and drop-out rates.[5]

Since education involves an investment decision, an additional year of schooling implies some cost for both, families and government. Empirical research in this field links schooling decisions with both direct or indirect costs of sending children to school. As pointed out earlier, the direct costs of schooling include school fees, books, uniforms and commuting costs. Some studies have found a direct link between these directs schooling costs and school attendance. Kremer et al. (1997) evaluate a randomized intervention providing uniforms to students who would otherwise need to pay for uniforms in Kenya. After five years, students with the free uniforms had completed 15 percent more schooling. Also, the drop-out rate was 6.8 percent at program schools, and 16.5 percent in comparison schools. The analysis suggests that reducing school fees would reduce drop-out rates. In a related study, Deininger (2003) evaluates the impact of "Universal Primary Education" program in Uganda which dispensed with fees for primary enrollment. He finds that a dramatic increase in primary school attendance and a substantial reduction in inequalities in attendance related to gender, income, and region were associated with the program.

The indirect schooling costs, such as the costs associated with accessing schooling, may also be important. Duflo (2001) finds a large increase in schooling attainment accompanying a school construction program in Indonesia that would have lowered the commuting costs of schooling dramatically. For Mexico, Schultz (2004) examine the impact on school enrollment of a school subsidy program in poor rural communities in Mexico called *Progresa*. He finds an average increase in enrollment of 3.4 percent for all students in grades 1 through 8; the increase was largest among girls who had completed grade 6, at 14.8 percent.[6] Another relevant indirect cost of schooling is foregone income of the child while going to school. Households may also be forced to keep children away from school because their income is close to the subsistence level. In Becker's (1965) model of household production and consumption, the opportunity cost of an individual's time is the marginal value of her or his output in alternative valued activities at home or family business, such as farming. Thus, for these families if the net return to human capital investment is too low compared to investment in other assets, children may be sent to work instead of attending school. Jacoby (1994) investigates the effect of borrowing constraints by looking at how quickly children, with different family

[5]Most related to our work, Krashinsky (2006) studies the effect of elimination of the fifth year of high school in Ontario, Canada on academic performance in first-year university courses. He finds that cohorts with four years of high school had substantially lower grade point averages in college than those who attended high school for five years.

[6]See Kremer, 2003 for a summarize of evaluations of educational programs in developing countries.

backgrounds, progress through the primary school system in Peru. In the Model, children from very high income households or with very low (initial) opportunity costs attend school full-time for essentially their entire educational careers. But, children with a high opportunity cost relative to household income may start school with only part-time attendance. He empirically finds that children start withdrawing from school earlier in households with lower income and durable good holdings and when children are more closely spaced.

4 Empirical Strategy and Data

4.1 Empirical Model

To evaluate and test the link between the duration of primary education and various educational outcomes such as school enrollment and drop-outs rate, we use a panel data of non OECD countries covering the period 1970-2012 and estimate the following linear model:

$$y_{it} = \alpha + DURPRIM_{it}\gamma + \mathbf{X}_{it}\beta + \mu_i + \varepsilon_{it}; \tag{1}$$

where y_{it} is the educational outcome in country i at time t; X_{it} is a matrix containing a set of covariates; μ_i is a country fixed-effect that allows us to control for country's unobserved heterogeneity (such as history and culture that might affect global macro-trends such as rising levels of educational attainment); ε_{it} is a time-varying error term, and α, γ and β are a set of parameters to be estimated. $DURPRIM_{it}$ refers to the duration of primary education in country i at time t. In these equation, our main coefficient of interest is γ, which picks-up the effect of the duration of primary education on the level of enrollment and drop-outs. Equation 1 is estimated using a linear fixed-effect panel data model.

Since we are mainly interested in analyzing the impact of policies changing the duration of primary education, we also consider changes in the level of these outcomes and inputs. Equation 2 explains the impact of reforms aimed at changing the duration of primary education on educational outcomes of the population:

$$\Delta y_{it} = \alpha + y_{it-1}\delta + \Delta DURPRIM_{it}\gamma + \Delta\mathbf{X}_{it}\beta + \mu_i + \varepsilon_{it}; \tag{2}$$

In both equations, our outcome variables (y_{it}) are the school enrollment rate in primary and secondary education, and the completion rate and drop-outs rate in primary education. In Equation 2, we include the endogenous variable lagged one period ($y_{i,t-1}$) since the speed of growth in

the explained variable depends on the level of this variable the previous year, i.e, those countries that have higher enrollment rates at $t-1$ will grow at a lower rate from $t-1$ to t.

By construction, $y_{i,t-1}$ is correlated with the error term, which generates a severe problem of endogeneity. In addition, the estimation of Equation 2 may present other econometric problems such as the country-specific effect and the presence of non-strictly exogenous variables. In order to overcome these problems, the strategy used to estimate this equation is the following. First, by differencing the equation the country-specific effect μ_i is removed. However, differencing means that even strictly exogenous variables can become endogenous, in addition to the presence of non-strictly exogenous variables. Therefore, our core specifications will include not only correlated and heteroskedastic residuals, but also non-strictly exogenous and endogenous variables as covariates. In this context, a fixed-effects model with the Newey–West corrected covariance matrix provides consistent estimates of the standard errors in the presence of serial correlation and heteroskedasticity in the residuals. However, the presence of endogenous covariates creates severe identification problems in the econometric estimation that in turn lead to inconsistent estimate of the model. To deal with this problem, we use a variant of the Arellano and Bond (1991) GMM estimator. More specifically, we compute a two-step GMM estimator which provides consistent and robust parameters to heteroskedasticity and serial correlation.[7] However, the two-step estimator computes standard errors that are downward bias. In order to fix this, we apply the finite-sample correction of the two-step covariance matrix proposed in Windmeijer (2005).

The consistency of the GMM estimator depends on whether the lagged values of the explanatory variables are valid instruments in the regression and the error term is not serially correlated. The validity of these assumptions is addressed by using different specification tests. For the validity of the instruments, we use the Hansen test of over-identifying restrictions where the null hypothesis is the joint validity of the instruments.[8] The Hansen J statistic replaces the Sargan test used in the original one-step Arellano-Bond estimator, since the Hansen test is robust to heteroskedasticity or autocorrelation.[9] In order to test the hypothesis of the absence of first and second-order serial correlation in the first differenced residuals, we use the Arellano-Bond test for autocorrelation.

[7] See Roodman (2009) for details.

[8] Under the null hypothesis the statistic follows a chi-square where the degrees of freedom are determined by the number of instruments used in the estimation.

[9] See Roodman (2009) for details.

4.2 Data

The empirical analysis draws on a variety of datasets. We assemble a database that contains information on population's educational attainment at country level, income per capita and other country characteristics. We use World Bank data which provides various measures on educational outcomes (completion rates, drop-outs and enrollment rates) at country level, per capita income and composition of the population.[10] Polity IV data provides a measure of democracy.

Our outcome variables are completion, drop-out and enrollment rates which are useful for comparative research. *Primary Completion Rate* ($PCRT$) is the total number of new entrants in the last grade of primary education, regardless of age, expressed as percentage of the total population of the theoretical entrance age to the last grade of primary.[11] *Drop-out rate* in primary school are the students or pupils who leave school definitively in a given school year, as a percentage of all students enrolled in primary school.

Gross enrollment ratios are defined as the total number of children enrolled in a level (primary or secondary education), regardless of age, divided by the population of the age group that officially corresponds to the same level. Gross enrollment ratios can exceed one-hundred percent due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition. *Net enrollment ratios* are calculated as the ratio of children of the official school age who are enrolled in a particular educational level (primary or secondary education) to the total population of the same age group.

The covariates we consider are the following. *Duration of primary* is the number of grades (years) required to complete primary education. This is our variable of interest. As controls for country characteristics we include the level of the *GDP per capita* lagged one period, and its annual growth. These two variables allows to control for differences in income across countries. Following previous authors, we also include a measure of *Democracy*, which is a dummy variable (Persson and Tabellini, 2009; Besley et al., 2011). Finally, as a control for urban bias of access to education, we include the percentage of urban population. We include this control since children living in rural areas are less likely to be enrolled in school (Deininger, 2003).

Table 2 shows summary statistics of these variables. In our sample of non-OECD countries, on average, the primary completion rate is 73.22% and the drop-out rate is about 34 %. Net and

[10] Education data comes from wbopendata available in Stata developed by Azevedo (2011).

[11] The ratio can exceed one-hundred percent due to over-aged and under-aged children who enter primary school late/early and/or repeat grades.

gross enrollment rate in primary education are 94.74% and 79.62%, respectively. For secondary education data, on average, the net enrollment rate is 53.19% and the gross enrollment is 51.97%. The duration of primary education is about 6 years. In about 41% of the country-year observations the regime is democratic. On average, the percentage of urban population is about 46%.

5 Results

Table 3 reports the results of the estimation of our core model in levels (Equation 1) for all our educational outcomes. This model is estimated using a linear panel fixed-effect model. We start by discussing the results of our variable of interest, that is, duration of primary education. We observe that the parameter associated to this variable turns out to be statistically significant and negative for primary the completion rate, but positive for the primary drop-out rate. This result indicates that for countries where duration of primary education is longer, the completion rate in primary education is lower, while the drop-out rate is higher. Regarding secondary education, we obtain that the link between duration of primary education and enrollment rate is statistically significant and negative, which means that those countries where duration of primary is longer, the enrollment rate in secondary education (gross and net) is lower. As we will explain later in more detail, these findings are in line with the fertility model approach mentioned in Section 2.

With respect to the remaining covariates, they behave as expected. Those factors that have a positive link with enrollment and graduation rates, exhibit a negative link with dropouts. We observe that those countries where the GDP per capita is higher, the completion rate in primary education and the enrollment rate in secondary education is also higher; but the drop-out rate is lower. One common hypothesis is that credit constraints limit the investment of the poor in their children's education (Schultz, 2004). Children from very low income households or with a high opportunity cost relative to household income may have lower attendance rate (Jacoby, 1994). Thus, countries with higher income levels will have higher levels of educational attainment and lower levels of drop-outs.

Similarly, we find that countries with a higher percentage of people living in urban areas have higher levels of completion rates in primary education, as well as higher levels of enrollment in primary and secondary education. This is explained by the fact that people living in rural areas, which may imply higher commuting costs, have limited access to resources and a lower concentration of schools compared to those people in urban areas, where the infrastructure tends to be

concentrated. For that reason, a higher percentage of people living in urban areas also implies lower levels of drop-outs in primary education, which is consistent with previous findings on the literature analyzing borrowing constraints and access to school in rural areas where children are employed by their parents to work on the family farm (Schultz, 2004). For countries where the political regimen is democratic, we also observe that completion rates in primary education and enrollment rates are higher, while the drop-out rate is lower. A common view, is that democratic countries have higher levels of educational attainment compared to non-democratic countries where the educational levels tend to be lower (Lipset, 1959; Barro, 1999; Glaeser et al., 2004)

In Table 4 we report the results of our model in differences (Equation 2). In this table we focus on the impact of reforms on primary educational outcomes. We estimate the model using a linear panel fixed-effects model and the Generalized Method of Moments (GMM). We begin by discussing the results of our variable of interest, i.e, the changes in the duration of primary education. Our results indicates that changes in the duration of primary education exert a statistically significant and negative impact on the annual growth in the completion and enrollment rates in primary education. Analogously, we also observe that the annual growth rate of drop-out significantly increases if the duration of primary education is lasted. These results are in line with fertility models and remain robust to different specifications and estimation methods. In a setting such as developing and underdeveloped countries where the children are perceived as a high economic value, the cost of schooling is predominantly the opportunity cost of the time a student withdraws from other activities (working) to attend school.

The remaining of the covariates also behave according to expectations. An increase in the percentage of urban population, increases the completion rate in primary education and reduces drop-outs. The growth rate of the logarithm of GDP per capita turns out to be statistically significant and positive for the growth in the completion and enrollment rates in primary education; while its impact on the drop-outs growth rate turns out to be negative. These results indicate that countries increasing their income level experience an increase in completion and enrollment rates in primary education, and a decrease in drop-outs. This means that improving the country's economic situation will turn in a decrease in children's contribution to family income because most working children live in low-income countries.

Our results indicates that laggard countries in terms of educational achievement tend to experience a greater growth rate, since we find a significant and negative effect of the initial value of our outcomes variables for all specifications. This means that those countries that have higher levels

of primary enrollment rates will grow at a lower rate than those countries that have lower levels of primary enrollment rates in $t-1$, and so on. This result is consistent in all the alternative models, fixed-effects and GMM.

In models using the GMM estimator, we report the results of the Hansen test of over-identifying restrictions on the validity of the instruments, and the Arellano-Bond test of first and second order autocorrelation.[12] While autocorrelation of first order prevails by definition, the null hypothesis of second-order autocorrelation must be rejected in order to get consistent estimators. In all models in Table 3, we find that the validity of the instruments is confirmed in all the specifications, since χ^2 statistic is not statistically significant in any model. For the autocorrelation test, we observe that AR(1) structure cannot be rejected in any of the estimated models, while the AR(2) structure is rejected in all of them. The results of both tests indicate that there is no serial correlation between the first-differenced variables used as instruments and the first differences of the residuals ε_{it}. Therefore, they are good instruments.

Table 5 presents the results of the estimation of our model in differences (Equation 1) for secondary education. This model explains the impact of changes in the duration of primary education on the enrollment rate of secondary education (gross and net). As in Table 4, we estimate this model using the linear panel fixed-effect model and the Generalized Method of Moments (GMM). Results regarding secondary education are in line with those obtained for primary education, that is, increasing the duration of primary education reduces the gross and net enrollment rates in secondary education. It applies the same reasoning as in the case of primary education. However, we consider that for secondary education the effect is easier to interpret because children are closer to the legal age to work, so their economic value is even higher than when they are in the age of attending primary education. As in Table 4, the remaining of the covariates provide the same quantitative and qualitative results.

In Table 5 we also find that the validity of the instruments is confirmed in all the specifications. Regarding the autocorrelation tests, we observe that AR(1) structure cannot be rejected in any of the estimated models, while the AR(2) structure is rejected in all of them. The results of both tests confirms the consistency of the GMM estimation.

[12]The null hypothesis is no autocorrelation and is applied to the differenced residuals.

6 Conclusions

Using a panel data for non-OECD countries covering the period 1970-2012, we analyze the impact of the duration of primary education on school enrollment, drop-out and completion rates. Our results show that for children in elementary school, one additional grade of primary education have a negative impact on the enrollment rate, while the effect on drop-outs is positive. Analogously, we obtain that an additional grade in primary education also reduces the enrollment rate in secondary education. Results stemming from this paper are in line with the fertility model approach, that is, in developing and underdeveloped countries parents do not have incentive to send children to school given the high perceived economic value of children. Thus, an increase in duration of primary education discourages their continuation in the education system. Our results indicate that this reasoning applies to both primary and secondary education.

Although previous literature provides evidence that increasing compulsory schooling in developed countries have positive returns in terms of earnings and non-pecuniary outcomes (school externalities), this will not apply for developing and underdeveloped countries where children earnings are an important component of the household income and in many cases represent the support of the entire family. Therefore, policies consisting in lasting the duration of primary education, which have been proved to be succesfull in developed countries, may fail in developing and underdeveloped since it might have an undesired impact on children educational outcomes (enrollment, graduation or drop-outs).

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Appendix

Table 1: Variables Description and Sources

Variables	Description	Source	Period Covered
Dependent Variables			
Primary Completion Rate	Percentage of students completing the last year of primary school. The ratio can exceed 100% due to over-aged and under-aged children who enter primary school late/early and/or repeat grades.	United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.	1970-2050
Primary Drop-out rate	Drop-outs in primary school are the students or pupils who leave school definitively in a given school year, as a percentage of all students enrolled in primary school.	UNESCO Institute for Statistics.	1970-2011
Gross Enrollment Rate Primary	Total enrollment in primary education, regardless of age, expressed as a percentage of the population of official primary education age.	UNESCO Institute for Statistics	1970-2050
Net Enrollment Rate Primary	Ratio of children of the official primary school age who are enrolled in primary school to the total population of the official primary school age.	UNESCO Institute for Statistics	1970-2050
Gross Enrollment Rate Secondary	Total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age.	UNESCO Institute for Statistics	1970-2050
Net Enrollment Rate Secondary	Ratio of children of the official secondary school age who are enrolled in secondary school to the population of the official secondary school age.	UNESCO Institute for Statistics	1970-2050
Independent Variables			
Duration of Primary	Number of grades (years) required to complete Primary education.	UNESCO Institute for Statistics	1970-2050
Democracy	Dummy that takes value 1 if the country is democratic.	Polity IV data	1800-2010
Log (GDP)	Log of per capita income.	World Bank data	1960-2011
Urban population(%)	Urban population refers to people living in urban areas as defined by national statistical offices.	United Nations, World Urbanization Prospects	1960-2012

Table 2: Summary Statistics

	Mean	Std. Dev.			Obs.
		overall	between	within	
Primary Completion Rate					
Levels	73.218	28.387	24.779	13.523	3173
Δ	0.983	5.550	2.410	5.381	2593
Primary Drop-out Rate					
Levels	34.407	23.193	20.299	12.592	2302
Δ	-0.599	5.476	2.772	5.284	1724
Enrollment Rare Primary					
Levels (Gross)	94.742	27.174	22.645	15.309	4941
Δ (Gross)	0.700	4.652	1.319	4.526	4449
Levels (Net)	79.619	19.785	17.966	9.494	2554
Δ (Net)	0.656	2.651	1.600	2.454	2014
Enrollment Rare Secondary					
Levels (Gross)	51.938	31.583	29.577	14.874	4180
Δ (Gross)	1.109	2.990	1.366	2.840	3587
Levels (Net)	53.194	27.473	26.394	11.153	1382
Δ (Net)	0.944	2.844	1.861	2.597	1005
Duration of Primary					
Levels	5.643	0.981	0.931	0.319	7052
Δ	0.002	0.152	0.016	0.152	6888
Democracy	0.407	0.491	0.383	0.327	4492
Log (GDP. Per cap)	7.253	1.450	1.411	0.300	5501
Urban Population (%)	45.727	24.264	23.450	6.378	6868

Table 3: Estimation Results for Primary and Secondary Education: Linear Fixed-Effect Model.

	Primary Education				Secondary Education	
	Completion Rate	Drop-out Rate	Gross Enrollment	Net Enrollment	Gross Enrollment	Net Enrollment
Duration of Primary	-4.868***	4.842***	-1.111	2.061	-4.107***	-6.136***
	(1.399)	(1.204)	(2.103)	(1.803)	(1.502)	(1.560)
$Log(GDP)_t$	12.474***	-8.034***	0.998	2.027	10.514***	11.946***
	(3.590)	(2.757)	(3.770)	(2.865)	(3.374)	(4.075)
Democracy	6.310***	-5.729***	5.661**	2.578	3.002*	3.250
	(2.180)	(1.895)	(2.787)	(2.217)	(1.523)	(2.719)
Urban population (%)	1.040***	-1.205***	0.968***	0.883***	1.355***	1.004***
	(0.190)	(0.150)	(0.203)	(0.156)	(0.130)	(0.261)
Constant	-38.579*	118.642***	48.696**	10.548	-61.015***	-50.971**
	(20.237)	(18.251)	(24.089)	(19.382)	((20.669)	(21.765)
Sample size	2397	1938	3407	1914	2919	942
No. Countries	121	121	123	122	122	101
R2 Adj.	0.484	0.512	0.239	0.367	0.628	0.664
F-stat	35.21	51.47	13.77	15.45	59.96	31.47

Notes: The outcome variables are in levels. All specifications include country-fixed effect. Standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table 4: Estimation Results for Primary Education: Effect of Changes in Duration of Primary Education.

	Completion Rate		Drop-out Rate		Gross Enrollment		Net Enrollment	
	Linear FE	GMM	Linear FE	GMM	Linear FE	GMM	Linear FE	GMM
$y_{t-1}\delta$	-0.078***	-0.062***	-0.118***	-0.100***	-0.024**	-0.121***	-0.029**	-0.086***
	(0.015)	(0.003)	(0.019)	(0.002)	(0.011)	(0.010)	(0.011)	(0.004)
Δ Duration of Primary	-0.838	-0.923***	2.710***	3.603***	-3.429**	-6.812***	-0.457	-1.028***
	(1.129)	(0.111)	(0.868)	(0.191)	(1.382)	(0.185)	(0.652)	(0.099)
$\Delta Log(GDP)_t$	3.159*	10.136***	-4.562	-7.050***	6.744***	15.972***	1.249	-0.419*
	(1.664)	(0.263)	(3.857)	(0.237)	(1.292)	(0.986)	(1.510)	(0.231)
Δ Democracy	0.360	0.619***	-3.121**	-5.101***	0.487	2.149***	0.070	-0.063
	(0.749)	(0.208)	(1.457)	(0.051)	(0.323)	(0.220)	(0.510)	(0.235)
Δ Urban population (%)	-0.271	1.824***	0.620	-0.198***	-0.145	4.100***	-0.430	-0.975***
	(0.422)	(0.224)	(0.528)	(0.061)	(0.337)	(0.316)	(0.263)	(0.095)
Constant	6.570***	4.362***	3.356***	3.136***	3.011***	9.916***	3.226***	7.979***
	(1.074)	(0.173)	(0.663)	(0.043)	(1.091)	(0.996)	(0.918)	(0.312)
Sample size	1965	1965.00	1474	1474.00	3085	3085.00	1522	1522.00
No. Countries	119	119.00	114	114.00	123	123.00	116	116.00
R2 Adj.	0.0414		0.0782		0.0313		0.0121	
F-stat	6.823		10.16		8.919		2.142	
Hansen Test (stat.)		114.11		109.69		109.15		113.64
Test AR(1) (z-stat.)		-3.68		-5.07		-5.11		-4.38
Test AR(2) (z-stat.)		1.11		0.72		-0.25		1.24

Notes: The outcome variables are in first differences. This Table reports the results using linear panel fixed-effect model and the GMM estimation method. All specifications include country-fixed effect. Standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table 5: Estimation Results for Secondary Education: Effect of Changes in Duration of Primary Education.

	Enrollment Rate Secondary (Gross)		Enrollment Rate Secondary (Net)	
	Linear Fixed-Effect	GMM	Linear Fixed-Effect	GMM
$y_{t-1}\delta$	-0.016**	-0.009***	-0.040*	-0.015***
	(0.007)	(0.002)	(0.020)	(0.001)
Δ Duration of Primary	-1.716**	-3.440***	-3.487**	-4.449***
	(0.763)	(0.044)	(1.621)	(0.042)
$\Delta Log(GDP)_t$	4.670***	10.413***	1.862	2.657***
	(1.244)	(0.100)	(1.821)	(0.013)
Δ Democracy	-0.071	0.095	-3.708	-5.064***
	(0.226)	(0.074)	(3.608)	(0.074)
Δ Urban population (%)	0.199	5.694***	0.074	0.535***
	(0.247)	(0.178)	(0.410)	(0.048)
Constant	1.657***	-1.193***	2.900**	1.417***
	(0.338)	(0.082)	(1.132)	(0.058)
Sample size	2517	2517.00	685	685.00
Number of Countries	122	122.00	92	92.00
R2 Adj.	0.0322		0.0830	
F-stat	5.049		3.581	
Hansen Test (stat.)		117.71		85.41
Test AR(1) (z-stat.)		-5.25		-1.69
Test AR(2) (z-stat.)		-0.17		-1.38

Notes: The outcomes variables, Gross and Net Enrollment Secondary, are in first differences. This Table reports the results using linear panel fixed-effect and the GMM. All specifications include country-fixed effect. Standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.