Is Education prejudiced by Country-Risk? A Panel-Data Study using Attainment Data and Country-Risk as a Rational Expectation

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Is Education prejudiced by Country-Risk? A Panel-Data Study using Attainment Data and Country-Risk as a Rational Expectation†

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Abstract

We consider country-risk as a determinant of education growth in a large cross-section of countries observed through time. Applying cross-country dynamic panel data estimations, we show that country-risk influences the education output growth negatively. This contributes to the literature on the educational production function, as it adds a robust determinant of that function. Among country-risks, economic risk is the most influential and among economic risks, economic growth, socioeconomic conditions and, mostly surprising, budget balance have the highest effects. This is a very robust empirical result and indicates that politicians should endeavor to decrease country-risk in order to enhance education.

Key-Words: Education, Country-Risk, Economic Growth.

JEL Codes: I21; O15; O17; O50.

† This is a paper resulting from the Master Dissertation in Economics of Nuno Ferraz, presented at Universidade da Beira Interior. This differs substantially in data, methodology and results from the article with the title 'Is Education Prejudiced by Country-Risk?', authored by us and forthcoming in the *Economic Record*.

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I INTRODUCTION

Many countries rely on education to promote economic growth, decrease unskilled unemployment and favor the general well-being. Most recent studies have showed that under some conditions education promotes economic growth (Temple, 1999, Mauro and Carmeci, 2003, Sequeira and Vilar, 2007). Moreover, education is also thought to have a role in favoring health and social integration and in decreasing marginality and criminality (Tamura, 2006; Wilson and Herrnstein, 1985). A general consensus in the labor literature is that more years of schooling leads to higher wages.

Given that education is important for both individuals and societies, one would like to know how to enhance or how to not prejudice education growth. However, the literature does not show consensus on the appropriate policies for enhancing education quantity and quality. In particular, most inputs to schooling have been found to be non-significant in micro- and in some macroeconomic studies. See Hanushek (2003) for a review on this issue.

At a country level, economic and financial risk may decrease incentives to individuals or families to invest in education, since socioeconomic conditions (risk of unemployment, risk of macroeconomic instability – inflation, high interest rate, and government debt) may expropriate the expectation for future returns to schooling. Also, political risk may deter educational investments, since government failures and takeovers, riots, terrorism, guerrilla activities or war may also decrease expected returns from education. As education is a long-run investment for which the first returns are appropriated after some years of continuous investment, it is meaningful to consider expected risk as a determinant of investments in years of schooling.

In this paper, we test if country-risk is a determinant of education growth and we found that it robustly determines education. Among different types of country-risk, economic and financial risks seem to be the most harmful to education, as they also seem to be the ones that most expropriate returns from investment in education. This has a clear policy implication: if governments want to enhance education in the country they should be aware of the economic and financial institutions' quality in the country. Previous literature is particularly scarce in considering economic risk as a determinant of education. However, some authors have not been far from this argument. For instance, Mauro and Carmeci (2003) consider that unemployment deters human capital accumulation as it prevents learning-by-doing, considering that unemployment acts as a cost for education; Hartog and Vijveberg (2007) had analyzed the effect of risk attitudes (among other factors) from individuals and schools in their investment strategies.

The paper continues as follows. In the following section, we present the data and estimation procedures. In the third section we present main results and robustness analysis. In the fourth section we conclude.

II. DATA, METHOD AND SPECIFICATION

1. Data and Sources

We use three main sources for data. First, the Barro-Lee datasets (2000, 2001) cover years of schooling in population, real government educational expenditure per pupil (as a ratio to *per capita* GDP). Second, for real GDP *per capita* (chain index), we used PWT 6.1. Third, the International Country-Risk Guide covers data for country-risk. The International Country Risk Guide Indicator (*ICRG*) is a composite indicator of risk constructed by the *PRS Group*, and comprises 22 variables in three subcategories of risk: political, financial and economic, in which the first subcategory is the one most weighted in the final index. Each indicator of risk is assigned a maximum numerical value (risk points), with a higher number of points indicating a lower potential risk for that component. The composite risk ranges from 0 to 100. We also present results based on each of the three main components of the composite index: financial, political and economic indexes. We further detail each of the indexes below.

Political Risk rating includes the following components: government stability, socioeconomic conditions (unemployment, consumer confidence and poverty), investment profile (expropriation, profits repatriation, payment delays), internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability and bureaucratic quality. Economic Risk includes GDP per head, real GDP growth, and annual inflation rate, budget balance as a percentage of GDP and current account as a percentage of GDP. Financial Risk includes foreign debt as a percentage of GDP, foreign debt service as a percentage of exports of goods and services, current account as a percentage of exports of goods and services; net international liquidity as months of import cover and exchange rate stability. These variables were measured in January of each year from 1985 to 2002.

2 Specification and Econometric Procedure

2.1 Specification and Measurement

We estimate the following equation, which specifies an education growth regression:

$$edu_{i,t} = \beta_0 + \beta_1 edu_{i,t-1} + \beta_2 classes_{i,t} + \beta_3 \exp editure_{i,t} + \beta_4 GDP_{i,t} + \beta_5 country - risk_i + t + d_t + v_i + \xi_{i,t} \quad (1)$$

The definitions of variables are as follows: *edu* means total years of education above 15 years; we also use a variable constructed by Portela (2006) - *pedu*, which decreases the measurement error in that variable and also the proportion of the population above 15 years old that attain secondary schooling – *sser*; *classes* means log of the pupil-teacher ratio averaged between the primary and secondary education level; *expenditure* means log of the government educational expenditure per pupil (as a ratio to *per capita* GDP) averaged between the primary and secondary education level; *GDP* means log of chain index real *per capita* GDP; *country-risk* means the log of the composite international country-risk guide measure ($total\_risk_i$) or alternatively the log of the indexes for economic (ec_risk_i), political (pl_risk_i) or financial risk (fn_risk_i). Moreover, t is a time trend; d represents time-dummies; v_i are the unobserved fixed effects and ξ is the error term. In some robustness analyses we also used primary years of education of the population above 25 years old ($\Pr im\_Edu25_{i,t}$) and the Black Market Premium (BMP), which are not included in equation (1), for simplicity of exposition.

The dependent variable and the first three regressors are measured in the same year, all of them in intervals of 5 years between 1960 and 2000. The country-risk enters as a fixed effect for the country, as an average between 1985 and 2004. This is done because of the lack of data to enter in five-year periods. We interpret this as education growth being dependent on the expected fixed risk for a country. The dependence of human capital on expected risk is natural, given the reasons mentioned above. The two additional and stronger assumptions are that these risk expectations are rational, in the sense that agents guess the true values, and that they are fixed within countries. These further assumptions were determined by data availability. GDP enters as five-year averages between 1960 and 2000. As an example, for education in 1960, GDP enters as the subsequent five-year (1960-1964) average.[1]

[1] We are also assuming that (as in risk) what determines education is expected GDP. The difference from the treatment of risk in regression is that this variable has time-series and cross-section variability while

In the next Table we present descriptive statistics for the variables.

Table 1. Descriptive Statistics

Variables	Observations	Average	S.D.	Min	Max
$edu_{i,t}$	923	4.828	2.838	0.086	12.049
$pedu_{i,t}$	923	5.093	2.952	-0.840	12.392
$sser_{i,t}$	950	2.684	1.125	-2.303	4.292
$\exp end_{i,t}$	410	3.009	0.740	1.047	5.810
$classes_{i,t}$	1242	2.954	0.034	2.688	3.757
$GDP_{i,t}$	918	8.164	1.068	5.718	10.537
$ec\_risk_{i,t}$	1017	3.473	0.201	2.797	3.787
$pl\_risk_{i,t}$	1008	4.099	0.241	3.342	4.526
$fn\_risk_{i,t}$	1017	3.448	0.261	2.585	3.879
$total\_risk_{i,t}$	1017	4.131	0.226	3.467	4.507

The logarithms in regressors do not change our results. We choose this specification because it smoothes the most volatile series, as can be noted by the analyses of Table 1.

2.2 Econometric Procedure

We use a system dynamic panel data *Generalized Method of Moments* (GMM) estimator developed by Blundell and Bond (1998, 2000) to estimate equations represented by (1). It is worth noting that the earlier Arellano and Bond (1991) estimator tends to be inconsistent due to weak instruments when the series for the dependent variables are persistent and a small time-series within the panel is available, which is the case in this application.

The advantages of using a dynamic model estimated by GMM are essentially three: (1) control for the individual country effects; (2) control for the possible existence of heteroskedasticity and (3) reduce the endogeneity problem, possibly caused by reverse causation, measurement error and/or omitted variables. This is appropriate as possible

risk has only cross-country variability. We also tested regressions in which GDP enters with one lag, and results do not change.

reverse causation from education to risk or expenditures per pupil may plausibly occur in our empirical exercise. Some measurement errors can also occur along with potential omitted variable bias.

However, these estimators are only consistent under two general assumptions: the validity of the moment conditions (which, according to Blundell and Bond (1998, 2000) and Bond *et al.* (2001) are not so restrictive), that first order autocorrelation does exist and that second order autocorrelation does not exist. The moment conditions for the differenced equation are the following: $E(edu_{i,t-s}\Delta\xi_{i,t})=0$ and $E(X_{i,t-s}\Delta\xi_{i,t})=0$, where $X_{i,t-s}$ includes all regressors. These moment conditions are complemented by those to the levels equation: $E(\Delta edu_{i,t-1}(\xi_{i,t}+v_i))=0$ and $E(\Delta X_{i,t-1}(\xi_{i,t}+v_i))=0$. Thus past education should not be correlated with current variations in the unobserved error term and past expenditures or risk should not be correlated with current variations in the unobserved error term. Additionally, one lagged variations of education and other covariates should not correlate with current unobserved error term and fixed-effects. This means that the level of education and covariates could in fact correlate with the fixed effect. All covariates except risk had the usual treatment for endogenous variables. However, risk is considered as exogenous. As it was considered to be fixed through time, lags of risk are not available as instruments. In a robustness test, we relax this assumption and consider exogenous (and external) instruments for risk.

To test the validity of the moment restrictions, we use the Hansen test, which tests the null under which the instruments are valid. Thus, the model is valid if we do not reject the null. We also present autocorrelation tests on the null of no autocorrelation. In particular, the AR(1) test on the differenced residuals should be rejected and the AR(2) test should not be rejected. To avoid the overfitting bias that can arise from the consideration of an excessive number of instruments in this estimator, we always considered as instruments the maximum number of lagged variables that allowed for the number of instruments to remain below the number of cross-section observations in each regression.

III. RESULTS

1. Benchmark Regression Results

We begin by presenting results on the estimation of equation (1) using the original Barro-Lee's variable on total years of education in the population above 15 years old. Then we present a table in which regressions use the corrected years of education in the population above 15 years old (from Portela, 2006) as the dependent variable. Finally, we use the per cent of population that attain the secondary year of schooling as the dependent variable.[2]

Table 2. Regressions for Years of Education in Population above 15

Dependent Variable: $edu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$edu_{i,t-1}$	0.966***	0.909***	0.933***	0.936***	0.912***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\exp end_{i,t}$	-0.224	-0.198	-0.164	-0.163	-0.139
	(0.123)	(0.184)	(0.251)	(0.246)	(0.366)
$classes_{i,t}$	0.610**	0.272	0.272	0.258	0.218
	(0.025)	(0.257)	(0.134)	(0.266)	(0.365)
$GDP_{i,t}$	0.405***	0.088	0.197	0.124	0.100
	(0.006)	(0.515)	(0.156)	(0.331)	(0.468)
Trend	0.079	0.086	0.065	0.096	0.077
	(0.265)	(0.237)	(0.368)	(0.182)	(0.288)
$total\_risk_{i,t}$	--	1.161**	--	--	--
		(0.030)			
$pl\_risk_{i,t}$	--	--	0.462	--	--
			(0.443)		
$ec\_risk_{i,t}$	--	--	--	0.731**	--
				(0.022)	
$fn\_risk_{i,t}$	--	--	--	--	0.813**
					(0.050)
$N.T$	291	268	262	268	268
N	76	70	69	70	70
Number of Instruments	70	60	60	60	60
Specification Tests:					
Hansen (p-value)	0.183	0.358	0.313	0.477	0.460
AR (1) (p-value)	0.000	0.000	0.000	0.000	0.000
AR (2) (p-value)	0.106	0.220	0.286	0.233	0.243

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

[2] We have also tested the use of enrolments at the secondary level (from the World Development Indicators, 2001 and 2004) as a dependent variable. However, we only reached near 60 observations in regressions. Although we reached significant results for risk, we do not think presenting this lower sample results will contribute to the point of the article. Thus they are omitted them but they are available upon request.

The first column in the table shows a benchmark equation in which expenditures are not significantly related to education output, as also is common in previous empirical micro literature on the determinants of schooling and GDP is highly significant in determining education output. When total risk is introduced it becomes the unique significant determinant of education output, making classes and GDP become non-significant determinants of education. This also happens in columns 3 and 4 in which economic and financial risk is introduced. Quantitatively, we can say that an increase in the log of economic risk of 0.2 (one standard-deviation) would lead to an increase of almost 2 months in education in the population above 15 years old.

In the next table, we present regressions in which the dependent variable is the same, but corrected from its measurement error (by Portela, 2006).

Table 3. Regressions for Years of Education in Population above 15 (corrected)

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$pedu_{i,t-1}$	0.981***	0.920***	0.929***	0.942***	0.924***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\exp end_{i,t}$	-0.143	-0.068	-0.079	-0.045	-0.013
	(0.244)	(0.608)	(0.535)	(0.720)	(0.923)
$classes_{i,t}$	0.575**	0.235	0.289	0.227	0.204
	(0.016)	(0.224)	(0.154)	(0.223)	(0.268)
$GDP_{i,t}$	0.347**	0.083	0.168	0.123	0.111
	(0.014)	(0.490)	(0.166)	(0.285)	(0.368)
Trend	-0.032	0.000	0.009	0.001	-0.010
	(0.665)	(0.995)	(0.906)	(0.988)	(0.904)
$total\_risk_{i,t}$	--	0.964*	--	--	--
		(0.052)			
$pl\_risk_{i,t}$	--	--	0.487	--	--
			(0.329)		
$ec\_risk_{i,t}$	--	--	--	0.549*	--
				(0.058)	
$fn\_risk_{i,t}$	--	--	--	--	0.612
					(0.103)
$N.T$	291	268	262	268	268
N	76	70	69	70	70
Number of Instruments	70	60	60	60	60
Specification Tests:					
Hansen (p-value)	0.550	0.693	0.689	0.749	0.682
AR (1) (p-value)	0.000	0.001	0.001	0.001	0.001
AR (2) (p-value)	0.270	0.479	0.729	0.485	0.513

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

In this table the significant effect of risk in education is due only to economic risk.

In the next table we show results based on regressions in which the dependent variable is the proportion of population with secondary education. As the AR(2) rejects the null of no second order autocorrelation, when necessary we begin to use instruments at the third lag and thus report the AR(3) test.

Table 4. Regressions for Proportion of Population above 15 with secondary education

Dependent Variable: $sser_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$sser_{i,t-1}$	0.831*** (0.000)	0.717*** (0.000)	0.764*** (0.000)	0.722*** (0.000)	0.723*** (0.000)
$\exp end_{i,t}$	-2.785* (0.093)	-4.480** (0.038)	-1.754 (0.310)	-1.154 (0.310)	-3.401** (0.061)
$classes_{i,t}$	3.569** (0.252)	1.403 (0.768)	4.217* (0.098)	3.071 (0.258)	1.182 (0.795)
$GDP_{i,t}$	3.970*** (0.002)	0.866 (0.688)	3.371** (0.017)	3.870*** (0.002)	1.768 (0.334)
Trend	-0.090 (0.898)	0.000 (0.995)	-0.001 (0.998)	0.183 (0.664)	-0.273 (0.741)
$total\_risk_{i,t}$	--	19.097** (0.049)	--	--	--
$pl\_risk_{i,t}$	--	--	6.376 (0.304)	--	--
$ec\_risk_{i,t}$	--	--	--	7.779** (0.058)	--
$fn\_risk_{i,t}$	--	--	--	--	12.307* (0.083)
$N.T$	294	269	263	268	268
N	78	72	71	70	70
Number of Instruments	57	58	60	60	60
Specification Tests:					
Hansen (p-value)	0.655	0.598	0.330	0.269	0.540
AR (1) (p-value)	0.001	0.002	0.001	0.001	0.001
AR (2) (p-value)	0.076	0.089	0.107	0.103	0.091
AR (3) (p-value)	0.188	0.810	---	---	0.677

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

The positive effect of average risk in educated population is confirmed by the results shown in Table 4, in which both economic and financial risk positively influence education. Here a 0.2 increase in the economic risk variable induces more (nearly) 1.5% of the population to attain the secondary level of schooling. In this table the other regressors seem to become statistically more significant: GDP positively influences attainment as well as the class size; expenditure tends to be negatively related to the proportion of the population that attains secondary school.

In the next section, we test the robustness of each type of risk in determining educational output growth.

2. Robustness

In this section we perform a number of robustness analyses. For this, we will use the corrected number of total years of education as a dependent variable and the reasons are twofold. First, it was with this variable (Table 3) that the effect of risk is less significant. Thus, robustness tests based on this variable are more demanding in obtaining higher statistical significance of risk. Second, this will keep the paper shorter and more focused. It is worth noting that for other dependent variables, the results do not change. The first robustness check is to drop class size from the regressions. As dependent variables measure quantity, class size has two not-distinguishable effects: a larger class prejudices the accumulation of knowledge and thus can favor dropouts, which would decrease education outputs; a larger class also saves resources (namely teachers) and increases the output. Additionally, we also drop GDP from regressions with economic risk, as this measure also includes a proxy for risk for the level of GDP. The second robustness test is the inclusion of primary education of adult population in regressions. As in Barro and Lee (2001), it is used as a proxy for family educational background which has been cited as an important determinant of education outcomes. The third robustness test considers that risk is endogenous and instrumented by the same instruments that Hall and Jones (1999) used to instrument GDP: the proportion of the population that speaks English or one of the European languages, the distance to equator and the Frankel-Romer trade indicator. Table 5 presents the results for the first test in which we dropped the class size as explanatory variable.

As can be observed in Table 5, the exclusion of class size from the regressions tends to increase the significance of total, economic and financial risks. Considering these types of risk as constant, GDP loses its significance in explaining education outcomes in comparison with regressions without risk.

Table 5. Regressions for Years of Education in Population above 15 (corrected) – without Classe Size

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$pedu_{i,t-1}$	0.897*** (0.000)	0.747*** (0.000)	0.872*** (0.000)	0.836*** (0.000)	0.846*** (0.000)
$\exp end_{i,t}$	-0.202 (0.138)	-0.023 (0.927)	-0.211 (0.182)	-0.161 (0.478)	-0.124 (0.411)
$GDP_{i,t}$	0.381** (0.027)	---	0.352** (0.033)	---	0.189 (0.227)
Trend	0.009 (0.912)	0.132 (0.146)	0.037 (0.639)	0.132 (0.169)	0.044 (0.566)
$total\_risk_{i,t}$	--	2.903** (0.011)	--	--	--
$pl\_risk_{i,t}$	--	--	0.090 (0.883)	--	--
$ec\_risk_{i,t}$	--	--	--	1.653** (0.033)	--
$fn\_risk_{i,t}$	--	--	--	--	0.885* (0.073)
$N.T$	298	285	269	285	275
N	77	75	70	75	71
Number of Instruments	60	41	61	41	61
Specification Tests:					
Hansen (p-value)	0.729	0.441	0.784	0.387	0.509
AR (1) (p-value)	0.000	0.006	0.001	0.002	0.001
AR (2) (p-value)	0.224	0.460	0.610	0.437	0.395

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

In the next table we show results for specifications in which we introduced primary education in the older population ($\Pr im\_Edu25_{i,t}$) as an additional regressor.

Table 6. Regressions for Years of Education in Population above 15 (corrected) – with Adult Education

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$pedu_{i,t-1}$	0.546***	0.449***	0.623***	0.467***	0.516***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\exp end_{i,t}$	-0.064	-0.069	-0.065	0.089	0.108
	(0.633)	(0.689)	(0.667)	(0.633)	(0.535)
$\Pr im\_Edu25_{i,t}$	0.576***	0.555***	0.411***	0.608***	0.571***
	(0.001)	(0.002)	(0.004)	(0.001)	(0.001)
$GDP_{i,t}$	0.260*	---	-0.007	---	-0.115
	(0.078)		(0.970)		(0.604)
Trend	0.069	0.154**	0.087	0.187**	0.108
	(0.344)	(0.045)	(0.230)	(0.016)	(0.134)
$total\_risk_{i,t}$	--	2.458***	--	--	--
		(0.001)			
$pl\_risk_{i,t}$	--	--	1.360*	--	--
			(0.064)		
$ec\_risk_{i,t}$	--	--	--	1.812***	--
				(0.007)	
$fn\_risk_{i,t}$	--	--	--	--	1.832**
					(0.017)
$N.T$	294	280	265	280	271
N	76	73	69	73	70
Number of Instruments	70	61	60	61	60
Specification Tests:					
Hansen (p-value)	0.451	0.492	0.483	0.513	0.228
AR (1) (p-value)	0.012	0.069	0.023	0.061	0.038
AR (2) (p-value)	0.334	0.413	0.483	0.479	0.485

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

Table 6 indicates that risk gains even more significance when we include years of primary education in the population above 25 years old. In fact, the new variable is highly significant, as expected, but induces an even stronger relationship between country risk and education. This is the first time that even political risk appears to decrease incentive to education.

As a last robustness check, we ask if the assumption of exogenous country-risk, as it enters as its own instrument in regressions, is conditioning our results. Thus we consider that risk indexes are instrumented by exogenous factors such as the proportion of population that speaks an European language, the distance to equator and the Frankel-Romer index of trade. These factors are highly correlated with risk indexes. The additional requisite to consider that they are good instruments is that they are not correlated with the error term. Theoretically, there is not any plausible justification for the proportion of European spoken languages, distance to equator or trade to be direct determinants of schooling growth.[3] We present results in Table 7. Column 1 of this table is a repetition of column 1 of Table 5. It is presented here for ease of comparison. In this table, we also add a difference-in-Hansen statistic that evaluates the statistical relevance of the instruments used to instrument risk.

Table 7. Regressions for Years of Education in Population above 15 (corrected) – Endogenous Risk

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
$pedu_{i,t-1}$	0.897***	0.823***	0.902***	0.922***	0.887***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\exp end_{i,t}$	-0.202	0.006	0.009	-0.042	0.051
	(0.138)	(0.968)	(0.927)	(0.794)	(0.601)
$GDP_{i,t}$	0.381**	--	0.019	--	0.037
	(0.027)		(0.885)		(0.760)
Trend	0.009	0.084	0.048	0.080	0.036
	(0.912)	(0.246)	(0.512)	(0.298)	(0.645)
$total\_risk_{i,t}$	--	2.568***	--	--	--
		(0.007)			
$pl\_risk_{i,t}$	--	--	1.072*	--	--
			(0.078)		
$ec\_risk_{i,t}$	--	--	--	1.933***	--
				(0.002)	
$fn\_risk_{i,t}$	--	--	--	--	1.316**
					(0.018)
$N.T$	298	285	269	285	275
N	77	75	70	75	71
Number of Instruments	60	41	64	44	61
Specification Tests:					
Hansen	0.729	0.311	0.522	0.309	0.615
Diff-in-Hansen for instruments to risk	--	0.349	0.448	0.874	0.771
AR (1) (p-value)	0.000	0.001	0.001	0.001	0.001
AR (2) (p-value)	0.224	0.435	0.680	0.421	0.450

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

In this table risk indexes remain highly significant and they even increase their significance and their coefficients become higher in absolute values. We note that GDP

[3] Tests using different subsets of these instruments reveal that the robust effect of risk is maintained through different changes in the instrument set.

again loses its significance when risk is introduced, as we saw in Table 6. Also, as has been usual in the last tables expenditure is not significant.

It is worth noting that all specification tests indicate that the model is reliable, namely the Differences-in-Hansen-statistic for the validity of additional instruments.

2.1 The influence of Sub-Items of economic risk

So far we have discovered that country-risk influences education outputs in a decisive way, compared with other determinants of schooling. In particular, we have discovered that among different components of risk, the economic risk is the most influential. Given this result, in this section we investigate the effect of different sub-items of economic risk in education outputs: risk for GDP growth; risk for GDP *per capita*; risk for budget balance, risk for socioeconomic conditions and risk for inflation. Table 8 presents the results. We present results for regressions in which the measure of risk is taken as exogenous and also for regressions in which risk is endogenous.

We found very significant effects of country-risk for GDP growth, GDP *per capita*, and socioeconomic conditions in educational outputs, which seem expectable given the results obtained so far. However, we also found a very significant effect of risk for budget balance, which seems to be a consequence of a *ricardian* effect, as current deficits may imply future taxes that would expropriate future returns from education years. Finally we found a non-significant effect of the risk for inflation. While inflation is a sign of macroeconomic instability that may decrease the real income for families to pay for education, education can also be an insurance against inflation since the costs for education (which in most countries have a public component) may be growing slower than wages seen as future benefits for education. In these regressions, in column 6, expenditure becomes marginally significant, indicating a small positive sign for countries with similar expectations for economic growth.

Quantitatively the effect of risks for GDP growth, Socioeconomic Conditions and risk for Budget Balance are the most important (from 1.5 to 1.8).

Table 8. Regressions for Years of Education in Population above 15 (corrected) – with sub-items of Economic Risk

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Sub-Item of Economic Risk	**Economic Growth**	**GDP per capita**	**Budget Balance**	**Socioecon. Conditions**	**Inflation**	**Economic Growth**	**GDP per capita**	**Budget Balance**	**Socioecon. Conditions**	**Inflation**
	Exogenous Risk					**Endogenous Risk**				
$pedu_{i,t-1}$	0.574***	0.463***	0.524***	0.341**	0.645***	0.706***	0.504***	0.616***	0.548***	0.704***
	(0.000)	(0.000)	(0.000)	(0.027)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
$\exp end_{i,t}$	0.247	0.124	0.208	0.151	0.135	0.159*	-0.010	0.057	-0.125	0.195
	(0.183)	(0.502)	(0.278)	(0.516)	(0.498)	(0.082)	(0.931)	(0.553)	(0.320)	(0.134)
$\Pr im\_Edu25_{i,t}$	0.494**	0.540***	0.550***	0.645***	0.422**	0.419**	0.523**	0.485***	0.477**	0.443**
	(0.019)	(0.003)	(0.003)	(0.003)	(0.027)	(0.033)	(0.011)	(0.014)	(0.026)	(0.031)
Trend	0.114	0.178**	0.151**	0.222**	0.108	0.047	0.150*	0.102	0.124	0.060
	(0.181)	(0.027)	(0.042)	(0.013)	(0.182)	(0.546)	(0.057)	(0.156)	(0.122)	(0.436)
$Sub-Item_i$	1.738***	0.946***	1.555***	1.837***	0.174	1.836***	0.887***	1.754***	1.660***	0.179
	(0.006)	(0.002)	(0.010)	(0.003)	(0.386)	(0.017)	(0.007)	(0.004)	(0.001)	(0.599)
$N.T$	280	280	280	280	277	280	280	280	280	277
N	73	73	73	73	72	73	73	73	73	72
Number of Instruments	61	61	61	61	61	64	64	64	64	64
Specification Tests:										
Hansen (p-value)	0.292	0.364	0.366	0.585	0.525	0.329	0.538	0.324	0.472	0.359
Diff-in-Hansen for instruments to risk	---	---	---	---	---	0.667	0.171	0.807	0.114	0.276
AR (1) (p-value)	0.020	0.044	0.023	0.215	0.010	0.007	0.041	0.017	0.025	0.009
AR (2) (p-value)	0.536	0.327	0.467	0.487	0.551	0.602	0.374	0.493	0.289	0.608

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

2.2 An Alternative Measure for Risk

In this section we test the effect of an alternative measure for economic risk in education: the black market premium (BMP), i.e. the difference between the official exchange rate between local currency and US dollar and the unofficial exchange rate. This is a more restrictive variable than those tested above, as it is only a proxy for the efficiency of currency markets. It can thus be considered as a proxy for economic risk. It has the advantage to be available for a larger time-series, which allows for within-panels variability. As this does not measure risk itself, a significant result is more demanding than with variables that measure multiple aspects of risk, as those supplied by the international country-risk guide and used above. Black market premium has been widely used as a regressor in economic growth regressions. We averaged the variable to construct five-year averages from 1960 to 1999, the data available in Global Development Network Database. We transformed it into log(BMP+1), as usual in empirical economic growth literature (e.g. Barro and Sala-i-Martin, 1995). We consider that Black Market Premium is endogenous (as lower education can contribute to increase black market premium) and is instrumented by the proportion of population that speaks a European language, the distance to equator and the Frankel-Romer index of trade, as we did for the risk indexes presented above in Table 7.

We discovered that given GDP and primary years of education of adults (above 25 years old), the black market premium negatively influences total years of education, confirming our argument in favor of a robust effect of economic/financial risk in education. We show the results in Table 9.[4] We show the effect of black market premium in the same period as GDP and with one and two lags, allowing for lagged effects of risk in education. In the three last columns we decrease the number of instruments and see that the claimed effect is robust to this change.

[4] In these regressions, expenditure is not included as it proved to be non-significant in most previous results.

Table 9. Regressions for Years of Education in Population above 15 (corrected) – with Black Market Premium

Dependent Variable: $pedu_{i,t}$	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	I	**II**	**III**	**IV**	**V**	**VI**
$pedu_{i,t-1}$	0.764***	0.758***	0.816***	0.696***	0.748***	0.787***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Pr im\_Edu25_{i,t}$	0.229***	0.259**	0.190***	0.324**	0.255	0.241**
	(0.006)	(0.036)	(0.004)	(0.043)	(0.161)	(0.011)
$GDP_{i,t}$	0.185**	0.130*	0.114	0.187**	0.116	0.054
	(0.019)	(0.096)	(0.105)	(0.029)	(0.163)	(0.513)
Trend	0.047	0.060	0.082	0.034	0.051	0.106*
	(0.357)	(0.229)	(0.110)	(0.525)	(0.287)	(0.056)
$BMP_{i,t}$	-0.047**	--	--	-0.073**	--	--
	(0.042)			(0.039)		
$BMP_{i,t-1}$	--	-0.073**	--	--	-0.110**	--
		(0.021)			(0.048)	
$BMP_{i,t-2}$	--	--	-0.060**	--	--	-0.126***
			(0.015)			(0.005)
$N.T$	585	572	493	585	572	493
N	96	91	91	96	91	91
Number of Instruments	85	85	82	45	45	42
Specification Tests:						
Hansen (p-value)	0.349	0.505	0.418	0.125	0.287	0.266
Diff-in-Hansen for instruments to risk	0.641	0.829	0.652	0.358	0.239	0.730
AR (1) (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) (p-value)	0.605	0.783	0.272	0.458	0.864	0.204

Notes: A constant and a complete set of time dummies are included in the regressions but are not shown in table for a space reason. *** - means significance at 1%; ** - significance at 5% and * - significance at 10%. Numbers in parentheses are p-values of t-statistics tests calculated using a robust variance-covariance matrix.

In the next section, we summarize the quantitative predictions of the results presented above.

3. Quantifying Effects of Risk in Education

In the next table we present the quantitative implications of the regression results presented so far. In particular, we conduct two experiments. First, we assume that each variable of risk increases just one standard-deviation, and evaluate its effect on years of education, according to the different coefficient estimates, assuming the average country in terms of corrected total years of education. In the other experiment, we assume that there is an increase on 10 points in risk (which corresponds to a decrease in risk) and again evaluate its impact on education growth if initially the country is at the average of education years.

Table 10. Effects of Risk on Education

		Increase in Risk = Stand. Dev.			Increase in Risk = 10		
	Signif. Coefficient	Econ. Risk	Political Risk	Financial Risk	Econ. Risk	Political Risk	Financial Risk
Table 2	0.549	2.17%			24.83%		
Table 5	1.653	6.53%			74.75%		
	0.885			4.68%			40.02%
Table 6	1.36		6.62%			61.50%	
	1.812	7.15%			81.94%		
	1.832			9.68%			82.84%
Table 7	1.072		5.22%			48.48%	
	1.933	7.63%			87.41%		
	1.316			6.95%			59.51%
		Increase in Risk = Stand. Dev.					
		Risk for Econ. Growth	Risk for GDP *per capita*	Risk for budget balance	Risk for Socioeconomic Conditions		Risk for Inflation
Table 8	Risk Exogenous	4.92%	2.68%	4.40%	5.20%		0.49%
	Risk Endogenous	3.78%	2.71%	4.96%	4.70%		0.51%
		More Instruments					
		BMP_t	BMP_{t-1}	BMP_{t-2}	BMP_t	BMP_{t-1}	BMP_{t-2}
Table 9	-0.047	1.72%			4.65%		
	-0.073		2.65%			7.18%	
	-0.060			2.18%			5.92%
		Less Instruments					
		BMP_t	BMP_{t-1}	BMP_{t-2}	BMP_t	BMP_{t-1}	BMP_{t-2}
Table 9	-0.073	1.95%			7.17%		
	-0.110		2.65%			10.80%	
	-0.126			4.56%			12.36%

This table shows that a standard-deviation decrease in economic risk would lead to a 2% increase in education (in the benchmark analysis). This value can increase up to 9.68% if the improvement were in financial risk. When risk points increase in a country by 10, education can grow from 24.83% (economic risk, Table 2) to 87.41% (economic risk, Table 7). As an example, a ten point difference in risk is the difference between Australia in 1994 and Australia in 2002 and also between Belgium and Hungary (taking the average). This means that plausible difference in country-risk may explain a great part of the differences in education growth between countries. When using different sub-items for economic-risk, we concluded that the most important, in quantitative terms, are risks for socioeconomic conditions, budget balance and economic growth, which account for increases of almost 5% in education output. The great impact of budget balance is mostly surprising and reflects a possible effect of expected unbalanced budget on expected taxes that hinders the expected returns from schooling. Also worth noting is the higher impact of economic growth than *per capita* GDP level, which may mean that expectation of opportunities growth is more important for education than expectation for economic income. This reflects the nature of education as an investment in the future. In order to decide to educate more or not, one gives more attention to the improvement over the present situation.

We also include the impact of risk when using the more restrictive Black Market Premium measure. We consider a one standard deviation change and a greater change of -5. Examples of countries that have experienced similar *decreases* in Black Market Premium are Egypt, which decreased this risk from 4 in 1960 to 0.7 in 2000 and Guinea, which experienced a change from 6.24 in 1980 to 0.8 in 1999. Figures in the Table show that these BMP changes can be responsible for changes between 7.17% and 12.76%.

IV. CONCLUSIONS

In this article we show that country-risk is an important determinant of education output (and growth) at the country level.

Microeconomic empirical studies have had difficulty in achieving a consensus on the importance of typical production factors as expenditures and teachers as determinants of educational quality and quantity. Macroeconomic empirical evidence has also failed to show clear evidence of the relative importance of determinants of education. With this article we add a new and significant determinant of education in a countrywide study, using a dynamic panel data approach: country-risk. As in most micro evidence, we also obtain that education of adults and GDP are the most significant determinants of educational outputs, among those determinants already tested by previous literature.

We use data from the International Country Risk Guide to evaluate the impact of risk in educational output, taking into account the usual determinants of education, such as expenditures, the pupil-teacher ratio and income. We compare the results obtained to those obtained with the Black Market Premium as a proxy for economic risk. We also considered different variables to measure educational output and different assumptions about the endogeneity of risk. Through all the analyses, country-risk and in particular economic and financial risk are significantly related to total years of education in a country and through time. Among economic risk indexes, those for socioeconomic conditions, economic growth and budget balance are the most important.

Quantitatively, a reasonable difference in risk between countries (e.g. Belgium and Hungary) can lead to a change in educational output of 25% to 87% of the average education years in the sample. Also, a reasonable difference in Black Market Premium between or within countries (Guinea, from 1980 to 1999) leads to differences from 5% to 12% in educational output. These differences could increase the educational level of Portugal (near 6 years) to the level of the United Kingdom (near 11 years). At the least, these differences are sufficient to explain the increase in educational output in Haiti from 1990 to 2000. These results seem to indicate not only a statistically significant effect but also a significant effect from the point of view of their policy implications.

From this article, it becomes clear that in order to increase education, country-risk must be reduced.

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