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THE POWER OF REMITTANCES ON THE PREVALENCE OF CHILD LABOR

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Abstract

This article examines the relationship between migrants' remittances and the prevalence of child labor by using a large sample of developing countries. In particular, we investigate whether the inflows of remittances help to offset the effects of financial constraints and income shocks on the prevalence of child labor. Starting from a simple theoretical model, then based on a sample of 82 developing countries (of which 31 are African) observed in the year 2000 and after taking into account the endogeneity of remittances, migration and financial development, we show that remittances reduce significantly the prevalence of child labor in developing countries characterized by weak financial systems and by strong income instability. However, we have not found a statistically significant relationship between adults' emigration and child labor at home. Policy recommendations for specific strategies to facilitate receipt of remittances by households are more than ever appropriate for a region like Sub-Saharan Africa, which currently receives a small fraction of these funds compared to other developing countries, and where the prevalence of child labor is still a serious issue.

Key words: Remittances, Financial development, Income variability, Child labor, LDCs, Instrumental variables

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1. Introduction

This paper analyzes the contribution of migrants' remittances on the reduction of child labor prevalence in developing countries. Using a large sample of countries (82) and after factoring in the endogeneity of migrants' remittances, migration and financial development, our results suggest that only remittances are robustly associated with child labor. Moreover, we have found that remittances help to reduce child labor prevalence in countries characterized by a low level of financial development and with a high exposure to production shocks.

This is an important question for a number of reasons. Firstly, the problem of child labor is a crucial issue for economic development in the extent to which this strategy has irreversible consequences. Indeed, it is generally difficult for children who have early left school to return even if the economic situation has improved. Just as children who are forced to work several times a week while going to school may have more difficulty than others in the training. In addition, for regions like sub-Saharan Africa and South Asia, the issue of child labor is important in terms of extremely high prevalence rates observed in these two regions. Several papers analyzing the factors of child labor in a cross country framework conclude that child labor is positively related to the level of poverty (Krueger, 1996) and the importance of income shocks (Guarcello et al., 2003; Dehejia and Gatti, 2005; Beegle et al., 2006; Duryea et al., 2007). In contrast, financial development and integration to the global economy through trade and finance are factors of reduction of child labor (Ranjan, 1999, 2001; Dehejia and Gatti, 2005; Shelburne, 2001; Cigno et al., 2002; Edmonds and Pavcnik, 2006; Neumayer and De Soysa, 2005; Davies and Voy, 2009). However, these macroeconomic studies have in our knowledge, never at this time taken into account another dimension of economic globalization in the discussion. Precisely, it appears that migration and remittances are absent of this macroeconomic literature on the sources of child labor prevalence in developing countries. The literature on the relationship between migration/remittances and child labor or child human capital is essentially microeconometric (Hanson and Woodruff, 2003; Edwards and Ureta, 2003; Lopez-Cordova, 2004; Borraz, 2005; McKenzie and Rapoport, 2006; Acosta et al., 2007; Yang, 2008b; Calero et al., 2009; Bansak and Chezum, 2009). These papers have focused their analyses on the Latin America region and thus, their results cannot be generalized. There is thus a necessity to provide a macroeconomic approach using international and comparable data to address this question.

Secondly, this paper addresses the question of the contribution of migration and remittances on child human capital and child welfare. Remittances are one of the most visible

dimensions of the current globalization. The World Bank estimates for example to 251 billion U.S. dollar, the amount of remittances in the world in 2007. Developing countries are the main recipient of these funds which are rapidly growing and whose characteristics and effects have been studied in several aspects. Ratha (2006) points three characteristics of remittances which are very important to understand why one can expect from them a significant impact on economic development. First, remittances are less volatile than other capital flows to developing countries. Second, they now exceed the volume of official development assistance received by developing countries. Finally, remittances do not pass through government budgets, and arrive directly in the pockets of households. Recent papers on remittances have provided evidence on the fact that remittances might be countercyclical in the sense that they generally react to the economic situation at home.

Unlike private capital flows, remittances tend to rise when the recipient economy suffers an economic downturn following a financial crisis, natural disaster, or political conflict. Mohapatra et al. (2009) show that, remittances tend to rise when the recipient economy suffers a natural disaster. Even after factoring in the endogeneity of remittances, they found also that remittances act as a risk preparedness and coping strategies. Indeed, concerning the risk preparedness, international remittance-receiving households in Burkina Faso and Ghana, especially those that receive remittances from high-income OECD countries, have housing built of concrete rather than mud and have greater access to communications, which can help in coping during natural disasters. They found also that Ethiopian remittance-receiving households tend to rely on cash reserves during shocks to food security, rather than sell productive assets such as livestock. Altogether, remittances constitute a factor of resilience at the household level which in turn contributes to "protect" the productive capacity of the country during disasters episodes and then smooth consumption and promote economic growth in long run. Yang (2008a) also provides cross-country evidence on the response of international flows to hurricanes, and concludes that for poorer countries, increased hurricane exposure is associated with greater remittance flows as well as greater foreign aid. In contrast, other private flows (commercial lending, FDI, and portfolio investment), actually decline in response to hurricane exposure.

These specificities of remittances have led researches to analyze the contribution of these flows on economic development. Several studies have shown the role of remittances on poverty reduction (Adams and Page, 2005; Gupta et al., 2009), promotion of education in the families (Edwards and Ureta, 2003), promotion of entrepreneurship (Woodruff and Zenteno, 2007),

economic growth (Giuliano and Ruiz-Arranz, 2009; Catrinescu et al., 2009) and reduction of inequalities (Koechlin and Leon, 2007; Chauvet and Mesplé-Somps, 2007). While the development potential of remittance flows is increasingly being recognized by researchers and policymakers, the effect of remittances on child labor at the cross-country level remains unexplored. This paper is a first effort to try to fill this gap in the literature.

There are several mechanisms through which migration and remittances might affect child labor in developing countries. When households are financially constrained, remittances might constitute for them an alternative source of funding which help to prevent the entry of children in the labor market. This idea that the marginal efficiency of remittances on indicators of economic development increases with the shallowness nature of the domestic financial system (on the level of financial constraints) has been put forward by Giuliano and Ruiz-Arranz (2009). Remittances might also reduce child labor prevalence by providing insurance for households against income shocks. Following the conclusion of recent papers which have shown that remittances received by households increase when countries are hit by shocks (natural disasters, conflicts, exchange rates), we can then expected that remittances will increase the ability of household to face shocks. This insurance role played by remittances is thus an important mechanism through which they contribute to prevent child labor prevalence in poor countries.

The net effect of migration on child labor is the combination of the effect of remittances and the direct effect of adults' emigration. While remittances might reduce child labor through the mechanisms describe above, adults' emigration in contrast can increase the probability that a child will work. This double face of migration on child human capital has been recently analyzed by Bansak and Chezum (2009). The authors using micro data for Nepal have found that remittances are negatively associated with child labor while the absenteeism of adults in the household as consequence of migration leads to the increase of the probability of child labor. Indeed, when a family member leaves the household to work and send remittances back, there may be disruption due to the loss of a productive adult member of the family. As a result, children may be required to work to offset the market and non-market work performed by the missing adult.

To take into account the fact that remittances' effect on child labor might be affected by the direct effect of migration on child labor, we build our empirical models by allowing the presence of emigration rates of adults (above 25 years old). Data on migration disaggregated by age are new and are drawn from Docquier, Lowell and Marfouk (2009). Once more to our

knowledge, this is the first paper which put into the same cup, remittances and migration and their respective impact on child labor using comparable and international datasets.

The empirical strategy that we pursue in this article has a number of strengths. Firstly, we control for the possible endogeneity of our variables of interest like remittances, migration and financial development by using instrumental variables following the recent literature. Indeed, remittances and migration are suspected of endogeneity because of reverse causality. For example, remittances might be send back in order to finance education of children and then, to prevent them to entry early in the labor market. Moreover, adults might migrate with the ambition to improve the welfare of their sibling or children. Financial development used to proxy for the level of credit constraints can be suspected of endogeneity because of measurement error problems (Dehejia and Gatti, 2005) in an equation of child labor at the macroeconomic level. Indeed, it is possible that that those countries with developed financial systems may also be those for which data on child labor are well measured.

We try to solve these problems by using the instrumental variables estimator. Remittances for each country are instrumented by the cost to send back 200 US dollar and a dummy variable indicating the presence of dual exchange rate system. Migration of adult in OECD countries is instrumented by the coastal area of a country (defined as the ratio of the area within 100 KM from a sea or an ocean to the total area of the country), by the mean distance between each country and the OECD countries and by a dummy variable which takes the value one if the developing country shares one of the languages of OECD countries. The level of financial development measured by the ratio of bank credit as a percentage of GDP is instrumented by the creditors' rights and by the existence of credit registries.

The rest of the article is organized as follows. Section 2 presents an overview of previous work on the topic of the relationship between migration, remittances and child labor. Section 3 presents a simple theoretical model on the conditional relationship between remittances and child labor in a context of financial constraints and households' income shocks. Section 4 is devoted to the construction of the econometric model, the presentation of the variables used in this article and estimation method. Section 5 discusses the results. We conclude in Section 6.

2 Literature review

We present an overview of the main findings of empirical work which have examined the relationship between remittances and child labor in developing countries. This section is built partially on the literature review made by Calero et al. (2009).

Several studies have found evidence that remittances and international migration are associated with increased educational attainment and reduction in child labor supply. For example, using migration networks and household migration history as instruments for remittances, for El Salvador, Acosta (2006) finds that girls and boys under 14-years-old from recipient families are more likely to attend school than those from non-recipient households, while remittances also seem to reduce child labor supply. In a similar vein, also based on data from El Salvador, Edwards and Ureta (2003) find that remittances reduce school dropout hazard rates. Borraz (2005) instruments remittances using historical migration patterns and distance to the United States and finds that remittances have a positive but small effect on schooling for boys and girls with low educated mothers and who reside in cities with less than 2,500 inhabitants. Hanson and Woodruff (2003) use migration patterns to instrument migration and find that having a migrated family member has a positive effect on educational outcomes for girls in Mexico (aged 10–15) whose mothers have a very low level of education. Using a similar empirical strategy, Mansuri (2006) finds strong positive effects of temporary economic migration on investments in children's schooling in Pakistan, especially for girls.

Yang (2008b) uses the Asian currency crisis to map out how variations in remittance receipts affect education and child labor in the Philippines. He uses the fact that the magnitude of the economic shock differed across Philippine recipient families depending on the host country of the family's emigrating members (because of differences in currency depreciation). Exploiting this variation across households he concludes that favorable economic shocks (which he translates into greater remittance flows) increases educational investments in girl children and decreases the number of hours worked by boy children. Milligan and Bohara (2007) show that in the case of Nepal, remittance income from international sources positively contributes to child welfare, but much less so than the same amount of income from other sources.

Dimova et al. (2008) examine the extent to which migration and remittances may reduce child labor even in households that do not participate in the migration and therefore do not receive remittances. They argue that the reduction of the amount of labor available in the

aftermath of migration and the remittances sent by emigrating parents may enable not only the children, but also other family members to stop working. The wage increase emanating from the fall in labor supply may then make it possible for parents to withdraw their children from the labor force. The authors successfully tested this hypothesis on panel data from several surveys of Tanzanian households. Calero et al. (2009) investigates how remittances via transnational networks affect human capital investments through relaxing resource constraints and facilitate households in consumption smoothing by reducing vulnerability to economic shocks. By using micro data for Ecuador, they show that remittances increase school enrollment and decrease incidence of child work, especially for girls and in rural areas. Furthermore, they find that aggregate shocks are associated with increased work activities, while remittances are used to finance education when households are faced with these shocks.

However, other findings present mixed results of the effect of migration and remittances. In a study on 11 Latin American countries, Acosta et al. (2007) find that remittances are associated with increased educational attainment in only six countries (Nicaragua, Guatemala, Honduras, Ecuador, Haiti, and El Salvador), the effect being larger for children whose mothers have a low level of education. Similarly, using historical migration rates to instrument current migration, McKenzie and Rapoport (2006) find a negative effect of migration on schooling attendance and education attainment among 16–18-year-old girls and 12–18-year-old boys, but a positive effect for younger girls with uneducated mothers in rural Mexico. They attribute these outcomes to side effects of migration. For instance, the absence of parents in the household due to migration could lead to reduced investment in their children's education and an increase in the incidence of child work. Relying on rainfall data as instrument for remittances, Lopez-Cordova (2004) shows that these effects are especially relevant for secondary school age children in Mexico, as receiving remittances positively affect school attendance for children aged 6–14, but negatively for boys and girls aged 15–17.

3. Theoretical model

We now turn to the theoretical model of the relationship between remittances, financial constraints, shocks and child labor. Our model is similar to those of Baland and Robinson (2000), Rogers and Swinnerton (2004) and Dustmann and Speciale (2005).

There are *N* identical households in the economy. Each family consists of a child and an adult. The model is built on two periods, *t = 1*, *2*. The discount rate is given by β with $0 < \beta \leq 1$. We assume further that the parent works only in the first period and supplies one unit of labor which has value of A_1 with (with $A_1 \geq 1$). We assume that the household starts with an initial level of wealth (which may come from the inheritance, and consists of farmland or livestock), which is valued at A_0. It follows that the parent's income in the first period is the sum of income from his job and his inheritance $A = A_0 + A_1$. At time *t = 1*, children may also work. Time not spent working is spent in school. The time children spend at work has a value of 1 (in efficiency units). The child has a unit time endowment. In the first period parents decide how to allocate their children's unit time endowment between labor (*l*) or schooling (*1-l*). The only cost to acquire education is an opportunity cost. In the second period, children become adults and they supply one unit of labor, which has value $h(1-l)$. Following Baland and Robinson (2000) and Rogers and Swinnerton (2004), the function $h(1-l)$ has the following properties: $h(0)=1,\ h'(1-l)>0,\ h''(1-l)<0.$

Let c_1 and c_2 be the household consumption in the first and second period, respectively. The household utility function is assumed to be separable:

$$W(c_1, c_2) = U(c_1) + \beta U(c_2) \qquad (1)$$

The function *W* is twice continuously differentiable, strictly increasing and strictly concave. We distinguish in this analysis, three possible cases: (1) the credit market works, (2) the credit market does not work and (3) the household faces uncertainty (risk) on parent first period income.

3.1. Credit market case

In the first best situation, households can borrow and lend freely in the credit market. To simplify notation, let the interest rate be equal to zero. Parents decide the optimal allocation of their children's unit time endowment between labor (*l*), schooling (*1-l*) and the optimal value of saving (*s*):

$$\max_{l,s} \ U(c_1) + \beta U(c_2)$$

$$c_1 = A + l + R(1-l) - s \qquad (2)$$

$$c_2 = h(1-l)+s$$

where *R* are remittances which are targeted to "buy" children's education (more precisely, to cover a fraction *R* of the opportunity cost of schooling, where $(0 < R \leq 1)$. The first order conditions with respect to *l* and *s* are respectively:

$$(1-R)U'(c_1) = \beta h'(1-l)U'(c_2)$$

$$U'(c_1) = \beta U'(c_2)$$

The first-best children's time allocation between labor and schooling is such that:

$$h'(1-l) = 1-R \qquad (3)$$

By implicit function theorem on $h'(1-l)-1+R=0,$ we can analyze the impact of remittances on children's labor:

$$\frac{\partial l}{\partial R} = \frac{1}{h''(1-l)} < 0 \qquad (4)$$

We conclude that child labor decreases with remittances. What now happens when there is no credit market in the economy?

3.2. No credit market case

The household problem is given by:

$$\max_{l} \; U(c_1)+\beta U(c_2)$$

$$c_1 = A + l + R(1-l) \qquad (5)$$

$$c_2 = h(1-l)$$

First order condition with respect to *l* leads to:

$$(1-R)U'(c_1) = \beta h'(1-l)U'(c_2)$$

Children's time allocation between labor and schooling is such that:

$$h'(1-l) = \frac{(1-R)U'(c_1)}{\beta U'(c_2)} \qquad (6)$$

By implicit function theorem on $h'(1-l) - \frac{(1-R)U'(c_1)}{\beta U'(c_2)} = 0$, we get the impact of remittances on child labor when there is no credit market:

$$\frac{\partial l}{\partial R} = \frac{U'(c_1)}{\beta U'(c_2)h''(1-l)} < 0 \qquad (7)$$

with $h''(1-l) < 0$.

When we compare expression 7 with the expression in 4, we see that remittances' impact on child labor when there is no credit market is higher (in absolute value) than the impact when there is a credit market. Thus, the marginal impact of remittances on child labor reduction decreases with the level of financial development. Now, we look at what happens if parent's income in the first period is uncertain (stochastic).

3.3. Remittances, income shocks and child labor

We assume now that household faces a risk[2] on the parent's income in the first period. In this case, A becomes stochastic and follows a distribution with a mean equals to A_m and with a variance σ^2. We write the household problem as follow:

$$\max_{l} \quad E[U(c_1)] + \beta U(c_2)$$

$$\tilde{c}_1 = \tilde{A} + l + R(1-l) \qquad (8)$$

$$c_2 = h(1-l)$$

with E, the operator of mathematical expectations.

A second order Taylor's expansion around A_m leads to the following expression of the expected utility function:

[2] This risk faced by household could be climatic shocks which destroy livestock or reduce the harvest.

$$\max_{l} \; U(A_m + l + R(1-l)) + \beta U(h(1-l)) + \frac{1}{2}\sigma^2 U''(A_m + l + R(1-l)) \qquad (9)$$

First order condition with respect to l gives:

$$h'(1-l) = \frac{(1-R)\left(\frac{1}{2}\sigma^2 U'''(c_1) + U'(c_1)\right)}{\beta U'(c_2)} \qquad (10)$$

The impact of remittances on child labor is given by:

$$\frac{\partial l}{\partial R} = \frac{\frac{1}{2}\sigma^2 U'''(c_1) + U'(c_1)}{\beta U'(c_2) h''(1-l)} < 0 \qquad (11)$$

with $U'''(c_1) > 0$, when the parent is prudent. We can conclude that the greater the risk to the parent's income is high, the greater the impact of remittances on the reduction of child labor.

To sum, the theoretical model proposed in this article predicts two important things. Indeed, the marginal impact of remittances on child labor reduction: (1) decreases with the access to financial services and (2) increases with the riskiest nature of the environment in which households evolves.

4. Econometric analysis

We present two econometric models in order to test the hypotheses formulated in this study. The first model is constructed to test the hypothesis that the marginal efficiency of remittances on child labor reduction increases with the level of financial constraints in developing countries. The second model is devoted to the insurance effect of remittances in a context of production volatility. In each of these two equations, we always control for the direct impact of adults' migration on child labor. Our specifications are closed to those of previous literature which have analyzed the factors of international disparities of child labor using cross country data. We then extend the models of Edmonds and Pavcnik (2006), Dehejia and Gatti (2005) and Davies and Voy (2009) by introducing migration and remittances variables.

4.1 An econometric equation of the relationship between remittances, financial development and child labor

We specify the following equation:

$$cl_i = \alpha + X_i'\beta + \gamma_1 R_i + \gamma_2 R_i * FD_i + \gamma_3 FD_i + \phi M_i + \mu_i + \varepsilon_i \quad (12)$$

where *cl*, *R*, *FD*, *M* and μ_i represent respectively the rate of prevalence of child labor, remittances as share of GDP, private credit ratio, emigration rate and regional dummies. *i* is the country index and ε_i the error term. The vector *X* contains the traditional determinants of child labor at the macroeconomic level. Thus, we include GDP per capita in a quadratic form[3], trade openness, rural population, a dummy variable, equal to 1 if, as of 1995 a country had signed the ILO Convention 138 establishing minimum working ages[4]. We also control for the initial level of child labor in each countries (level of child labor in 1960) as well as shocks variables. The rural population and the volatility of GDP per capita are expected to be positively related to child labor while trade openness should reduce it following the results of previous works (Edmonds and Pavcnik, 2006, Dehejia and Gatti, 2005). GDP per capita, trade openness, rural population, private credit ratio and child labor data are drawn from World Bank tables (World Development Indicators, 2004, 2008).

To measure economic volatility we follow Flug et al. (1998) and Dehejia and Gatti (2005) and construct the standard deviation of annual per capita income growth rates in the previous 5 (and 10) years. We expect that more children enter the labor force when economic volatility is high. Our hypothesis is that $\gamma_1 < 0$ and $\gamma_2 > 0$ so that the impact of remittances $\gamma_1 + \gamma_2 FD_i$ on child labor is more negative at low levels of financial development.

4.2. An econometric equation of the relationship between remittances, economic volatility and child labor

Do migrants' remittances dampen the effect of economic volatility on the prevalence of child labor? In order to answer this question, the following model is specified:

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[3] We allow for the (log) income to enter the specification nonlinearly because the effects of income on child labor likely differ across poor and rich countries.

[4] Dates of ratification of the ILO Convention 138 can be found at http://www.ilo.org/ilolex/cgi-lex/ratifce.pl?C138.

$$cl_i = \alpha + X_i'\beta + \theta_1 R_i + \theta_2 R_i * Sh_i + \theta_3 Sh_i + \phi M_i + \mu_i + \varepsilon_i \quad (13)$$

where Sh_i refers to the measure of economic volatility in each country. The model includes the same control variables as before and we test the hypothesis that remittances increase the ability of households to face income shocks. Empirically, we test that the coefficient associated to the interaction between remittances and either indicators of shocks (volatility in the previous 5 or 10 years) is statistically negative. Put differently, we verify that the impact of remittances $\theta_1 + \theta_2 Sh_i$ on child labor is more negative at high levels of GDP per capita growth volatility.

4.3 Data

We measure the extent of child labor as the percentage of the population in the 10–14-year-old age range that is actively engaged in work. These data were compiled by the International Labor Organization (ILO) and are available at 10-year intervals, beginning in 1950 for 172 countries. "Active population" includes people who worked (for wage or salary, in cash or in kind, as well as for family unpaid works) for at least 1 hour during the reference period (International Labor Organization, 1996). The structure of the data does not allow us to infer the intensity of child labor, so we cannot distinguish between light work (which some might argue is beneficial for adolescents) and fulltime labor, which might seriously conflict with human capital accumulation. Moreover, like most official statistics on child labor, these data are likely to suffer from underreporting, because work by children is illegal or restricted by law in most countries, and children often are employed in agriculture or the informal sector. These problems notwithstanding, the ILO data have the advantage of being carefully adjusted on the basis of internationally accepted definitions, thereby allowing cross-country comparisons over time (Ashagrie, 1993). Child labor data for year 2000 are drawn from World Bank Development Indicators (2004).

Remittances data are drawn from the World Bank database (World Development Indicators, 2008). This variable includes three categories: "unrequited transfers" which refer to money sent by migrants to family and friends to the home country, "migrant transfers" which are equal to the net worth of the migrants (considered here as individual's change of residence for at least one year) and finally "compensation of employees" which represent funds sent back by temporary workers who work abroad for less than a year. This database provides information for a lot of countries and over a long period. We use in our estimation the ratio of remittances

received by the home country on its GDP. We have to bear in mind the fact that remittances data underestimates the effective volume received by households in developing countries. But, World Bank data are commonly used by several authors in the studies of remittances at the macro-economic level.

Financial development is measured as the ratio of domestic credit to private sector provided by deposit banks. Series are drawn from the database compiled annually by Beck, Demirgüç-Kunt and Levine for the World Bank. The choice of this variable to proxy the level of financial development is justified by two important reasons. On the one hand, the dimension of financial intermediation in which we are interested in is the capacity of banks to provide funds to households or firms. On the other hand, the variables retained as exogenous instruments for financial development are more pertinent if financial development is proxied by the credit ratio.

Data on emigration rates come from Docquier et al. (2009) and consist in the emigration rates of each developing country of individuals aged 25+ to OECD in 2000. More precisely, emigration rates are defined as the ratio of the stock of migrants aged 25+ observed in 2000 to the native population with the same age.

Table 1 presents the descriptive statistics for each of the variables used in the estimations. Data concern the year 2000, year for which data on emigration rate of individuals aged 25+ to OECD countries are available.

Table 1: Descriptive statistics

Variables	Obs.	Mean	Std-dev.	Minimum	Maximum
Prevalence of child labor	82	12.89561	14.50189	0	51.13
Remittances	82	3.344394	4.430152	0.0145116	21.79848
Private credit ratio	82	27.93375	29.20471	3.838443	177.9058
GDP per capita growth volatility (5 ans)	82	2.910967	1.989611	0.3568309	9.109325
GDP per capita growth volatility (10 ans)	81	5.138843	4.086954	0.583939	20.76032
Emigration rate of individuals aged 25+	82	4.093543	5.789015	0.0676045	34.94054
GDP per capita	82	1650.143	1756.961	120.1141	8270.758
Trade openness	82	22.73487	9.185678	3.785335	49.22613
ILO Convention 138	82	0.2439024	.4320773	0	1
Rural population (%)	82	51.8561	20.53585	8.9	87.9
Prevalence of child labor in 1960	82	24.01329	18.96497	0	79.4

4.4. Identification strategy

Finding an appropriate instrument or set of instruments that corrects for the endogeneity of our variables of interest is a challenge for researchers. Two key features govern the selection of

an instrument: the instrument must be correlated with the endogenous regressors, and its effect on individual country prevalence of child labor must operate solely through its impact on endogenous variables or through the effect on other explanatory variables we already control for. We propose several instrumental variables for remittances, international migration and financial development following the recent literature on these respective topics.

Remittances

The first instrument is the cost to send $200 remittances to each developing country. This instrument is expected to be negatively correlated to the volume of remittances received. Freund and Spatafora (2008) have addressed this issue using data collected from official money transfers operators. They also have estimated a negative association between remittances and the existence of dual exchange rate in a country. This binary indicator specifies if a country has more than one exchange rate that may be used simultaneously for different purposes and/or by different entities. It comes from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions, ARREAR (2003). The second instrumental variable is thus a dummy variable for dual exchange rate.

Emigration of individuals aged 25+

Several microeconometric papers on the impact of migration on child labor have put forward the issue of the endogeneity of migration (Hanson et Woodruff, 2003; Borraz, 2005; Acosta, 2006; Calero et al., 2009). In this paper, international migration is instrumented by three variables of geographical and cultural proximity between the country of origin and the OECD area. Following Docquier et al. (2009) and Abdih et al. (2008), we retain as exogenous determinants of emigration rates: The log of the distance between the departure point and the OECD area, the log of coastal area of a country (defined as the ratio of the area within 100 KM from a sea or an ocean to the total area of the country) and finally, a dummy variable which takes one when the same language is shared between one country and OECD countries. Coastal area data are drawn from the works of Gallup et al. (1999), distance and language are taken from a study of the *Centre d'études prospectives et d'informations internationales-CEPII*.

Private credit ratio

Two variables are chosen as instruments for the banks' private credit ratio. They are creditors rights and binary variable on the existence of public (i.e., government-owned) and private credit registries in different countries. These registries collect information on credit

histories and current indebtedness of various borrowers and share it with lenders. Djankov et al. (2007) have shown that the level of creditors' right is an important determinant of private credit. In fact, when lenders can more easily force repayment, grab collateral, or even gain control of the firm, they are more willing to extend credit. They have also shown that what matters for lending is information. When lenders know more about borrowers, their credit history, or other lenders to the firm, they are not as concerned about the lemons problem of financing nonviable projects and therefore extend more credit. We think that these two variables are good exclusion restrictions in the sense that we cannot consider that information-sharing or creditors' right may be directly linked to child labor prevalence other than through their respective impacts on private credit.

Interaction terms

Given the fact that our structural models of child labor allow for the presence of interactive terms in endogenous regressors (remittances crossed with private credit and GDP per capita growth volatility) the list of endogenous variables increases by including also the interaction terms. Thus we need also to take into account the endogeneity of remittances crossed with private credit and remittances crossed with volatility. The first variable is instrumented by the product of each instrument of remittances by each instrument of private credit. The second variable is instrumented by the product of remittances' instruments by shocks variables. Indeed following Calero et al. (2009), we make the assumption that economic volatility is orthogonal to the errors terms in each model of child labor.

5. Results

We present the results of the impact of remittances on child labor which depends on the level of financial development and on the importance of income shocks. The estimator of the generalized method of moments is preferred than the traditional 2SLS estimator because the first is more efficient in the case of over-identified models and non spherical errors terms.

5.1. Remittances, financial constraints and the prevalence of child labor

The results of the estimation of the model (12) are presented in Table 2. Two models are estimated depending on the indicator of economic volatility retained. The first column includes the standard deviation of GDP per capita growth rate in the previous 5 years while the second

column presents results obtained when volatility is computed from the 10 previous years. Before we discuss the results of the impact of remittances, we need to tell something about the instrumentation equations. Table A1 in Appendix presents the instrumentation equation associated to each of endogenous regressors and each specification of the structural model (12). The first four columns of Table A1 present instrumentation equations derived from the specification in column 1 of Table 2. The last four columns of Table A1 are devoted to the results of the instrumentation equation derived from the specification in column 2 of Table 2. Table 2 presents also diagnostic tests associated to first stage models. As we can see from columns 1 and 2, our instruments are significantly associated to endogenous regressors given the low probability of the F-test statistics in the first stage. Moreover, the over-identification tests (Hansen OID test) do not reject the hypothesis that our instruments are not correlated to the error terms of structural equations.

We now turn to the discussion of results derived from the estimation of the structural equations. We notice that all explanatory variables have the correct sign and some of them are statistically significant. We observe for example that the quadratic relationship between GDP per capita and child labor prevalence is confirmed by our data. Indeed, this result had been previously found by Dehejia and Gatti (2005) and Edmonds and Pavcnik (2006). Initial conditions are also a good predictor of child labor given the positive and significant coefficient of child labor in 1960. The rural population share is also positively related to the prevalence of child labor and the ratification of ILO 138 Convention in 1995 is negatively associated to child labor in 2000 although the coefficient is not statistically significant.

When we turn to our variables of interest, we observe that remittances and remittances crossed with the private credit are significantly associated to the prevalence of child labor and their coefficients exhibit opposite signs. This result holds whatever the measure of economic volatility included in the models (columns 1 and 2). This result suggests that the marginal efficiency of remittances on child labor reduction increases with the importance of credit constraints in countries. To ensure that the overall impact of remittances on child labor is statistically significant, we perform an F-test of the joint significance of coefficients associated to remittances and remittances crossed with private credit ratio. The results of this test present in Table 2 suggest that the coefficients are jointly significant. We then can make some basics simulations in the basis of these results. Perhaps a better sense of the quantitative significance of the impact of migrants' remittances can be obtained from the following calculation based on the results of column 1. A one standard-deviation increase in remittances ratio (4.43) is associated

with a 41% decrease in child labor relative to the mean (12.90%) for a developing country with a credit ratio which corresponds to the 25th percentile of the distribution of the variable (9.97%).

While remittances appear to be negatively associated to child labor in developing countries, we notice from results of columns 1 and 2 that adults' emigration is not statistically related to the international prevalence of child labor. However, the coefficient of this variable is positive although not significant.

5.2. Remittances, economic volatility and the prevalence of child labor

The results of the estimation of the model (13) are presented in Table 2. Two models are estimated depending on the indicator of economic volatility retained. In the third column, we present the results of the estimation of the model in which volatility is measured as the standard deviation of GDP per capita growth rate in the previous 5 years. Column 4 presents the results when volatility is constructed on the basis of 10 previous years. The corresponding instrumentation equations are presented in Table A2 in Appendix. Moreover, the diagnostic tests associated to first stage analysis confirm the validity of our instrumental strategy. We notice that our instruments are significantly related to the endogenous regressors given the low values taken by F-test probabilities. Moreover, the test of over-identification restrictions suggests an absence of correlation between our instruments set and the error terms in the structural equations.

The U-shaped relationship between GDP per capita and child labor is confirmed once again. Rural population is a factor of child labor expansion while trade openness reduces it. One of the most important results is the fact that volatility is positively and significantly associated to child labor. This result had been previously found by Dehejia and Gatti (2005) in a cross country study and by Calero et al. (2009) in a microeconometric study for Ecuador. We notice that recent economic shocks (volatility measured using data for the 5 previous years) contribute the most in the expansion of child labor than old shocks (instability using the 10 previous years).

Table 2: Causal impact of migration and remittances on Child Labor. Estimation method: GMM estimator

Dependent variable : Prevalence of Child Labor : (Children aged 10-14)	(1)	(2)	(3)	(4)
Remittances	-1.498***	-1.531***	0.467	1.219**
	(-3.195)	(-3.422)	(1.156)	(2.431)
Remittances*Private credit ratio	0.0300**	0.0326**		
	(2.017)	(2.355)		
GDP per capita growth volatility (5years)	0.331		1.365**	
	(1.031)		(2.181)	
Remittances*GDP per capita growth volatility (5years)			-0.392**	
			(-2.174)	
Remittances*GDP per capita growth volatility (10years)				-0.237***
				(-2.629)
GDP per capita growth volatility (10years)		0.196		0.962**
		(1.259)		(2.566)
Emigration rates of individuals to OECD (aged 25+)	0.326	0.273	0.396	0.178
	(1.272)	(0.916)	(1.338)	(0.722)
Private credit ratio	-0.0692	-0.0719	-0.0142	-0.0204
	(-1.302)	(-1.343)	(-0.345)	(-0.455)
Initial level of child labor	0.412***	0.418***	0.390***	0.438***
	(6.037)	(5.677)	(5.550)	(6.298)
GDP per capita (log)	-17.04**	-14.89*	-20.85***	-28.88***
	(-2.180)	(-1.739)	(-2.934)	(-3.175)
(GDP per capita (log))^2	1.012*	0.895	1.244**	1.816***
	(1.825)	(1.440)	(2.389)	(2.946)
Rural population (%)	0.240**	0.263**	0.149**	0.0332
	(1.993)	(2.135)	(2.306)	(0.503)
Trade openness	-0.163*	-0.192**	-0.147**	-0.142**
	(-1.826)	(-2.317)	(-2.084)	(-2.073)
ILO Convention 138	-1.229	-0.854	-1.666	-1.930
	(-0.958)	(-0.681)	(-0.941)	(-1.046)
Constant	64.80**	55.03*	78.16***	108.6***
	(2.234)	(1.810)	(3.056)	(3.192)
Observations	82	81	82	81
Centered R^2	0.878	0.872	0.861	0.873
Joint significance of remittances variables (p-value)	0.005	0.003	0.093	0.024
Remittances instrumentation F-stat (p-value)	0.000	0.000	0.000	0.000
Remittances*Private credit instrumentation F-stat (p-value)	0.030	0.025	..	..
Remittances*Volatility (5y) instrumentation F-stat (p-value)	..	..	0.537	..
Remittances*Volatility (10y) instrumentation F-stat (p-value)	..	..	..	0.066
Private credit ratio instrumentation F-stat (p-value)	0.004	0.005	0.014	0.023
Emigration to OECD instrumentation F-stat (p-value)	0.000	0.000	0.000	0.000
Hansen OID p-value	0.363	0.376	0.784	0.391

Note : Robust t-statistics in parentheses. The GMM estimator has been used in all specifications. Endogenous explanatory variables are: remittances, remittances*private credit, remittances*GDP per capita growth volatility, the private credit ratio, and emigration rate. Remittances are instrumented by the cost to send $200 to each country and by a dummy variable for the existence of dual exchange rate. Private credit ratio is instrumented by the index of creditors' right and by a binary variable on the existence of public (i.e., government-owned) and private credit registries. Emigration rate of individuals aged 25+ to OECD is instrumented by the log distance between each country and the OECD area, by a binary variable of common language shared with at least one member of the OECD area and finally by the ratio of coastal area to the total area. Endogenous interactive variables are instrumented by the product of instruments of each endogenous variables. Regional dummies are included in all models. *** p<0.01, ** p<0.05, * p<0.1.

From the results of columns 3 and 4, the insurance role played by remittances is confirmed empirically. Indeed, the interaction terms of remittances crossed with either indicators of economic volatility is statistically significant and negative. This suggests that remittances increase the ability of households to face shocks. The F-test of the joint significance of additive and interactive terms leads to the conclusion that the total impact of remittances on child labor is statistically significant. On the basis of results obtained in column 3 of Table 2, a one standard-deviation increase in remittances ratio (4.43) is associated with a 38% decrease in child labor relative to the mean (12.90%) for a developing country with a volatility which corresponds to the 75th percentile of the distribution of the variable (4.05%).

Once more, even in this specification, migration is not robustly associated to child labor when we have already controlled for remittances. However, the coefficient of the emigration rates of individuals aged 25+ is positive and in conformity with the previous results of Bansak and Chezum (2009) from micro data for Nepal.

6. Concluding remarks

Workers' remittances, flows received from migrant workers residing abroad, have become the second largest source of external finance for developing countries in recent years. In addition to their increasing size, the stability of these flows despite financial crises and economic downturns make them a reliable source of funds for developing countries. While the development potential of remittance flows is increasingly being recognized by researchers and policymakers, the effect of remittances on child labor at the cross-country level remains unexplored.

This paper is a first effort to try to fill this gap in the literature. We have tested the hypothesis that remittances are more effective in child labor reduction when the constraints faced by households of these countries are high. On the basis of a large sample of developing countries observed in the year 2000, we have shown that the marginal impact of migrants' remittances on child labor increases with the levels of financial constraints and the intensity of income shocks. These results are robust to the correction of endogeneity bias arising from omitted factors, reverse causation, and measurement error in our variables of interest.

Our results suggest that all strategies to facilitate the inflow of remittances in these countries are important for the accumulation of child human capital and a reduction in the prevalence of child labor. Such policies have distinct advantages over other remedies. Compared with legal restrictions and direct bans, it can decrease child labor without lowering household welfare, and it is arguably a simpler goal than general economic development and can have a more immediate impact. There would be substantial potential benefits to the world's poor if more international attention were focused on integrating "migration policy" within the larger global dialogue on economic development and poverty reduction. With respect to remittances, the international community needs to take efforts to reduce the current high transaction costs of remitting money to labor-exporting countries. At present, high transaction costs resulting from lack of competition, regulation, and/or low levels of financial sector performance in labor-exporting countries act as a type of regressive tax on international migrants, who often tend to be poor and to remit small amounts of money with each remittance transaction. Lowering the transactions costs of remittances will help to increase the economic development-increasing impact of international remittances and will also encourage a larger share of remittances to flow through formal financial channels.

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APPENDIX

Table A1: Instrumentation equations related to the estimation of model (12)

Variables	R	FD	M	R*FD	R	FD	M	R*FD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per capita (log)	7.739	18.59	6.499	163.9	11.04*	17.96	7.808	345.2
	(1.454)	(0.547)	(1.186)	(0.751)	(1.962)	(0.528)	(1.416)	(1.366)
(GDP per capita (log))²	-0.698*	-0.537	-0.340	-15.46	-0.919**	-0.514	-0.432	-27.92
	(-1.874)	(-0.222)	(-0.894)	(-1.007)	(-2.330)	(-0.213)	(-1.116)	(-1.514)
Rural population (%)	-0.0337	-0.190	0.118*	-6.483	-0.0463	-0.191	0.110	-6.978
	(-0.534)	(-0.645)	(1.855)	(-1.458)	(-0.715)	(-0.624)	(1.619)	(-1.477)
Trade openness	0.0895	0.0518	-0.00208	7.000	0.0923	0.0463	-0.00126	6.952
	(1.192)	(0.181)	(-0.0476)	(1.238)	(1.295)	(0.164)	(-0.0293)	(1.250)
Volatility (5 years)	0.0563	-0.439	-0.0145	-12.71				
	(0.204)	(-0.283)	(-0.0648)	(-1.260)				
Volatility (10 years)					0.164*	-0.264	-0.00430	6.300
					(1.781)	(-0.481)	(-0.0335)	(1.222)
ILO Convention 138	-2.173**	-4.244	-2.041	-31.42	-2.004*	-4.693	-2.031	-34.92
	(-2.047)	(-0.714)	(-1.548)	(-0.766)	(-1.960)	(-0.751)	(-1.510)	(-0.821)
Initial Child Labor	0.0333	0.518*	-0.0815	2.747	0.0514	0.506*	-0.0735	3.243
	(0.900)	(1.780)	(-1.223)	(1.458)	(1.414)	(1.693)	(-1.019)	(1.606)
Cost to send $200	-0.710**	2.344	-0.622	-8.192	-0.659**	2.251	-0.596	-10.03
	(-2.156)	(0.848)	(-1.473)	(-0.424)	(-2.041)	(0.817)	(-1.372)	(-0.525)
Cost to send $200*Information	0.228	0.535	0.325	9.979	0.168	0.463	0.255	8.353
	(0.750)	(0.235)	(0.797)	(0.589)	(0.534)	(0.188)	(0.582)	(0.465)
Cost to send $200*Creditors' right	0.312*	-3.252***	0.431**	0.0408	0.302*	-3.195***	0.429**	1.805
	(1.920)	(-2.750)	(2.235)	(0.00687)	(1.980)	(-2.781)	(2.169)	(0.301)
Dual exchange rates	-4.404	-0.800	4.373	-16.68	-5.403	-2.055	3.507	-83.52
	(-1.496)	(-0.0326)	(1.153)	(-0.101)	(-1.409)	(-0.0778)	(0.998)	(-0.401)
Dual exchange rates*Information	2.199	6.684	1.723	59.70	4.011	8.559	3.016	195.5
	(0.744)	(0.403)	(0.625)	(0.434)	(1.182)	(0.395)	(1.069)	(1.107)
Dual exch. rates*Creditors' rights	0.739	-9.169	-3.147**	-45.73	0.460	-9.462	-3.333**	-68.47
	(0.753)	(-1.209)	(-2.364)	(-0.844)	(0.446)	(-1.231)	(-2.445)	(-1.189)
Creditors' rights	-4.761*	55.82***	-5.447*	21.35	-4.619**	55.14***	-5.390*	-2.060
	(-1.993)	(3.183)	(-1.915)	(0.216)	(-2.053)	(3.215)	(-1.864)	(-0.0209)
Information	-3.811	3.817	-6.120	-113.4	-3.000	4.589	-5.216	-94.68
	(-0.908)	(0.120)	(-0.914)	(-0.520)	(-0.701)	(0.135)	(-0.726)	(-0.410)
lc100km	8.029***	-1.101	8.061***	259.3***	7.999***	-1.445	7.984***	248.8***
	(5.915)	(-0.124)	(3.870)	(3.527)	(5.803)	(-0.160)	(3.842)	(3.443)
Distance OECD (log)	-4.453	-1.091	-15.27***	-40.00	-4.369*	-1.776	-15.28***	-62.09
	(-1.669)	(-0.0711)	(-4.202)	(-0.309)	(-1.730)	(-0.110)	(-4.032)	(-0.476)
Common language OECD	-1.503	-3.152	0.767	-43.95	-1.718	-2.751	0.795	-52.39
	(-0.689)	(-0.369)	(0.470)	(-0.328)	(-0.774)	(-0.313)	(0.492)	(-0.375)
Constant	30.78	-117.6	106.3***	201.5	16.98	-106.3	101.8***	-268.0
	(1.042)	(-0.664)	(3.134)	(0.167)	(0.581)	(-0.588)	(2.899)	(-0.208)
Observations	82	82	82	82	81	81	81	81
Partial R²	0.36	0.46	0.49	0.20	0.38	0.44	0.50	0.21

Note: Robust t-statistics in parentheses. R : Remittances in percentage of GDP ; FD : private credit ratio ; M : Emigration rates of individuals aged 25+ to OECD ; Information : binary variable on the existence of public (i.e., government-owned) and private credit registries (Djankov et al. [2007]) ; Distance OECD : The log of the distance between the departure point and the OECD area; Common language OECD : binary variable which takes the value one if the country shares the same language with at least one member of OECD; lc100km : Ratio of coastal area (area within 100km of sea/ocean) to total area. Regional dummies are included in all specifications. *** p<0.01, ** p<0.05, * p<0.1.

Table A2 : Instrumentation equations related to the estimation of model (13)

Variables	R	FD	M	R*Sh (5years)	R	FD	M	R*Sh (10years)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per capita (log)	7.304	15.32	1.571	31.20	9.775*	13.39	2.051	41.34
	(1.437)	(0.467)	(0.259)	(1.249)	(1.958)	(0.392)	(0.307)	(0.853)
(GDP per capita (log))²	-0.662*	-0.383	-0.00184	-2.556	-0.826**	-0.256	-0.0407	-3.910
	(-1.890)	(-0.161)	(-0.00422)	(-1.490)	(-2.403)	(-0.105)	(-0.0852)	(-1.227)
Rural population	-0.0275	-0.216	0.125*	0.182	-0.0336	-0.237	0.122*	-0.348
	(-0.429)	(-0.810)	(1.863)	(0.745)	(-0.519)	(-0.842)	(1.702)	(-0.725)
Trade openness	0.0992	0.148	0.0358	-0.242	0.106	0.0370	0.0447	-0.121
	(1.230)	(0.510)	(0.638)	(-0.747)	(1.241)	(0.114)	(0.743)	(-0.178)
ILO Convention 138	-2.285**	-5.757	-1.577	-12.96**	-2.182**	-5.786	-1.651	-22.83**
	(-2.055)	(-0.955)	(-1.127)	(-2.262)	(-2.103)	(-0.877)	(-1.077)	(-2.243)
Initial Child Labor	0.0347	0.510*	-0.0752	-0.115	0.0462	0.501	-0.0757	0.200
	(0.917)	(1.752)	(-1.120)	(-0.635)	(1.230)	(1.671)	(-1.006)	(0.652)
Dual exchange rates	-0.482	-20.28	0.831	-2.069	-0.0109	-27.40**	1.885	-1.708
	(-0.248)	(-1.495)	(0.257)	(-0.242)	(-0.00517)	(-2.116)	(0.465)	(-0.0859)
Cost to send $200	0.000540	-0.872	0.385	-0.938	-0.0195	-1.819	0.393	-2.559
	(0.00264)	(-0.396)	(0.956)	(-1.140)	(-0.0755)	(-1.015)	(0.842)	(-0.945)
Volatility(5 years)	-0.0834	8.517	-0.188	-1.670				
	(-0.131)	(0.766)	(-0.236)	(-0.469)				
Dual exchange*Volatility (5yea.)	-0.115	1.208	-0.286	-1.746				
	(-0.190)	(0.265)	(-0.382)	(-0.685)				
Cost $200*Volatility (5years)	0.00151	-0.606	-0.00205	0.439				
	(0.0292)	(-0.849)	(-0.0310)	(1.179)				
Information	0.100	9.943	-0.718	-2.029	0.417	8.310	-0.527	-5.014
	(0.0859)	(1.593)	(-0.376)	(-0.392)	(0.354)	(1.317)	(-0.260)	(-0.494)
Creditors' right	-0.102	6.929***	0.310	0.524	-0.133	7.660***	0.304	-0.191
	(-0.251)	(2.804)	(0.563)	(0.346)	(-0.323)	(3.168)	(0.523)	(-0.0624)
lc100km	7.515***	4.509	8.030***	15.73**	7.480***	4.577	8.012***	38.92***
	(5.321)	(0.447)	(3.825)	(2.357)	(5.246)	(0.399)	(3.617)	(3.652)
Distance OECD (log)	-3.530	-11.35	-14.26***	-21.49	-3.585	-10.88	-14.49***	-36.43
	(-1.272)	(-0.691)	(-3.794)	(-1.416)	(-1.311)	(-0.603)	(-3.751)	(-1.347)
Common language OECD	-1.077	1.834	1.011	-3.091	-1.096	-1.573	1.298	-15.13
	(-0.492)	(0.210)	(0.751)	(-0.346)	(-0.489)	(-0.159)	(0.962)	(-0.899)
Volatility (10 years)					0.0499	3.510	0.0445	-6.707
					(0.0624)	(0.599)	(0.0424)	(-0.647)
Dual exchange*Volatility (10ye.)					-0.207	2.180	-0.446	-2.296
					(-0.535)	(0.924)	(-0.707)	(-0.692)
Cost $200*Volatility (10years)					0.00807	-0.288	-0.00513	0.857
					(0.128)	(-0.646)	(-0.0653)	(1.078)
Constant	13.48	30.31	100.4***	101.2	4.003	52.46	100.3***	261.9
	(0.440)	(0.152)	(2.867)	(0.662)	(0.128)	(0.234)	(2.780)	(0.773)
Observations	82	82	82	82	81	81	81	81
Partial R^2	0.30	0.36	0.41	0.20	0.31	0.32	0.22	0.41

Note: Robust t-statistics in parentheses. R : Remittances in percentage of GDP ; FD : private credit ratio ; M : Emigration rates of individuals aged 25+ to OECD ; Information : binary variable on the existence of public (i.e., government-owned) and private credit registries (Djankov et al. [2007]) ; Distance OECD : The log of the distance between the departure point and the OECD area; Common language OECD : binary variable which takes the value one if the country shares the same language with at least one member of OECD; lc100km : Ratio of coastal area (area within 100km of sea/ocean) to total area; Sh (5years): Standard deviation of GDP per capita growth rate in previous 5 years; Sh (10years): Standard deviation of GDP per capita growth rate in previous 10 years Regional dummies are included in all specifications. *** p<0.01, ** p<0.05, * p<0.1.