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Abstract

This paper investigates international capital flows to developing countries for the period 1970-2006. The study focuses on the empirical puzzle that although one would expect international capital to flow to capital scarce countries where returns are higher, observation shows that capital flows to richer rather than to poorer countries (the Lucas paradox). To explore this, total capital is measured as the sum of foreign direct investment and portfolio equity flows. The paper addresses the argument, based on cross-section evidence (Alfaro *et al.*, 2008, *Rev. Econ. Stats*), that including the quality of institutions accounts for the paradox (because richer countries have better institutions they attract more capital) and finds that this only holds if developed countries are included; *within* developing countries, institutions do not account for the paradox. Hence, for a consistent sample of 47 developing countries the positive wealth bias in international capital flows or the Lucas paradox is shown to be a persistent phenomenon in the long run.

Keywords: Capital flows, Lucas paradox, Institutional quality, Economic growth, Cross-section OLS, Long-run

JEL classification: E02, E13, F21, F41, J24, O16

1 Introduction

Obstfeld and Rogoff (2000) include limited international capital mobility as one of the six major puzzles in international macroeconomics. The stickiness in cross border capital transfers was first documented by Feldstein and Horioka (1980) who found very high correlations between domestic savings and investments in OECD countries for the 1960-1974 period. Since incremental savings tend to stay in the country making the savings it is hard to assert that foreign capital has been perfectly mobile. Using the self-financing ratio of cumulative discounted gross national savings and gross national investment, Aizenman *et al.* (2007) demonstrated that 90 percent of domestic capital stock, on average, in developing countries is self-financed and this fraction was stable during the 1990s.

Under homogeneous technology with constant returns to scale, identical goods, and competitively free international trade, conventional neoclassical growth and trade theory predicts that factor price equalizing (Samuelson, 1948) investments will accrue to the capital scarce less developed economies, i.e. capital will tend to flow to poorer countries. Via this mechanism international convergence in economic growth and consumption would be accomplished in a transition period during which cross-country differences in levels of economic development will fade away. This has evidently not happened.

The Lucas paradox refers to the observation of rich-to-poor capital flows falling far short of the flows predicted by the neoclassical growth and trade theory, as systematically observed in Lucas (1990). In fact, capital flows tend to move disproportionately to richer countries, if not from poorer to richer countries. In the same vein and with reference to endogenous growth theory (Romer, 1986; Lucas, 1988), King and Rebelo (1993) conclude that under such conventional assumptions about preferences it is hard to rely on the neoclassical model to explain *sustained* variations in growth rates across countries. Accounting for this paradox would also help explain the more general puzzle of relatively immobile international capital flows.

Lucas (1990) provided four possible hypotheses to account for that puzzling patterns of international capital flows: differences in relative human capital stocks; variations in external benefits of human capital; capital market imperfections (political risk, institutions etc.); and restrictions on capital flows (taxation, capital controls and similar policies) and monopolistic power (Parente and Prescott, 1999) of either the imperial colonizer or of the national sovereign government. Reasoning that adjusting for human capital differentials eliminates the return differentials between poorer and wealthier countries, he favours the combination of the first two explanations.

Theoretical approaches to the Lucas paradox can be categorized into two major groups. Papers in the first group try to explain the puzzle through domestic economic fundamentals such as omitted factors of production, disruptive government policies in forms of taxation, direct controls and restrictions, institutional establishments (incentive and safeguard structures) and total factor productivity differences.[1] International capital market imperfections constitute the conceptual stance on which the second approach favours asymmetric information and sovereign risk explanations.[2] Both approaches are inevitably interlinked and some recent papers (e.g. Goldstein and Razin, 2006; Kraay *et al.*, 2005) take a mixed position between fundamentals and financial market inefficiencies in modelling private foreign equity and portfolio flows.

Although empirical literature focusing directly on the Lucas paradox is limited (e.g. Clemens and Williamson, 2004, Alfaro *et al.*, 2008), there is extensive applied work on the realization of capital flows. Financial and banking crises, capital flight, and rapid capital flow resumptions stimulated economists to analyse the main determinants and properties of flows through empirical research. Some studies have concentrated on the topic of whether external financing is driven by domestic or foreign factors—the push versus pull controversy.[3] Time series properties of cross border fund movements have also been analyzed.[4] Other papers have provided evidence on compositional dynamics and differentiation of various types of financial transfers according to their build-up and determination.[5]

Specifically for institutions, several studies document that institutional quality is important in explaining capital flows. Employing world governance indicators of the World Bank as proxy for institutions Faria and Mauro (2009) find that institutional quality index is positively significant in explaining the share of direct and portfolio equity stocks in total external liabilities. De Santis and Lührmann (2009) show the negative impact of deteriorating civil liberties on income scaled foreign portfolio equity flows. Daude and Fratzscher (2008) demonstrate that component based institutional quality in terms of corruption, expropriation risk, repudiation costs, and days of enforcement for business contracts has differing influence on capital stock compositions. Institutions, for instance, have not been detected to be effective on FDI unlike the situation for international portfolio equity investments. Edison and Warnock (2008) could not discover any meaningful association between first differenced International Country Risk Guide (ICRG) composite index and US net monthly purchases of emerging Asian and Latin American portfolio equity securities.

Using cross-section data for countries from all income levels (both industrialized and unindustrialized), Alfaro *et al.* (2008) find that the problem of 'lower-than expected capital flows to poorer economies' (the Lucas paradox) is resolved by including a measure for institutional quality. For a sample of 47 developing countries over the 1970-2006 period, this study tests if their findings hold up when advanced countries—that consistently have higher levels of institutional quality—are excluded.[6] Employing simple cross-section OLS estimators and using real capital flows (the sum of foreign direct and portfolio equity investment) per capita as the dependent variable (as in Alfaro *et al.*, 2008), the paper provides evidence for the Lucas paradox *within* developing countries.[7] Following Houthakker (1965), Baltagi and Griffin (1984), Pesaran and Smith (1995), we interpret the estimation results from cross-section OLS as capturing *long-run* relationships.

The remainder of the paper is organized as follows. Section 2 discusses theoretical background and Section 3 specifies econometric methodology. Section 4 describes the data and overviews the evolution of selected data over time. Core regression results are given in Section 5 and concluding remarks are in Section 6.

2 Theoretical motivation

We follow the expositions of Alfaro *et al*. (2008). In the context of economic growth, assume a small open economy operating with explicit production factors capital, K, and labour, L, through a constant returns to scale (CRS) production function of the form:

$$Y_t = A_t \mathrm{F}(K_t, L_t) \quad F_K(\cdot) > 0, F_L(\cdot) > 0; \quad F_{KK}(\cdot) < 0, F_{LL}(\cdot) < 0 \tag{1}$$

where Y represents output, A stands for total factor productivity (TFP), and t subscript denotes time. In such an open economy agents can lend and borrow capital globally. Hence, if all countries are endowed with identical technology with homogeneous capital and labour inputs the instantaneous convergence of the returns to capital would be accomplished via free and competitive international trade so as to get;

$$A_t \mathrm{f}'(k_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt}\right) \tag{2}$$

where $\mathrm{f}(\cdot)$ denotes the net of depreciation production function in per capita terms and k refers to capital input per capita in country i or j. Diminishing returns, identically endowed constant TFP, free and competitive trade, and international arbitrage imply that financial resources will move from capital-abundant countries of low returns to capital-scant countries of high returns. As noted, however, this is not observed; giving rise to the Lucas paradox. Theoretical approaches to account for this paradox can be categorized as cross country variations in economic fundamentals versus international capital market imperfections.

2.1 Economic Fundamentals

2.1.1 Omitted Factors of Production

One conjecture is that the conventional neoclassical theory disregards other factors potentially influencing production. Natural resources and human capital (Lucas, 1990; Acemoglu and Zilibotti, 2001) may have positive externalities on productivity ultimately leading to increased returns to capital. Incorporating these factors under a new term, Z_t, yields

$$Y_t = A_t \mathrm{F}(K_t,\ Z_t,\ L_t) \tag{3}$$

Thus, we now obtain the true returns equated as

$$A_t \mathrm{f}'(k_{it},\ z_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt},\ z_{jt}\right) \tag{4}$$

The implication being that lower z reduces relative returns in poorer countries.

2.1.2 Government Policies

Fiscal policy by means of taxation, monetary policy via inflation targeting, and policies directly imposing capital controls may interrupt capital flows (Stockman and Hernández, 1988). The distortive effects of these government policies can be inserted into the model by supposing that governments levy tax on capital returns at varying rates of τ. The equivalent returns are given in the form of

$$A_t \mathrm{f}'(k_{it})(1-\tau_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt}\right)(1-\tau_{jt}) \tag{5}$$

2.1.3 Institutions and TFP

Consisting of both culture shaped informal codes of conduct like social norms, customs, traditions, ethical and moral values; and formal rules such as laws, decrees, statutes, communiqués, and similar regulations institutions are the constraints that structure political, economic, and social interactions. Weak property rights, fear of expropriation, low enforcement of legal contracts, and other weak socio-political and socioeconomic conditions

due to poor institutions may leave productive capacities unexploited and may create a wedge between ex ante and ex post financial investment returns in that economy (Parente and Prescott, 1994).[8] Being unable to explicitly distinguish among the reflections of heterogeneous incentive structure, innovation opportunities, and technological efficiency both TFP and institutional quality originated factors are attributed to A_t. The return differentials are expressed as

$$A_{it}\mathrm{f}'(k_{it}) = r_t = A_{jt}\mathrm{f}'\left(k_{jt}\right) \tag{6}$$

2.2 International Capital Market Imperfections

2.2.1 Asymmetric Information

Both national and international financial markets are subject to either adverse selection, moral hazard, costly state verification, or all of these to a certain extent. In general, laissez-faire market conditions may be paralyzed through the distortions caused by this sort of informational asymmetries among the participants. Furthermore, as Gertler and Rogoff (1990) notes, North-South capital flows are dampened and possibly reversed relative to the perfect-information benchmark. Eventually, the lack of international portfolio diversification and home bias can come into play in the forms of disinvestment, divestment, and under investment particularly in less developed poor countries (Gordon and Bovenberg, 1996).

2.2.2 Sovereign Risk

Bearing an overlapping relationship with political risk and institutions, sovereign risk exclusively embraces credit risk, the probability that a sovereign will default on servicing its debt, as well as the risk of expropriation and repudiation. It also refers to the policies by which a government can discourage domestic residents in fulfilling their obligations to foreign contracts. In his recent theoretical paper Wright (2006) argues that due to default risk only smaller levels of capital flows can be supported in equilibrium. By means of the example of colonial India which was exposed to the same rules as imperial Great Britain, Lucas (1990) argued that sovereign risk could not solve his puzzle. Conversely, recalling several rebellions in India, Reinhart and Rogoff (2004) maintained that sovereign risk might well account for the paradox: "As long as the odds of non-repayment are as high as 65 percent for some low-income countries, credit risk seems like a far more compelling reason for the paucity of rich-poor capital flows."

3 Methodology

The cross section ordinary least squares (OLS) specification for the long run averages over time can be characterized as:

$$F_i = \mu + \alpha Y_i + \mathbf{x}_i\boldsymbol{\beta} + \varepsilon_i \tag{7}$$

where F_i is average inflows of portfolio equity and direct investment per capita to country i $(i = 1, 2, \dots, N)$, μ is a constant or the intercept, Y_i is the log per capita initial wealth, $\mathbf{x}_i$ is a $1 \times (K-1)$ row vector of any additional covariates or control variables included sequentially either in a way of 'one at a time' or in a multivariate regression framework, and ε_i is the usual disturbance term. The coefficients of interest are α and $(K-1) \times 1$ column vector $\boldsymbol{\beta}$, where K is the number of regressors and $K \geq 1$. The former will be capturing

the presence of the Lucas paradox while the latter will be offering quantitative insight about the ability of corresponding regressor in accounting for, i.e. resolving, the paradox.

4 Descriptive statistics and trends

Alfaro *et al*. (2008) argued that it is more appropriate to use time averaged variables for elucidating the long run relationships. Figure 1 shows the trends of twelve components of the composite index for the quality of institutions. The scores of each component are the annual mean values across all sample countries for which the data are available. Because institutional quality is one of the core variables it has been conjectured that a breakdown of its components would demonstrate the profile of their time variation, thus giving an idea about the composite index too. Indeed, as can be seen from the figure all the components but four display a relatively stationary pattern and those four are mostly stable throughout the 1980s and since 2001. The coefficient of variation statistics of both per capita equity inflows and institutional quality averaged across counties are less than of those averaged across years.[9]

[Figure 1]

Table 1 provides descriptive statistics for time averaged cross section data on the main variables in our analysis. On average, a typical developing country attracts per capita foreign portfolio equity plus direct investment around $48. Ranging between $1 and $202 average capital flows per capita also has high variation across countries. With a mean value of 5.9 out of 10 the index of quality of institutions has the lowest cross country variation; a parallel and more pronounced less spatial (country) heterogeneity indication.

[Table 1]

In a slight contrast, average years of education attainment shows a wide array from about five months to 8 years which demonstrates the disparity in human capital formation across unlucky developing countries. The negative mean growth rate of the most volatile variable of average total factor productivity might be a sign for declining efficiency in production processes and technologies of those countries. Finally, it is important to note that the mean value of the composite variable of restrictions on capital mobility (taking values between 0 and 1) reads as 0.60 which is well above 0.50. This reveals how strongly countries themselves de-jure constrain and control the flow of funds albeit all financial liberalizations they pass through and economic globalizations they become a part.

5 The underlying regression results

This section concentrates on the actual models fitted to the data by replicating key aspects of the analysis in Alfaro *et al*. (2008) first, laying down the estimation outputs in the subsequent tables for the sample of developing countries second, carrying out sensitivity checks third and finally dealing with potential endogeneity issues through instrumental variable regressions.

5.1 Replication of Alfaro *et al.* (2008)

Using data for the same sample of 98 developed and developing countries, we first replicate the main estimates of Alfaro *et al*. (2008). Panel A in Table 2 provides the cross-section OLS regression results following the approach of the original paper.

[Table 2]

Models (1), (3) and (6) show that the Lucas paradox exists for both samples of countries from all income levels as the log per capita initial GDP (a proxy for the level of initial capital stock in an economy) is positively significant in explaining the inflow of new foreign capital. The inclusion of institutional quality 'resolves' the paradox in all models except (8) which, in contrast, demonstrates that the results for the original period 1970-2000 are sensitive to base year adjustment. Nevertheless, our data reaffirm the findings of Alfaro *et al*. (2008) with the same base year. Panel B reports estimation results from the replications that consider slight modifications (e.g., extending the sample period to 2006, taking 2005 as the base year and additionally incorporating the 'socioeconomic conditions' component in the composite institutional quality variable). The estimates in this lower panel corroborate those of Alfaro *et al*. (2008) more strongly than the upper panel.

Throughout the remainder of this paper, we focus on the subset of developing countries and investigate the empirical implications of the Lucas paradox and related theories within that particular country group. More specifically, we explore if the above findings hold when industrialised (developed) countries are removed from the sample.

5.2 Central Cross-Section OLS Results

Table 3 reports the main estimation results for the sample of developing countries. The preliminary cross section OLS regressions of per capita foreign portfolio equity and direct investment inflows on initial GDP and composite institutional quality index are given in the first three models.

[Table 3]

Model (1) in the table corroborates that the Lucas paradox indeed exists; i.e. capital moves to wealthier markets in contrast to the expectations of neoclassical growth and trade theory. Looking at Model (2), log initial GDP per capita remains significant. With an alternative income measure, Model (3) supports the previous model that quality of institutions is not able to resolve the paradox for a sample of only developing countries. The last three models in the same table portray additional and augmented multivariate estimation results. This part encompasses regressions testing all four hypotheses proposed by Lucas (1990). From these explanations Lucas (1990) had preferred the stock differences in and positive externalities of human capital interpretations over the remaining. Model (4) challenges this as the inclusion of average years of schooling as human capital proxy does not remove the paradox for developing countries. Similarly, Model (5) shows that initial GDP still preserves its statistical significance (at 10%) despite controlling for distance, restrictions on capital market transactions and years of schooling. With a slightly different initial wealth measure, Model (6) also corroborates the persistence of the paradox within developing economies.

To address potential endogeneity, cross feedback, and collinearity issues Figure 2 illustrates the conditional correlation plots between the residuals from core specifications. Panel A plots the data pointed residuals from the regression of average capital inflows on average institutional quality index against the residuals from the regression of log initial GDP again on institutional quality variable. Panel B, likewise, sketches the data pointed residuals from the regression of average equity investment on log initial GDP against the residuals from the regression of institutional quality on log GDP in 1970. It is clear that institutional quality abstracted initial GDP and initial GDP-free institutional quality are both positively related to capital flows, visualizing the persistence of the Lucas paradox within developing countries.

[Figure 2]

5.3 Robustness Checks

A variety of alternative specifications and variable measures show our main results to be robust.[10] Table 4 provides six different models fitted. With the same periodic focus as in Table 3 and by controlling for additional proxies of economic fundamentals, each of the first mid three regressions substantiate that the quality of institutions does not fully answer the question; why does capital *not* flow to poorer countries? Meanwhile, all the parameters on those covariates carry expected signs despite some being insignificant. Model (5) switches initial wealth measure, the paradox proxy, from GDP to gross capital formation per capita (domestic capital stock) and verifies the settled outcomes of the second and third models in the previous table. The two remaining estimations, one on the far left and the other on the far right of the table, fit the data averaged over two different sub-periods without breaking the robustness of our key findings.

[Table 4]

Asymmetric information and sovereign risk explanations are considered in Table 5. Models from (1) to (3) testify that none of the additional covariates is significant and our basic results are insensitive to allowing for them. Specification (4) regresses average capital inflows over 1985-2006 on initial levels of institutional quality (in 1984). The positively significant impact of pre-sample institutions on the subsequent capital inflows wanes when per capita GDP in 1984 enters in the last model. This is just the opposite of the corresponding estimates in Alfaro *et al.* (2008).[11]

[Table 5]

5.4 Instrumental Variable Estimations

Taking into account possible endogeneity of institutional quality variable because of different factors like measurement error and attenuation bias, we conduct instrumental variable (IV) estimations as the final stage of analysis. The index of institutional quality is sequentially instrumented by European settler mortality variable (in logs), British legal origin dummy, and the variable of English language.

[Table 6]

Under Model (1) in Table 6, negative significance of the settler mortality variable at the first stage regression (in Panel B) corroborates the assertion of Acemoglu *et al.* (2001) that if the European settlement was

discouraged by diseases or when they could not settle the colonizers created worse institutions. In Panel A under the same model, second stage regression of the two stage least squares (2SLS) indicates that the portion of the average institutional quality index that is explained by the log European settler mortality has a significantly positive impact on capital flows. Under (2B), however, log European settler mortality is no longer significant once initial income enters into the specification. And under (2A), neither log initial GDP nor is instrumented institutional quality statistically different from zero. Therefore, settler mortality appears to be an imperfect or weak instrument. Very large standard errors of the 2SLS estimates in 2A (see below) and specification-sensitive results support this surmise. Hence, we cannot assert that European settler mortality resolves our question (the Lucas paradox) despite its common use as an effective instrument for institutions in the literature.

The last IV estimation is given under Model (3) where institutional quality is now instrumented by the British legal origin dummy and the English language variable. Extremely weak coefficient on log colonizer mortality verifies the excludability (strict exogeneity) of that variable. Moreover, the p-value of the Hansen J-test of over-identifying restrictions ascertains that all instruments are valid. Contrary to our results, highly significant English language seems to be crucial in accounting for institutional differences across countries in Alfaro *et al.* (2008). This might be due to the fact that their sample contains currently advanced large countries like the United States of America, Canada, New Zealand and Australia which were the former British colonies.

The IV (2SLS) estimator is less efficient (has larger standard errors) than OLS when the explanatory variables are exogenous (Wooldridge, 2009, p. 527). Therefore it would be useful to test whether the institutional quality variable is in fact endogenous. One way to do this is to conduct a Hausman test to compare the IV and the OLS estimates. According to Hausman specification tests on the non-robust versions we are unable to reject the null hypothesis that the difference between IV and OLS are not systematic. Hence, endogeneity does not appear to be a critical problem.

6 Conclusion

This paper empirically examines whether the results of Alfaro *et al.* (2008) are robust to a sample that excludes developed countries. Using cross-section data averaged over the period 1970-2006 for up to 47 developing countries, it tests the sensitivity of the Lucas paradox to a measure for institutional quality, given control variables. We discover that, within developing economies, the puzzle of rich-to-poor capital flows persists, despite allowing for the quality of institutions, in the long-run. In most of the cross-section OLS estimations, the real per capita initial GDP (the paradox proxy) and the composite index of institutional quality have positive impacts on real capital inflows (the sum of foreign direct and portfolio equity inflows) per capita.

Our analysis suggests that the approach of Alfaro *et al.* (2008) only appears to explain the Lucas paradox because of the driving effects of developed countries. Relative to developing countries, advanced countries attract higher volumes of capital inflows and have significantly higher institutional quality. These are supported by the larger variable variances across countries and very high correlations between main explanatory variables in their sample (Tables 1-4 in Alfaro *et al.*, 2005). Another explanation for the persistence of the wealth bias (the Lucas paradox) within developing countries could be that either underdeveloped economies do not actually have higher returns or international investors and creditors are not satisfactorily convinced that they are higher.

Notes

1. See Martin and Rey (2004), Razin and Yuen (1994), Gomme (1993), Tornell and Velasco (1992).
2. See Albuquerque (2003), Gordon and Bovenberg (1996), Gertler and Rogoff (1990).
3. See Calvo *et al.* (1993), Fernández-Arias (1996), Chuhan *et al.* (1998), Taylor and Sarno (1997).
4. Claessens *et al.* (1995), Sarno and Taylor (1999a, 1999b), Levchenko and Mauro (2007).
5. See, for instance, Lane (2004).
6. The exclusion of some developing countries like those in the Eastern Europe is because of data unavailability especially for the period 1970-1990. There is no any explanation in Alfaro *et al*. (2008) on how they find '*per capita GDP in 1970*' for some countries (like for example Azerbaijan) in their sample.
7. It might be argued that taking Lucas (1990) as the main theoretical reference is not appropriate for such a study focusing on developing countries only, as Lucas (1990) makes developed versus developing or rich versus poor distinction by comparing rich US and poor India. This should be regarded as a specific case or just an example to make the point vivid however. Under the objectivity of science (Popper, 2005, who notes that scientific statements or theories must be inter-subjectively testable implying that from the theories which are to be tested other testable theories can be deduced.) it is more general and scientifically plausible to continuously differentiate countries or economies as poorer versus richer rather than splitting them into just two discrete groups as developed versus developing or rich versus poor. Moreover, developing countries are classified with respect to income, wealth or capital stock (e.g. low income, lower middle income and upper middle income) more commonly and often than developed counties. Such widespread classification implies sufficient heterogeneity among developing countries in terms of initial capital stocks which also justifies the appropriateness of the theoretical framework adopted in the study.
8. See Acemoglu and Dell (2010), and Castro *et al.* (2004) for institutions; Hsieh and Klenow (2009), and Parente and Prescott (2000) for TFP differences.
9. The *within* coefficient of variation is 0.65 for per capita equity flows, and 0.10 for institutional quality whereas the *between* coefficient of variation reads 1.40 for the former, and 0.11 for the latter.
10. Outliers detecting added variable plots (available upon request) indicate that Chile and Panama may have influential observations. Our key results are left unaltered, however, when we drop either of them in turn or suppress both at once.
11. For robustness purposes, taking the fifth model in Table 3 as benchmark, we also run the regressions involving real capital flows per capita as the dependent variable including debt and aid flows besides direct and portfolio equity flows under a more composite capital flow measure; and regressions containing real per capita capital flows as another dependent variable excluding only aid allocations. Alternatively we have incorporated population, savings and income growth under the same specification as Mankiw *et al*. (1992) suggests that those factors affect marginal product of capital according to their augmented Solow growth model. In addition to savings and growth, Gourinchas and Jeanne (2013) argue that the allocation puzzle in capital flows to developing countries is also related to the pattern of accumulation of international reserves. All of the reassurance checks with these alternative dependent and independent variables deliver results (available upon request) very similar to Model (5) of Table 3.

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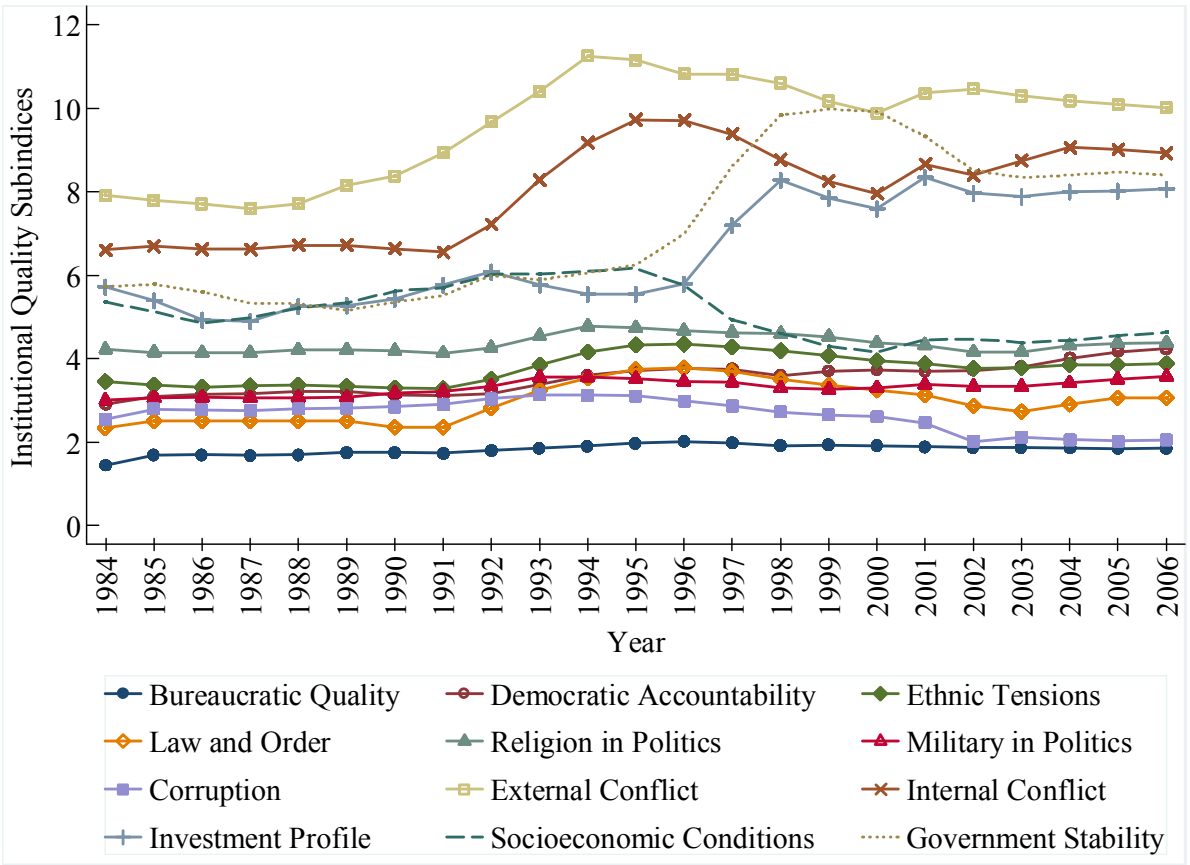
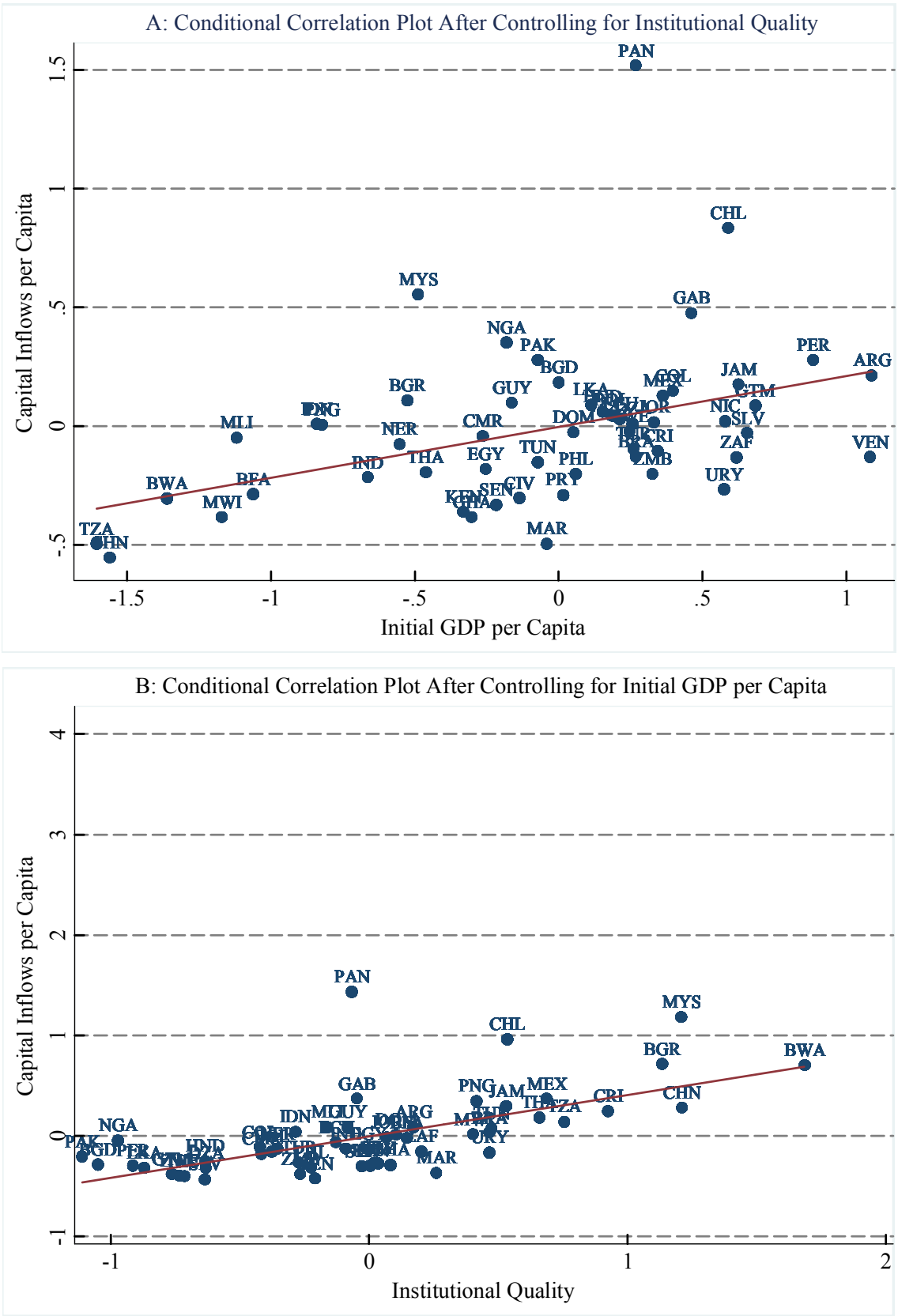
Figures

Figure 1 Evolution of the Institutional Quality Index Components, 1984–2006



Note: A higher score which is the average across 53 countries for each year implies lower risk for every component.

Figure 2 Conditional Correlation Plots of the Residuals



Note: Panel A abstracts from the effects of institutional quality while Panel B does from those of log initial GDP in shaping the mutual associations in question.

Tables

Table 1 Descriptive Statistics

Variables	Sample	Mean	Std. Dev.	Min	Max
Average per capita equity flows, 1970-06	47	47.964	48.692	1.189	202.261
Per capita GDP (PPP $US) in 1970	47	0.881	0.588	0.175	2.838
Average institutional quality, 1984-06	47	5.901	0.688	4.539	7.238
Average years of schooling, 1970-00	47	3.932	1.693	0.477	8.209
Average distance, 1970-06	47	8.842	1.657	5.903	12.312
Average capital mobility barriers, 1970-05	47	0.600	0.202	0.000	0.910
Average corporate tax rate, 1999-06	36	29.872	5.422	15.000	38.240
Average trade openness, 1970-06	47	63.162	31.823	16.924	155.182
Average bank assets, 1970-06	46	0.344	0.198	0.118	0.990
Average TFP growth, 1982-06	39	-0.277	1.448	-3.934	1.909
Per capita GCF (2005 $US) in 1970	44	0.401	0.411	0.057	2.005
Malaria contagion risk as of 1994	47	0.418	0.400	0.000	1.000
Average country risk, OECD, 1999-06	47	5.145	1.582	2.000	7.000
Average Int'l voice traffic, 1970-06	46	30.523	39.074	0.785	165.678
Average foreign bank asset share, 1990-97	41	0.229	0.208	0.006	0.852

Note: Though it may change as a result of data availability, the overall sample period is 1970-2006 in our case whereas it is either 1970-2000 or 1970-1997 in Alfaro *et al*. (2008). All selected variables expressed as monetary values are either in current PPP $US or in 2005 constant $US. Distance, gross capital formation (GCF), and GDP are in thousands of $US. Due to data unavailability, unlikely Alfaro *et al*. (2008), we used GCF rather than domestic capital stock and OECD's country risk in lieu of Moody's sovereign risk and international per person voice traffic instead of *Reuters*. Moreover, in their TFP growth calculation only capital input has been subtracted from the total output whereas in ours both capital and labour inputs deducted so as to yield more accurate TFP estimation.

Table 2 Replication of Core Specifications in Alfaro *et al*. (2008)

A. 1970-2000 Period								
	Base Year 1996					**Base Year 2005**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Log per capita initial GDP (1996 PPP$)	1.20*** (0.18)	-0.02 (0.30)	1.36*** (0.19)	-0.08 (0.43)	0.07 (0.26)			
Log per capita initial GDP (2005 PPP$)						1.39*** (0.20)	0.18 (0.27)	0.46** (0.23)
Average institutional quality, 1984-2000		1.22*** (0.35)		1.31*** (0.43)	1.18*** (0.41)		1.43*** (0.41)	1.37*** (0.41)
Log average years of schooling, 1970-2000					-0.38 (0.35)			-0.78 (0.58)
Log average distance, 1970-2000					1.02 (1.26)			1.60 (1.71)
Average restrictions to capital mobility					-2.27** (0.90)			-2.60** (1.04)
Countries	98	98	81	81	81	81	81	81
R^2	0.27	0.43	0.29	0.44	0.50	0.30	0.44	0.50
B. 1970-2006 Period								
	Base Year 2005					**Base Year 1996**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Log per capita initial GDP (2005 PPP$)	1.65*** (0.22)	0.09 (0.33)	1.79*** (0.24)	0.08 (0.40)	0.31 (0.29)			
Log per capita initial GDP (1996 PPP$)						1.74*** (0.22)	-0.27 (0.57)	-0.12 (0.35)
Average institutional quality, 1984-2006		1.82*** (0.48)		1.92*** (0.55)	1.80*** (0.55)		1.75*** (0.54)	1.56*** (0.53)
Log average years of schooling, 1970-2005					-0.81 (0.72)			-0.39 (0.44)
Log average distance, 1970-2006					1.07 (2.14)			0.61 (1.59)
Average restrictions to capital mobility					-2.80** (1.31)			-2.40** (1.09)
Countries	98	98	81	81	81	81	81	81
R^2	0.32	0.49	0.33	0.49	0.53	0.31	0.50	0.53

Note: Dependent variable is average capital flows (the sum of FDI and foreign portfolio equity inflows, wherever the data are available for at least one of them) per capita expressed either in 1996 or in 2005 US dollars. Initial GDP is the first-observed GDP of a country within the corresponding sample period. The dependent variable and log per capita initial GDP consistently accord with the relevant base year. As the most part of Panel A (especially the first five models) is an exact replication of Alfaro *et al*. (2008), institutional quality considered in this panel is composed of eleven components out of twelve ICRG political risk indicators. The remaining 'socioeconomic conditions' component is also incorporated in Panel B as in this paper. The 'years of schooling' variable refers to average years of school attainment (at all levels) of the total population aged 25 and over and not 15 and over. The results are robust to either measure of institutional quality and years of schooling. The base sample of 81 countries excludes any country that does not have data for all variables of interest. Heteroscedasticity robust (White-corrected) standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations.

Table 3 Cross-Section OLS Regressions of Capital Inflows per Capita, 1970-2006

	(1)	(2)	(3)	(4)	(5)	(6)
Log per capita GDP (PPP$) in 1970	0.372*** (0.077)	0.187*** (0.060)		0.225** (0.089)	0.137* (0.073)	
Average institutional quality, 1984-2006		0.446*** (0.062)	0.348*** (0.060)		0.410*** (0.065)	0.366*** (0.060)
Log average per capita GDP (PPP$), 1970-2006			0.276*** (0.071)			
Log average years of schooling, 1970-2000				0.288** (0.134)	0.060 (0.079)	0.007 (0.056)
Log average distance, 1970-2006					-0.050 (0.265)	0.078 (0.250)
Average capital mobility restrictions, 1970-2005					-0.665 (0.429)	-0.625 (0.395)
Log per capita GDP (2005 US$) in 1970						0.220*** (0.072)
Countries	47	47	47	47	47	47
R^2	0.259	0.592	0.620	0.335	0.669	0.707

Note: Dependent variable is average capital (foreign direct and portfolio equity) flows per capita. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations.

Table 4 Robustness Cross-Section OLS Regressions of Capital Inflows per Capita

	(1) 1990–06	(2) 1970–06	(3) 1970–06	(4) 1970–06	(5) 1970–06	(6) 1994–06
Log per capita initial GDP (PPP$)	0.593*** (0.100)	0.204*** (0.059)	0.139** (0.057)	0.177** (0.072)		0.643*** (0.122)
Average institutional quality	0.508*** (0.126)	0.404*** (0.064)	0.423*** (0.050)	0.448*** (0.084)	0.410*** (0.073)	0.563*** (0.133)
Average corporate tax rate, 1999-06	-0.010 (0.022)					
Log average trade openness, 1970-06		0.204 (0.136)				
Log av. deposit money bank assets, 1970-06			0.220** (0.103)			
Log average TFP growth, 1982-06				0.001 (0.025)		
Log per capita GCF (2005 $US) in 1970					0.143*** (0.051)	
Malaria contagion risk in 1994						0.112 (0.232)
Countries	36	47	46	39	44	47
R^2	0.611	0.634	0.650	0.739	0.721	0.657

Note: Dependent variable is average capital (foreign direct and portfolio equity) flows per capita. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations. Although the same restrictions imposed throughout all the estimations to ensure sample consistency, sample size may still vary due to data availability for some control variables.

Table 5 Robustness Cross-Section OLS Regressions of Capital Inflows per Capita

	(1) 1990–06	**(2) 1970–06**	**(3) 1990–06**	**(4) 1984–06**	**(5) 1984–06**
Log per capita initial GDP (PPP$)	0.437*** (0.092)	0.148** (0.066)	0.429*** (0.114)		
Average institutional quality	0.562*** (0.106)	0.425*** (0.067)	0.603*** (0.154)		
Average country risk, OECD, 1999-06	-0.014 (0.057)				
Log average Int'l voice traffic, 1970-06		0.047 (0.032)			
Average foreign bank asset share, 1990-97			-0.124 (0.511)		
Average institutional quality in 1984				0.226*** (0.058)	0.098* (0.058)
Log per capita GDP (PPP$) in 1984					0.550*** (0.114)
Countries	47	46	41	45	45
R^2	0.640	0.603	0.613	0.177	0.449

Note: See notes to Table 4.

Table 6 Instrumental Variable Regressions of Capital Inflows Per Capita

	(1)	(2)	(3)
Panel A Two-Stage Least Squares (2SLS)			
Average institutional quality, 1984-2006	0.849***	2.377	0.935**
	(0.285)	(21.261)	(0.453)
Log per capita GDP (PPP$) in 1970		-0.854	
		(11.525)	
Log European settler mortality			0.016
			(0.117)
Hausman RE Test (p-value)	0.397	0.996	0.649
Hansen J-Test (p-value)			0.898
Panel B First Stage for Average Institutional Quality in 1984-2006			
Log European settler mortality	-0.189**	-0.010	-0.202*
	(0.089)	(0.122)	(0.102)
Log per capita GDP (PPP$) in 1970		0.529***	
		(0.193)	
British legal origin			-0.275
			(0.289)
English language			0.720
			(0.633)
R^2	0.061	0.284	0.111
Panel C Ordinary Least Squares			
Average institutional quality, 1984-2006	0.528***	0.428***	0.507***
	(0.072)	(0.086)	(0.069)
Log per capita GDP (PPP$) in 1970		0.188**	
		(0.076)	
Log European settler mortality			-0.065
			(0.050)
Countries	39	39	39

Note: In Panels A and C the response variable is average capital (foreign direct and portfolio equity) flows per capita whereas in B it is the composite index of institutional quality. Hausman regressor endogeneity (RE) test compares each model between Panels A and C whilst Hansen *J*-test of over-identifying restrictions –feasible only under (3)– assesses the validity of model instruments. For both tests given are *p*-values. Robust standard errors are in parentheses. Unreported constant included in all estimations. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively.

Appendices

Appendix A Data

Table A.1 Variable Descriptions and Sources

Variable	Definition	Source
Capital flows	Sum of foreign direct and portfolio equity flows (also known as total equity flows) expressed in per capita 2005 $US, rescaled by 100 and averaged over 1970-2006.	World Development Indicators (WDI), World Bank.
Initial GDP	Purchasing power parity (PPP) adjusted per capita GDP as of the model-corresponding initial year (mostly 1970), expressed in 2005 $US and in logs.	Heston *et al.* (2009), Penn Wold Table (PWT), Center for International Comparisons of Production, Income and Prices (CIC), University of Pennsylvania.
Institutional quality	A composite index constructed by adding up annual scores of twelve sub-indices (government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability, bureaucratic quality), rescaled by 10 and averaged over 1984-2006.	International Country Risk Guide (ICRG), Political Risk Services Group (PRS, 2007).
Years of schooling	Educational attainment of total population aged 25 and over in some levels (primary, secondary or tertiary) for some years, averaged over 1970-2000 and expressed in logs.	Barro and Lee (2001).
Distance	Unilateral distance constructed as a GDP weighted average of the geodesic distances between capital city of a country and capital cities of all the other countries in the world, averaged over 1970-2006 and expressed in logs.	Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) and World Development Indicators (WDI), World Bank.
Capital mobility restrictions	Taking values between 0 (if no restriction) and 1 (if there is restriction), it is the mean of four dummy variables (multiple exchange rate practices, restrictions on current account transactions, barriers on capital account dealings, and surrender and repatriation requirements for export proceeds), averaged over 1970-2005.	Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), IMF.
Corporate tax	A percentage rate levied on the company profits in a country, averaged over 1999-2006.	Corporate and Indirect Tax Rate Survey (various years), KPMG.
Trade openness	Exports plus imports expressed as a percentage of GDP and in logs, averaged over 1970-2006.	World Development Indicators (WDI), World Bank.

(continued on next page)

Table A.1 *(continued)*

Variable	Definition	Source
Deposit money bank assets	Ratio of deposit money bank assets to GDP, averaged over 1970-2006 and expressed in logs.	Financial Development and Structure Database, Beck *et al*. (2010).
TFP growth	The effect of technological change, efficiency improvements and immeasurable contribution of all inputs other than capital and labour which is estimated as the residual (i.e. Törnqvist index) by subtracting the sum of two-period average compensation share of capital and labour inputs weighted by their respective growth rates from the output growth rate. Usage of log level differences delivers the annual percentage TFP growth rates averaged over 1982-2006.	Total Economy Database, The Conference Board (2010).
Initial GCF	Gross capital formation (GCF) per capita as of the model-corresponding initial year (mostly 1970) refers to outlays on additions to the fixed assets of the economy plus net changes in the level of inventories, expressed in 2005 $US and in logs.	World Development Indicators (WDI), World Bank.
Malaria	The proportion of a country's population at risk of falciparum malaria infection as of 1994.	Sachs (2003).
Country risk	Countries are assessed in terms of credit risk and classified into eight numerical categories between 0 (lowest credit risk) and 7 (highest credit risk) using both quantitative and qualitative methods. Data is averaged over 1999-2006.	OECD, 2010.
International voice traffic	The sum of international incoming and outgoing telephone calls in minutes divided by the total population, averaged over 1970-2006 and expressed in logs.	World Development Indicators (WDI), World Bank.
Foreign bank asset share	Equals to the share of foreign bank assets in total banking sector assets, averaged over 1990-1997.	Financial Development and Structure Database, Beck *et al*. (2000).
European settler mortality	The mortality rates of European settlers per 1,000 mean strength in the 19th century, expressed in logs.	Acemoglu *et al*. (2001).
British legal origin	A dummy variable indicating whether the origin of the current formal legal code of a country is British common law.	La Porta *et al*. (1997).
English language	Fraction of the population speaking English as mother tongue.	Hall and Jones (1999).

Appendix B Samples

Table B.1 Replication Samples

Whole World Sample of 98 Countries			Base Sample of 81 Countries		
Albania	Gabon	Nicaragua	Argentina	India	Slovenia
Algeria	Gambia	Niger	Australia	Indonesia	South Africa
Angola	Germany	Nigeria	Austria	Iran	Spain
Argentina	Ghana	Norway	Bangladesh	Israel	Sweden
Armenia	Greece	Oman	Bolivia	Italy	T. Tobago
Australia	Guatemala	Pakistan	Brazil	Jamaica	Tunisia
Austria	Guinea	Panama	Bulgaria	Japan	Turkey
Azerbaijan	Guyana	P. N. Guinea	Cameroon	Jordan	Uganda
Bangladesh	Haiti	Paraguay	Canada	Kenya	Ukraine
Belarus	Honduras	Peru	Chile	Korea Rep.	UK
Bolivia	Hungary	Philippines	Colombia	Latvia	US
Brazil	India	Portugal	Congo Rep.	Lithuania	Uruguay
Bulgaria	Indonesia	Russian Fed.	Costa Rica	Malaysia	Vietnam
Burkina Faso	Iran	Saudi Arabia	Croatia	Mali	Zambia
Cameroon	Israel	Senegal	Cyprus	Mexico	Zimbabwe
Canada	Italy	Sierra Leone	Czech Rep.	Morocco	
Chile	Jamaica	Singapore	Denmark	Mozambique	
Colombia	Japan	Slovenia	Dominican Rep.	Netherlands	
Congo Rep.	Jordan	South Africa	Ecuador	New Zealand	
Costa Rica	Kazakhstan	Spain	Egypt	Nicaragua	
Côte d'Ivoire	Kenya	Sweden	El Salvador	Niger	
Croatia	Korea Rep.	T. Tobago	Estonia	Norway	
Cyprus	Latvia	Tunisia	Finland	Pakistan	
Czech Rep.	Lithuania	Turkey	France	Panama	
Denmark	Madagascar	Uganda	Gambia	P. N. Guinea	
Dominican Rep.	Malaysia	Ukraine	Germany	Paraguay	
Ecuador	Mali	UK	Ghana	Peru	
Egypt	Mexico	US	Greece	Philippines	
El Salvador	Morocco	Uruguay	Guatemala	Portugal	
Estonia	Mozambique	Vietnam	Guyana	Russian Fed.	
Ethiopia	Namibia	Zambia	Haiti	Senegal	
Finland	Netherlands	Zimbabwe	Honduras	Sierra Leone	
France	New Zealand		Hungary	Singapore	

Note: Unlike what Alfaro *et al*. (2008) report in their Appendix B, Belarus drops from the base sample due to schooling data unavailability but Vietnam remains instead.

Table B.2 Developing Country Samples

Baseline Sample		**IV Regressions Sample**	
Algeria	Kenya	Algeria	Mexico
Argentina	Malawi	Argentina	Nicaragua
Bangladesh	Malaysia	Bangladesh	Niger
Bolivia	Mali	Bolivia	Pakistan
Botswana	Mexico	Brazil	Panama
Brazil	Nicaragua	Cameroon	Papua New Guinea
Bulgaria	Niger	Chile	Paraguay
Cameroon	Pakistan	China	Peru
Chile	Panama	Colombia	Senegal
China	Papua New Guinea	Costa Rica	South Africa
Colombia	Paraguay	Dominican Republic	Sri Lanka
Costa Rica	Peru	Ecuador	Thailand
Dominican Republic	Philippines	Egypt	Tunisia
Ecuador	Senegal	El Salvador	Uruguay
Egypt	South Africa	Ghana	Venezuela
El Salvador	Sri Lanka	Guatemala	
Ghana	Thailand	Guyana	
Guatemala	Tunisia	Honduras	
Guyana	Turkey	India	
Honduras	Uruguay	Indonesia	
India	Venezuela	Jamaica	
Indonesia	Zambia	Kenya	
Jamaica	Zimbabwe	Malaysia	
Jordan		Mali	