WHY DOESN'T CAPITAL FLOW FROM RICH TO POOR COUNTRIES? AN EMPIRICAL INVESTIGATION

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Abstract—We examine the empirical role of different explanations for the lack of capital flows from rich to poor countries—the "Lucas Paradox." The theoretical explanations include cross-country differences in fundamentals affecting productivity, and capital market imperfections. We show that during 1970–2000, low institutional quality is the leading explanation. Improving Peru's institutional quality to Australia's level implies a quadrupling of foreign investment. Recent studies emphasize the role of institutions for achieving higher levels of income but remain silent on the specific mechanisms. Our results indicate that foreign investment might be a channel through which institutions affect long-run development.

I. Introduction

THE standard neoclassical theory predicts that capital should flow from rich to poor countries. Under the usual assumptions of countries producing the same goods with the same constant returns to scale production technology using capital and labor as factors of production, differences in income per capita reflect differences in capital per capita. Thus, if capital were allowed to flow freely, new investments would occur only in the poorer economy, and this would continue to be true until the return to investments were equalized in all the countries. However, in his now classic example, Lucas (1990) compares the United States and India in 1988 and demonstrates that, if the neoclassical model were true, the marginal product of capital in India should be about 58 times that of the United States. In face of such return differentials, all capital should flow from the United States to India. In practice, we do not observe such flows. Lucas questions the validity of the assumptions that give rise to these differences in the marginal product of capital and asks what assumptions should replace these. According to Lucas, this is the central question of economic development.

Lucas's work has generated an extensive theoretical literature. Researchers, including Lucas himself, show that with slight modifications of the standard neoclassical theory, the paradox disappears. These theoretical explanations for the "Lucas Paradox" can be grouped into two categories. The first group includes differences in fundamentals that affect the production structure of the economy, such as technological differences, missing factors of production, government policies, and institutional structure.[1] The second group of explanations focuses on international capital market imperfections, mainly sovereign risk and asymmetric information. Although capital has a high return in developing countries, it does not go there because of market failures.[2] According to Lucas, international capital market failures, or "political risk" as he puts it, cannot explain the lack of flows before 1945 since during that time most of the "third world" was subject to European legal arrangements imposed through colonialism. Hence, investors in the developed countries, such as the United Kingdom, could expect contracts to be enforced in the same way in both the United Kingdom and India.[3] However, British institutions in India do not necessarily have the same quality as British institutions in the United States and Australia. As shown by Acemoglu, Johnson, and Robinson (2001, 2002), if European settlement was discouraged by diseases or if surplus extraction was more beneficial, then the European colonizers set up an institutional structure where the protection of property rights was weak.

Our objective in this paper is to investigate the role of the different theoretical explanations for the lack of flows of capital from rich countries to poor countries in a systematic empirical framework.[4] We show that during the period 1970–2000, low institutional quality is the leading explanation for the Lucas Paradox. The ordinary least squares (OLS) estimates show that improving the quality of institutions to the United Kingdom's level from that of Turkey's implies a 60% increase in foreign investment. The instrumental variable (IV) estimates imply an even larger effect:

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[1] See King and Rebelo (1993), Razin and Yuen (1994), Gomme (1993), and Tornell and Velasco (1992). Lucas finds that accounting for the differences in human capital quality across countries significantly reduces the return differentials, and considering the role of human capital externalities eliminates the return differentials. However, his calculations assume that the externalities from the country's stock of human capital accrue entirely to the producers within the country, in other words, all knowledge spillovers are local. This assumption is at odds with the evidence of quantitatively significant international knowledge spillovers; see Helpman (2004).

[2] See Gertler and Rogoff (1990) and Gordon and Bovenberg (1996).

[3] Before 1945, European imperial powers granted trading rights to monopoly companies, an action that created one-way flows. In theory a large capital-exporting economy can limit capital flows in order to push interest rates in a favorable direction. Gordon and Bovenberg (1996) note that there is little evidence of large countries restricting capital flows for this purpose.

[4] Obstfeld (1995) argues that the most direct approach would be to compare the capital's rate of return in different countries. Unfortunately, it is difficult to find internationally comparable measures of after-tax returns to capital.

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improving Peru's institutional quality to Australia's level implies a quadrupling of foreign investment.[5]

An excellent example of the role of institutional quality in attracting foreign capital is Intel's decision to locate in Costa Rica in 1996.[6] In the final stage of the decision process, the short list included Mexico and Costa Rica. The two countries have similar GDP per capita in U.S. dollars (close to $3,000 at that time), albeit Mexico is a much larger country. Both countries have similar levels of adult literacy rates. However, given the overall size of Intel's investment relative to the size of the economy, one important concern in the decision process was the absolute availability of engineers and technically trained graduates, which favored Mexico. Hence, one cannot argue that human capital was a defining issue in Intel's final choice. Instead, Costa Rica's stability and lower corruption levels tilted the balance in favor of the country. As noted by Spar (1998), Mexico's offer to make "exceptions" to the existing rules only for Intel, in contrast to Costa Rica's approach of making any concession made to Intel available to all other investors, was an important factor in the final decision. Another example is the recent boom in foreign direct investment (FDI) in Turkey. This boom is similar to what Portugal and Greece experienced after joining the European Union (EU). Turkey became an official accession country on October 3, 2005, and started entry negotiations. In a recent article, Champion and von Reppert-Bismarck (2005) argue that these official entry negotiations would force Turkey to become more like the "EU countries" in its banking sector, antitrust laws, regulation, and policies, which in turn would attract foreign investment. Turkey has undertaken major institutional reform and constitutional change in the past two years, including the 2003 FDI law that cuts the number of official procedures from fifteen to three for foreign investors. Multinational companies such as Metro AG, Peugeot Citroën PSA, Vodafone PLC, and France Telecom are increasing their presence in Turkey, arguing that the investor protection and overall investment climate improved considerably as a result of these reforms. As a result, FDI flows boomed from an average of well under $1 billion in the 1990s to $2.6 billion in 2004.

The Lucas Paradox is related to the major puzzles in international macroeconomics and finance.[7] These include the high correlation between savings and investment in OECD countries (the Feldstein-Horioka puzzle); the lack of overseas investment by the home country residents (the home bias puzzle); and the low correlations of consumption growth across countries (the risk-sharing puzzle). All of these puzzles stem from the lack of international capital flows, more specifically, the lack of international equity holdings. However, the empirical literature on these issues is extremely thin and not in agreement. In particular, we still do not know what is more important in explaining the Lucas Paradox: fundamentals or market failures? Some researchers provide indirect historical evidence that schooling, natural resources, and demographic factors are the reasons for the European investment into the "New World."[8] The empirical literature on the determinants of capital flows has focused on the role of external (push) and internal (pull) factors. Researchers find that external factors, mostly low interest rates in the developed nations, and particularly in the United States, played an important role in accounting for the renewal of foreign lending to developing countries in the 1990s.[9] The literature pays particular attention to the determinants of FDI and shows that government size, political stability, and openness play an important role.[10] In terms of the determinants of bilateral equity flows and external debt, some studies find support for theories emphasizing imperfections in international credit markets.[11] These papers, however, have not paid particular attention to the role of institutions in shaping international capital flows over the long run.[12]

Our paper is also related to the recent work on economic development that emphasizes the role of institutions for achieving higher levels of income.[13] However, there is little systematic evidence on the specific mechanisms. Our results show that institutional quality has shaped international capital flows in the last thirty years, which in turn implies that foreign investment can be one of the missing links through which institutions affect long-run development.[14]

The rest of the paper is organized as follows. Section II reviews the standard neoclassical model and presents the main empirical implications in terms of capital movements. Section III investigates the role of the different theoretical explanations of the Lucas Paradox in a cross-country re-

[5] Both Turkey and Peru are in the bottom 25th percentile in the distribution of the index of institutions, whereas Australia and the United Kingdom are in the top 75th percentile.

[6] See Spar (1998) and Larrain, Lopez-Calva, and Rodriguez-Clare (2000).

[7] See Obstfeld and Rogoff (2000) for an overview of the major puzzles in international economics.

[8] In the context of overseas British investment before World War I, O'Rourke and Williamson (1999) find that British capital chased European emigrants, where both were seeking cheap land and natural resources. Clemens and Williamson (2004), using data on British investment in 34 countries during nineteenth century, show that two-thirds of the British capital exports went to the labor-scarce New World and only about one-quarter of it went to labor-abundant Asia and Africa because of similar reasons.

[9] See Calvo, Leiderman, and Reinhart (1996).

[10] See Edwards (1991) and Wei and Wu (2002).

[11] See Lane (2004) and Portes and Rey (2005).

[12] Using firm-level data, Stulz (2005) and Stulz, Doidge, and Karolyi (2004) show that the institutions of the country where a firm is located affect how investors receive a return from investing in the firm. Specifically, they show that almost all of the variation in governance ratings across firms in less-developed countries is attributable to country characteristics. The implication of their work is that weak institutions at the country level can explain the lack of flows to countries where the return is the highest, a corollary on which we provide systematic evidence.

[13] See North (1981, 1994, 1995), Hall and Jones (1999), and Acemoglu, Johnson, and Robinson (2001, 2002).

[14] Klein (2005) shows that the effect of capital account liberalization on growth depends on the institutional development of a country.

gression framework. Section IV addresses possible endogeneity issues. Section V concludes.

II. Conceptual Issues

Assume a small open economy where output is produced using capital K and labor L via a constant returns to scale production function,

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

where Y denotes output and A denotes the total factor productivity (TFP). Agents can borrow and lend capital internationally. If all countries share a common technology, perfect capital mobility implies the instantaneous convergence of the returns to capital. Hence, for countries i and j,

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

where $f(\cdot)$ is the net of depreciation production function in per capita terms and k denotes capital per capita. Diminishing returns to capital implies that in the transition process, resources will flow from capital-abundant countries (low returns) to capital-scarce countries (high returns). Although widely used in the growth literature, the neoclassical model with constant TFP has counterfactual implications for rates of return since not enough capital seems to flow to capital-scarce countries and implied interest rates do not seem to converge. As explained in the introduction, the theoretical explanations for this paradoxical pattern can be grouped as differences in fundamentals across countries versus international capital market imperfections. We investigate each group in detail below.

A. Fundamentals

Missing factors of production. One of the explanations for the lack of capital flows from rich to poor countries is the existence of other factors—such as human capital and land—that positively affect the returns to capital but are generally ignored by the conventional neoclassical approach. For example, if human capital positively affects capital's return, less capital tends to flow to countries with lower endowments of human capital. Thus, if the production function is in fact given by

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

where Z_t denotes another factor that affects the production process, then equation (1) misrepresents the implied capital flows. Hence, for countries i and j the true return is

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

Government policies. Government policies can be another impediment to the flows and the convergence of the returns. For example, differences across countries in government tax policies can lead to substantial differences in capital-labor ratios. Inflation may work as a tax and decrease the return to capital. In addition, the government can explicitly limit capital flows by imposing capital controls. We can model the effect of these distortive government policies by assuming that governments tax capital's return at a rate τ, which differs across countries. Hence, for countries i and j, the true return is

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

Institutional structure and total factor productivity. Institutions are the rules of the game in a society. They consist of both informal constraints (traditions, customs) and formal rules (rules, laws, constitutions). They shape the structure of an economy. North (1994) defines institutions as the humanly devised constraints that structure political, economic, and social interaction. There is an important distinction between policies and institutions. Policies are choices made within a political and social structure, that is, within a set of institutions. Institutions are understood to affect economic performance through their effect on investment decisions by protecting the property rights of entrepreneurs against the government and other segments of the society and by preventing elites from blocking the adoption of new technologies.

In general, weak property rights due to poor institutions can lead to lack of productive capacities or uncertainty of returns in an economy. Thus institutional weaknesses create a wedge between expected returns and ex post returns. We model these as differences in the parameter A_t, which captures differences in the overall efficiency in the production across countries. In defining the parameter A_t, we cannot differentiate between the effect of institutions on investment opportunities versus that of the TFP (in other words, A_t defined as the incentive structure that allows for innovations versus A_t defined as the productivity index). Indeed, as Prescott (1998) argues, efficient use of existing technologies or resistance to the adoption of new ones depends on the "arrangements" a society employs. Eichengreen (2003) argues that capital-labor ratios across countries might differ because of differences in cultural context and/or technological capacity. Although technology is available to all countries, there might be barriers to the adoption of the existing technologies, or differences in the efficient use of the same technology.[15,16]

Hence, for countries i and j the true return is given by

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

[15] See Parente and Prescott (2000) and Rajan and Zingales (2003).

[16] Kalemli-Ozcan et al. (2003) show that capital flows to high-productivity states within the United States, where there is a common institutional structure. This result is consistent with the prediction of a neoclassical model with TFP differences.

B. International Capital Market Imperfections

Asymmetric information. Asymmetric information problems, intrinsic to capital markets, can be ex ante (adverse-selection), interim (moral hazard), or ex post (costly state verification). In general, under asymmetric information, the main implications of the neoclassical model regarding capital flows tend not to hold. In a model with moral hazard, for example, where lenders cannot monitor borrowers' investments, poor countries' per capita investment depends positively on per capita wealth. Alternatively, if foreign investors are handicapped in terms of domestic market information, they tend to underinvest.

Sovereign risk. Sovereign risk is defined as any situation where a sovereign defaults on loan contracts with foreigners, seizes foreign assets located within its borders, or prevents domestic residents from fully meeting obligations to foreign contracts.[17] The problem stems from the fact that repayment incentives for a sovereign debtor might differ from its obligations specified in a contract because the ability of courts to force a sovereign entity to comply is extremely limited.

Lucas (1990), citing the specific example of colonial India, dismisses sovereign risk as an explanation for the lack of flows from rich to poor countries. He maintains that investors in India faced the same rules and regulations as the investors in the United Kingdom. However, as Reinhart and Rogoff (2004) argue, the numerous rebellions in colonial India indicate that the perceived ex ante risk of expropriation was greater than the ex post one. Reinhart and Rogoff (2004) emphasize the relationship between sovereign risk and historical defaults and conclude that sovereign risk must be the explanation for the Lucas Paradox. They argue the following: "[T]he fact that so many poor countries are in default on their debts, that so little funds are channeled through equity, and that overall private lending rises more than proportionately with wealth, all strongly support the view that political risk is the main reason why we do not see more capital flows to developing countries. If credit market imperfections abate over time due to better institutions, human capital externalities or other 'new growth theory' elements may come to play a larger role." This argument is consistent with our result since historical defaults are indicators of poor quality of the early institutions.[18]

III. Institutions and the Lucas Paradox: OLS Estimates

A. Data and Descriptive Statistics

Capital flows. The *International Financial Statistics* (IFS) issued by the International Monetary Fund (IMF) is the standard data source for annual capital inflows. Although there are other data sources, the IMF's IFS provides the most comprehensive and comparable data on international capital flows.[19] The main categories of capital inflows are FDI, portfolio equity investment, and debt inflows. FDI data include greenfield investments (construction of new factories), equity capital, reinvested earnings, and other capital and financial derivatives associated with various intercompany transactions between affiliated enterprises. Portfolio equity investment includes shares, stock participations, and similar documents that usually denote ownership of equity. When a foreign investor purchases a local firm's securities without a controlling stake, the investment is regarded as a portfolio investment. FDI is equity participation giving a controlling stake.[20] In the regression analysis, we do not distinguish between minority and majority shareholders, as this distinction is not relevant for our analysis. In addition, because of missing portfolio data (some countries tend not to receive portfolio flows, in part due to lack of functioning stock markets), we prefer to use total foreign equity flows in the analysis, which is the sum of inflows of direct and portfolio equity investment.

Debt inflows include bonds, debentures, notes, and money market or negotiable debt instruments. We prefer to abstract most of our analysis from debt flows since they tend to be shaped by government decisions to a greater extent than flows of equity.[21] We, on the other hand, would like to capture market decisions.[22] Ideally, we would like to use all of the private capital flows and abstract the public part of debt flows. These data, however, are not available. The IMF's IFS data include both private and public issuers and holders of debt securities. Although the data are further divided by monetary authorities, general government, banks, and other sectors, this information is unfortunately

[17] Lucas (1990) discusses monopoly power and capital controls, that is distortive government policies under capital market imperfections, since he combines domestic and international capital market imperfections. Following Obstfeld and Rogoff (1995), we considered international capital market imperfections to be only those related to sovereign enforcement problems or those based on information asymmetries. We put all domestic distortions under fundamentals since they affect capital's productivity.

[18] Although our view is that weak institutions belong in the "fundamentals" group of explanations, we are sympathetic to the view that weak institutions might be responsible for historical and current sovereign risk and high probability of default. As Henry (2006) puts it, it is difficult to say where institutional quality ends and capital market imperfections begin in general.

[19] All the data are described in appendix A and in greater detail in appendix A of the working-paper version, Alfaro, Kalemli-Ozcan, and Volosovych (2005).

[20] The IMF classifies an investment as direct if a foreign investor holds at least 10% of a local firm's equity, while the remaining equity purchases are classified under portfolio equity investment. Recently most of the FDI has been in the form of mergers and acquisitions instead of greenfield investments.

[21] Until the mid-1970s—following the shutting down of the international markets in the 1930s—debt flows to most developing countries were generally restricted to international organizations/government-to-government loans. During the late 1970s, banks replaced governments of industrial countries as lenders to developing countries. After 1982, following the debt crisis, official creditors once again dominated lending to many developing countries.

[22] In many countries bank loans have usually been intermediated through poorly regulated financial systems, hence not responding to market incentives. See Henry and Lorentzen (2003) and Obstfeld and Taylor (2004).

not available for most countries for long periods of time. In addition, it is difficult to divide the available data by private/public creditor and debtor.[23] On the other hand, one might fear that excluding debt inflows totally will reduce measures of capital inflows for countries with limited stock market development and/or for countries that receive low levels of FDI, which in turn might bias our results. We argue that the role of total equity (direct and portfolio) flows for the developing countries is not small at all. For the developing countries, average inflows of FDI per capita grew by 6.2% over the last thirty years and became the main source of private capital during the 1990s. Average inflows of portfolio equity per capita grew by 9.3%. Average inflows of debt per capita grew by only 3.3%. Nevertheless, we examine the role of debt inflows in our robustness section.

Another issue about the IMF's IFS capital flows data is related to the importance of valuation effects. As Obstfeld (2004) notes, "an increasingly serious inadequacy of the standard current account measure is that it does not incorporate potentially large valuation effects." The IFS reports the BOP transactions as flows of equity and debt. The recent literature draws attention to the significant role of capital gains and losses, defaults, and price and exchange rate fluctuations, that is, of valuation effects, as an international financial adjustment mechanism.[24] Kraay et al. (2000, 2005) (KLSV) and Lane and Milesi-Ferretti (1999, 2001) (LM) construct estimates of foreign assets and liabilities and their subcomponents for different countries in the 1970s, 1980s, and 1990s, paying particular attention to these valuation effects, thus providing a better "tracking device" of a country's external position. These authors perform a meticulous job of cleaning the existing data. LM estimate stocks of portfolio equity and foreign direct investment based on the IMF's IFS flow data. In order to estimate FDI stocks, the authors cumulate flows and adjust for the effects of exchange rate changes. For portfolio equity stocks, they adjust for changes in the end of year U.S. dollar value of the domestic stock market. KLSV argue against the valuation of stocks using stock market prices, maintaining that capital listed on the stock market and the corresponding share prices—especially in developing countries—are not representative of the stock of capital of a country. Instead, they use the price of investment goods in local currency, which is the investment deflator. They also adjust for exchange rate changes as in the LM data set. Both KLSV and LM data sets are higher quality since the respective authors put extreme care into cleaning the basic IFS data, checking individual country sources and so forth.

We use capital inflows data from these three different sources in our empirical analysis. We calculate annual inflows of direct and portfolio equity investment out of the stocks in the KLSV and LM data sets as the yearly change in the stock of foreign claims on domestic capital. The inflows of direct investment from the IMF (which KLSV and LM data are based on), include reinvested earnings of foreign-owned firms, while data on inflows of portfolio equity investment do not. As KLSV point out, changes in the stock market valuation of equities will reflect these reinvested earnings, while changes in the investment deflator valuation will not. Hence, the KLSV procedure will underestimate the claims on portfolio equity investment. We believe the weakness of the stock market data for developing countries to be of greater concern and hence use KLSV data in most of our analysis.

Table 1 shows descriptive statistics on 81 countries during 1970–2000 from the IMF data: 58 countries between 1970 and 1997 from the KLSV data; and 56 countries between 1970 and 1998 from the LM data. These countries constitute our "base" samples for each data set. The base sample countries are selected out of available data for our variables of interest, which are 98, 61, and 60 countries in each data set respectively, since the base sample countries are the ones where data are available for all the main explanatory variables. In all our regressions the dependent variable is the inflows of direct and portfolio equity investment per capita, averaged over the relevant sample period. We believe per capita measures are more in line with the theoretical literature.[25] We use the average inflows to capture the long-run effects of the various explanations of the Lucas Paradox.

Average inflows of direct and portfolio equity investment per capita have a mean of 117 with a standard deviation of 170 for the IMF sample; 39 with a standard deviation of 59 for the KLSV sample; and 202 with a standard deviation of 322 for the LM sample. Notice that the IMF and LM data are in 1996 constant U.S. dollars and the KLSV data are in 1990 constant U.S. dollars. All three data sets show a large amount of variation, where some countries receive 1,000 times more flows than the others. Explanatory variables also show similarly large variation, which we explain in detail below.

The Lucas Paradox and fundamentals. Figure 1 shows inflows of direct and portfolio equity investment for 23 developed and 75 developing countries during 1970–2000.

[23] The World Bank's Global Development Finance database, which focuses on the liability side, divides debt data by the type of creditor (official and private) but not by the type of debtor. These data are available only for developing countries. As Lane and Milesi-Ferretti (2001) note, for developing countries there are discrepancies between the loan flows reported in the IMF's balance-of-payments (BOP) statistics and the changes in the external debt stocks as reported by the World Bank's Global Development Finance database. Following the 1980s debt crisis, there are a number of measurement problems related to different methodologies for recording nonpayments, rescheduling, debt forgiveness, and reductions.

[24] Obstfeld (2004) compares two cases. In one case, firms with equity held by foreigners pay dividends. In the second case, firms with equity held by foreigners retain earnings. In the first case, paying dividends would show up in the current account as a service import (net factor income). In the second case, a firm's stock market price would rise but there would be no record in the BOP under the current accounting method.

[25] In addition a histogram revealed that this measure is more normally distributed than the other potential measures.

TABLE 1.—DESCRIPTIVE STATISTICS

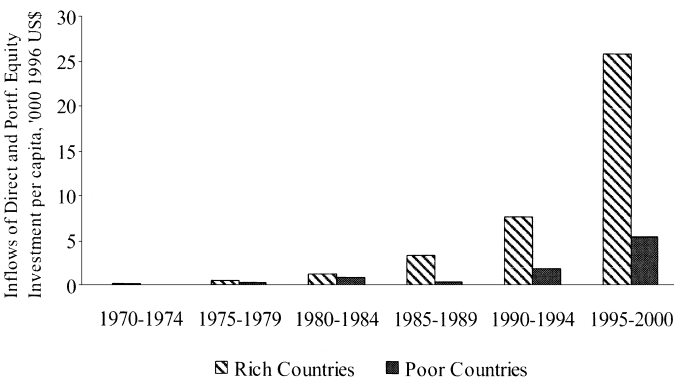
	Mean	Std. Dev.	Min	Max
IMF, IFS Capital Flows Data: Base Sample of 81 Countries				
Average inflows of capital per capita, 1970–2000	117.34	170.29	−0.29	722.72
GDP per capita in 1970 (PPP 1996)	5.86	4.53	0.61	16.49
Average institutional quality, 1984–2000	6.94	1.50	4.31	9.69
Average years of schooling, 1970–2000	5.53	2.92	0.48	11.41
Average distantness, 1970–2000	7.93	2.11	5.45	13.75
Average restrictions to capital mobility, 1970–2000	0.52	0.27	0.00	0.97
KLSV Capital Flows Data: Base Sample of 58 Countries				
Average inflows of capital per capita, 1970–1997	38.57	59.27	−29.32	181.16
GDP per capita in 1970 (PPP 1990)	5.17	4.07	0.85	15.74
Average institutional quality, 1984–1997	6.92	1.64	4.35	9.65
Average years of schooling, 1970–1997	5.59	2.60	1.78	11.41
Average distantness, 1970–1997	8.16	1.96	5.75	13.50
Average restrictions to capital mobility, 1970–1997	0.54	0.27	0.00	1.00
LM Capital Flows Data: Base Sample of 56 Countries				
Average inflows of capital per capita, 1970–1998	202.29	322.00	0.80	1,309.30
GDP per capita in 1970 (PPP 1996)	6.60	5.25	0.56	23.39
Average institutional quality, 1984–1998	7.12	1.52	4.46	9.67
Average years of schooling, 1970–1998	5.83	2.44	2.00	11.41
Average distantness, 1970–1998	8.28	2.20	5.43	13.80
Average restrictions to capital mobility, 1970–1998	0.51	0.29	0.00	0.98

Notes: Average inflows of capital per capita, 1970–2000, include inflows of direct and portfolio equity investment from the IMF's IFS. The base sample is composed of 81 countries for which all the main explanatory variables are available. Inflows are expressed in constant 1996 U.S. dollars. Average inflows of capital per capita, 1970–1997, are the flows of foreign claims on domestic capital in constant 1990 U.S. dollars, from the KLSV data set. The base sample is composed of 58 countries for which all the main explanatory variables are available. Average inflows of capital per capita, 1970–1998, are the flows of foreign claims on domestic capital in constant 1996 U.S. dollars, from the LM data set. The base sample is composed of 56 countries for which all the main explanatory variables are available. GDP per capita in 1970 is the gross domestic product divided by population in 1970 in PPP basis (in 1990 U.S. dollars or 1996 U.S. dollars). Average institutional quality is the sum of all the rating components from *International Country Risk Guide,* averaged over the relevant sample period. The components are investment profile, government stability, internal conflict, external conflict, no-corruption index, nonmilitarized politics, protection from religious tensions, law and order, protection from ethnic tensions, democratic accountability, and quality of bureaucracy. The index ranges from 0 to 10, where a higher score means lower risk. Average years of schooling is years of total schooling in total population, averaged over the relevant sample period. Average distantness is constructed as the weighted average of the distances in thousands of kilometers from the capital city of the particular country to the capital cities of the other countries, using the total GDP shares of the other countries as weights, averaged over the relevant time period. Average restrictions to capital mobility is the mean value of four dummy variables, averaged over the relevant sample period: (i) exchange arrangements: separate exchange rates for some or all capital transactions: (ii) payments restrictions on payments for current transactions: (iii) payments restrictions on payments for capital transactions; (iv) surrender or repatriation requirements for export proceeds. See appendix A in the working-paper version for detailed explanations of all the variables and sources.

The difference between the two is a stark demonstration of north-north flows, or the Lucas Paradox. We use the logarithm of GDP per capita at PPP in 1970 on the right-hand side in each regression to capture the Lucas Paradox, in other words, the positive significance of this variable demonstrates the presence of the paradox. Then we include the other explanatory variables. We analyze which one makes the logarithm of GDP per capita in 1970 insignificant when included, hence providing an explanation for the Lucas Paradox.[26] One must keep in mind that in order to quantitatively account for the entire paradox, we must do a calibration exercise for a fully specified model, which is beyond the scope of this study.

To capture fundamentals we use the logarithm of the average years of total schooling and average institutional quality, where both of these variables are averaged over the relevant sample period. The measurement of institutional quality is a challenging task. As argued by Acemoglu, Johnson, and Robinson (2001), there is a "cluster of institutions," including constraints on government expropriation, independent judiciary, property rights enforcement, and institutions providing equal rights and ensuring civil liberties, that are important to encourage investment and growth. Thus we construct a yearly composite index using the *International Country Risk Guide's* (ICRG) variables from the PRS Group (2001).[27] The composite index is the

FIGURE 1.—TOTAL EQUITY INFLOWS PER CAPITA TO RICH AND POOR COUNTRIES, 1970–2000



Notes: Inflows of total equity (FDI and portfolio equity investment) divided by population are based on the IMF's IFS data in 1996 U.S. dollars. Data are for 98 countries and averaged over five-year periods. FDI inflows, which include equity capital, reinvested earnings, other capital, and financial derivatives associated with various intercompany transactions between affiliated enterprises, correspond to direct investment in reporting economy (line 78bed). Portfolio equity inflow, which includes shares, stock participations, and similar documents that usually denote ownership of equity, correspond to equity liabilities (line 78bmd). Rich countries include 23 high GDP per capita countries that are classified as "rich" by the World Bank; poor countries denote the 75 remaining ones.

[26] Everything else equal, the neoclassical theory implies a negative relationship between the initial capital stock (or the initial output) and the future inflows only if the countries are at the same technological development level. Unfortunately data does not allow us to control for the cross-country differences in technology other than the addition of the Solow residual as an extra control.

[27] The ICRG data are not based on opinion surveys of any kind. The ICRG model for forecasting financial, economic, and political risk was created in 1980 by the editors of *International Reports*, a weekly news-

sum of the indices of investment profile, government stability, internal conflict, external conflict, no-corruption, nonmilitarized politics, protection from religions tensions, law and order, protection from ethnic tensions, democratic accountability, and bureaucratic quality. This index takes values from 0 to 10 for each country, where a higher score indicates lower risk.[28]

Theoretical papers show that low levels of human capital and weak institutions dampen the productivity of capital. Thus, we expect these variables to be positively significant. As shown in table 1, GDP per capita (PPP) in 1970, average institutional quality, and average years of schooling show large variation. GDP per capita in 1970 varies between $500 at PPP to $23,000 at PPP; and the most educated country has eleven years of schooling as opposed to one-half in the least-educated country. For the institutional quality variable, we have countries with strong institutions in the 75th percentile of the distribution such as the United Kingdom and Denmark and also countries with weak institutions in the 25th percentile of the distribution such as Turkey and Mexico. Because our samples are composed of poor and rich countries, there is large variation in all of these explanatory variables, which in turn allows us to investigate the roles of various explanations behind the Lucas Paradox in a cross-country setting.

We also use an additional variable, restrictions to capital mobility, as a measure of a government's explicit restriction to free capital mobility. This measure is the average of four dummy variables constructed by the IMF: exchange arrangements, payments restrictions on current transactions and on capital transactions, and repatriation requirements for export proceeds, where each dummy takes a value of 1 if there is the restriction. These restrictions vary between 0 and 1, as shown in table 1, and we expect this variable to be negatively significant. Since many countries liberalized their capital accounts throughout our sample period, we also run our cross-country regressions for each decade in our sample. This exercise will capture the changing nature of the restrictions to the capital mobility variable.

International capital market imperfections. It is difficult to obtain the appropriate information (from an investment point of view) about a country without visiting the country and, therefore, the location and accessibility to that country could be a concern. Portfolio managers and investment bankers, who advise their clients about investing in China, for example, advertise themselves by pointing out how frequently they visit the country. As Adam Smith noted, "In the home trade, his capital is never so long out of his sight as it frequently is in the foreign trade of consumption. He can know better the character and situation of the persons whom he trusts, and if he should happen to be deceived, he knows better the laws of the country from which he must seek redress."[29] Recently, distance has been used as a proxy for the international capital market failures, mainly asymmetric information. Analyzing the equity holdings of a large sample of actively managed mutual funds in the United States, Coval and Moskowitz (1999, 2001) find that fund managers earn substantially abnormal returns in geographically proximate investments (within a 100 kilometers of a fund's headquarters). The authors interpret the results as fund managers exploiting informational advantages in their selection of nearby stocks. Portes and Rey (2005) use a similar interpretation of distance in the context of bilateral capital flows, as do Wei and Wu (2002) in analyzing the determinants of bilateral FDI and bank lending.

We follow Kalemli-Ozcan, Sorensen, and Yosha (2003) and construct a variable called "distantness," which is the weighted average of the distances from the capital city of a particular country to the capital cities of the other countries, using the GDP shares of the other countries as weights. The GDP weights capture the positive relation between trade volume and GDP. This variable is different from the "distance from equator" and average distance that proxy for geography. It is a proxy for "remoteness," and hence captures information frictions. For example, a country like Congo, which is close to the equator, is going to be farther from other countries if we just look at average distance. It is going to be even farther according to our measure because of the GDP weights. Based on our measure, a country like the United States will be one of the least remote countries.[30] Table 1 shows that the most disadvantaged country in terms of this variable is three times more distant then the least disadvantaged country. We expect the distantness variable to be negatively significant. Table 2 shows descriptive statistics for the additional control variables that are used in the robustness analysis.

B. OLS Regressions

Specification and results. We perform cross-country OLS regressions. The main reason for this is that most of

letter on international finance and economics. The editors created a statistical model to calculate country risks, which later turned into a comprehensive system that enables measuring and comparing various types of country-level economic and political risks. In 1992, ICRG (its editor and analysts) moved from *International Reports* to the PRS Group. Now, the PRS Group's professional staff assigns scores for each category to each country.

[28] The previous ICRG classification (1982–1995) included risk of government repudiation of contracts and risk of expropriation, both of which are used by Acemoglu, Johnson, and Robinson (2001). After 1995 these variables are reported under ICRG's investment profile category.

[29] Adam Smith (1976, p. 454) quoted in Gordon and Bovenberg (1996).

[30] Denoting the distance from country i's capital city to country j's capital city by d_{ij}, country i's distantness is defined as $\frac{1}{T}\sum_{t=1}^{T}\sum_{j} d_{ij} gdp_j^t / gdp^t$ where gdp^t is the year t sample wide (total) GDP, and T is the sample length. For Congo: average distance (without the weights) is 6,600 kilometers (it ranks 35th in a sample of 60, where 1 is the farthest) and distantness is 9,000 kilometers (it ranks 16th in a sample of 60, where 1 is the most distant). For the United States average distance (without the weights) is 8,700 kilometers (it ranks 28th in a sample of 60, where 1 is the farthest) and distantness is 6,400 kilometers (it ranks 45th in a sample of 60, where 1 is the most distant).

TABLE 2.—DESCRIPTIVE STATISTICS FOR THE ADDITIONAL CONTROL VARIABLES

	Sample	Mean	Std Dev	Min	Max
KLSV Capital Flows Data: Base Sample of 58 Countries					
Average inflation volatility, 1970–97	58	0.86	0.69	0.27	4.41
Corporate tax rate in 1997[a]	44	33.98	7.30	15.00	53.20
Average FDI restrictions, 1990–97[b]	35	1.49	0.85	0.00	3.00
Average FDI incentives, 1990–97[b]	35	1.74	0.70	0.00	3.00
Average trade openness, 1970–97	58	55.38	24.68	14.83	122.28
Average paved roads, 1990–97[c]	57	53.72	32.21	4.79	100.00
Average bank assets, 1970–97	58	0.44	0.25	0.07	1.08
Average stock market value traded, 1970–97[d]	50	0.09	0.10	0.00	0.46
Average TFP, 1970–97	58	0.37	0.18	0.14	0.78
Capital stock per capita in 1970	58	11.11	12.21	0.73	55.15
Malaria in 1994	58	0.12	0.26	0.00	1.00
Average sovereign risk, Moody's, 1990–97[e]	38	6.49	4.50	1.00	14.25
Average sovereign risk, S&P, 1990–97[f]	37	6.11	4.66	1.00	14.00
Average Reuters, 1987–97	58	3.69	10.76	0.05	79.75
Average foreign bank asset share, 1990–97[g]	49	0.12	0.12	0.00	0.42

Notes: See appendix A in the working-paper version for the detailed explanations of the variables. Samples: 58 is the base sample from the KLSV data set. [a]44-country sample due to missing data on corporate tax rates. [b]35-country sample due to missing data on FDI restrictions and incentives. [c]57-country sample due to missing data on paved roads for China. [d]50-country sample due to missing data on stock market value traded. [e]38-country sample due to missing data on Moody's sovereign ratings. [f]37-country sample due to missing data on S&P's sovereign ratings. [g]49-country sample due to missing data on foreign bank assets.

our explanatory variables are slowly changing over time. Figure 2 plots the evolution of each component of our composite institutional quality index, averaged for all 58 countries in our base sample for the KLSV data. It is clear that there is almost no time variation in the institutional quality index during our sample period. When we plot time evolution of each component *only* for the poor countries in the same sample, which are the developing and emerging market countries, we discover that the improvements in the indices of external conflict, internal conflict, and government stability, and to some extent investment profile, are all due to the improvements in the developing countries.[31]

Table 3 reports OLS regressions of average inflows of direct and portfolio equity investment per capita on log of GDP per capita in 1970 and average institutional quality, using the IMF's IFS capita flows data. The linear regressions are for the equation

$$F_i = \mu + \alpha \log Y_i + \beta I_i + \varepsilon_i, \quad (7)$$

where F is average inflows of direct and portfolio equity investment per capita (inflows of capital per capita), μ is a constant, Y_i is log of GDP per capita in 1970, I_i is average institutional quality, and ε_i is a random-error term. The coefficients of interest are both α and β, the effect of log GDP per capita and institutional quality on inflows of direct and portfolio equity investment per capita, respectively.

We have 98 countries, denoted as the "whole world" sample, and 81 countries as the base sample. The whole world samples have similar descriptive statistics.[32] Our additional explanatory variables are available only for the base sample. Both of these samples are composed of poor and rich, and small open and large open economies.[33] Notice that since both capital inflows and log GDP are in per capita terms, we are already controlling for the size effects.

In general, most of the correlations between the regressors are all below 0.50, with the clear exception of GDP, institutions, and schooling.[34] Log GDP per capita and institutional quality are highly correlated in all three samples, and so are log GDP per capita and log schooling. Since the main point of our analysis is to find out which of the explanatory variables remove the Lucas Paradox, it is very important to look at the role of each variable one at a time and also in a multiple regression framework, given the high correlations. We also undertake Monte Carlo simulations and other tests to show that our results are not spurious due to highly correlated variables.

Our main result is that institutional quality is the variable that explains the Lucas Paradox. Column 1 of table 3 demonstrates that capital flows to rich countries, the Lucas Paradox. In column 2 we add our index of institutional quality. Upon this addition, we see that the Lucas Paradox disappears. The institutional quality is the "preferred" variable by the data. This result may not be surprising from an econometric standpoint since the recent research on institu-

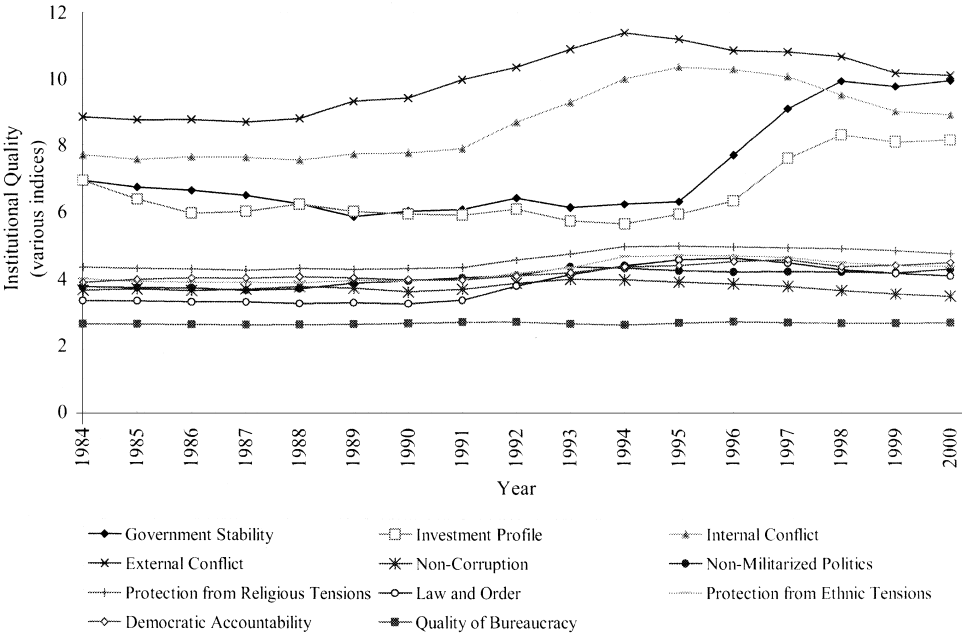
[31] See figure 3 in the working-paper version, Alfaro, Kalemli-Ozcan, and Volosovych (2005). The improvement in the government stability and internal conflict components for developing countries during the 1990s captures the political changes in Latin America and Asia, in particular in Guatemala and El Salvador, where the civil wars ended, and in India, where government stability improved after the violence in the 1980s.

[32] For the 98-country whole world sample out of the IMF data: mean and the standard deviation for the inflows are 103.9 and 158.4; mean and the standard deviation for the GDP per capita are 5.9 and 4.5; mean and the standard deviation for institutions are 6.8 and 1.4. For the 61-country whole world sample out of KLSV data: mean and the standard deviation for the inflows are 38.0 and 58.3; mean and the standard deviation for the GDP per capita are 5.1 and 4.0; mean and the standard deviation for institutions are 6.9 and 1.6. For the 60-country whole world sample out of LM data: mean and the standard deviation for the inflows are 193.0 and 313.3; mean and the standard deviation for the GDP per capita are 6.7 and 5.3; mean and the standard deviation for institutions are 7.1 and 1.5.

[33] See appendix B for the detailed list of countries.

[34] Table 3 and 4 in the working-paper version, Alfaro, Kalemli-Ozcan, and Volosovych (2005), shows the correlations between the main explanatory variables and between the main explanatory variables and the additional control variables that are used in the robustness analysis.

FIGURE 2.—EVOLUTION OF INSTITUTIONAL QUALITY INDEX. 1984–2000: SUBCOMPONENTS



Notes: The graph of subcomponents of the institutional quality index. For each subcomponent, a higher score means lower risk. See section 3.1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

tions and development shows that these two variables are highly collinear because the historically determined component of institutions is a very good predictor for income in 1970.[35] Nevertheless, our index of institutions is significant at the 1% level, while the log GDP per capita is not. Columns 3 and 4 repeat the same exercise for the base sample. The impact of institutions on capital inflows in our base sample is quite similar to that of the whole world sample.

As shown in column 5, on its own, the index of institutions can explain 52% of the cross-country variation in inflows of direct and portfolio equity investment per capita. It is very striking that log GDP per capita has no additional explanatory power, which can be seen by comparing columns 4 and 5. The partial R^2 is 0.0 for the log GDP per capita, whereas it is 0.13 for the index of institutions as seen by comparing columns 3 and 4. Columns 6–8 repeat the same exercise using the average values both for GDP per capita and institutional quality, showing similar results.

To get a sense of the magnitude of the effect of institutional quality on inflows of direct and portfolio equity investment per capita, let's consider two countries such as Guyana and Italy: if we move up from the 25th percentile (Guyana) to the 75th percentile (Italy) in the distribution of the index of institutions, based on the results shown in column 4, we have $188 more inflows per capita over the sample period on average. This represents a 60% increase in inflows per capita over the sample mean, which is $117; therefore institutional quality has quite an effect.

Table 4 investigates the role of the other proposed explanations for the Lucas Paradox, both for the whole world and for the base samples. Notice that the whole world sample changes for each variable because of data availability. In column 1, we add average log years of schooling, which turns out to be insignificant.[36] In column 2, we add log distantness, which also turns out to be insignificant. Column 3 looks at the role of restrictions to capital mobility, which enters negative and significant at the 1% level. However, log GDP per capita also remains positive and significant and hence restrictions to capital mobility cannot account for the paradox. Columns 4–6 repeat the same exercise for the base sample obtaining similar results. Column 7 runs the multiple regression, where the paradox disappears because of the inclusion of the index of institutions. Only in the regressions where the index of institutions is included on its own (as shown in table 3) or together with the other explanatory variables does log GDP per capita become insignificant. Restrictions to capital mobility is also an important determinant, but it cannot account for the paradox. The institutional quality variable is robust to inclusion of the other explanatory variables and is always significant at the 1% level. One might argue that PPP-based GDP is higher in the poor countries that receive low levels of inflows, an issue that will cause a downward bias on log GDP per capita.

[35] A similar result can be find in Acemoglu et al. (2003), where they investigate the effect of institutional quality and GDP per capita on growth volatility.

[36] We repeat the analysis using average years of higher schooling instead of total schooling as the measure of human capital and get similar results.

TABLE 3.—OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA I: IMF FLOWS DATA (DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA, 1970–2000)

	Whole World (1)	Whole World (2)	Base Sample (3)	Base Sample (4)	Base Sample (5)	Base Sample (6)	Base Sample (7)	Base Sample (8)
Log GDP per capita (PPP) in 1970	1.05***	0.20	1.18***	0.14				
	(0.17)	(0.13)	(0.19)	(0.20)				
Log average GDP per capita (PPP) 1970–2000						1.17***	0.16	
						(0.18)	(0.20)	
Average institutional quality, 1984–2000		0.68***		0.75***	0.82***		0.73***	0.82***
		(0.14)		(0.16)	(0.12)		(0.17)	(0.12)
R^2	0.37	0.52	0.39	0.52	0.52	0.42	0.52	0.52
Countries	98	98	81	81	81	81	81	81

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. Samples: 98-country whole world sample includes all the countries with data available for inflows of capital, GDP per capita, and institutional quality, excluding outliers and countries with population less than a million. The base sample is composed of 81 countries for which all the main explanatory variables are available. Average inflows of capital per capita, 1970–2000, include inflows of direct and portfolio equity investment from the IMF's IFS. Inflows are expressed in constant 1996 U.S. dollars. See table 1 and appendix A in the working-paper version for detailed explanations of all the variables and sources.

Column 8 runs the same regression using log GDP per capita (constant 1996 U.S. dollars) in 1970 instead of the PPP-based measure used in the previous columns and shows that this is not the case. The estimated coefficient on log GDP per capita is somewhat larger but still insignificant, and the estimated coefficient on institutional quality is very similar. The results are also economically significant as before. Based on the results shown in column 7, if we move up from the 25th percentile (the Philippines) to the 75th percentile (Spain) in the distribution of the index of institutions, we have \$163 more inflows per capita over the sample period on average. This represents a 40% increase in inflows per capita over the sample mean, which is \$117.

Table 5 repeats the same exercise using KLSV capital inflows data. As mentioned, these data are better measures of capital flows. Column 1 demonstrates the Lucas Paradox for the whole world sample. Column 2 shows our main result that the Lucas Paradox disappears with the addition of institutional quality. Columns 3 and 4 demonstrate the same result for the base sample for which all of the main explanatory variables are available. As before, the estimated coefficients are very similar in both samples. Column 4 also shows a partial R^2 of 0.16 for the index of institutional quality. Columns 5–7 add the other proposed explanations for the paradox. Both log years of schooling and restrictions to capital mobility are significant at the 1% level with the right sign. However, log GDP per capita remains significant in these specifications, that is, these other potential explanations cannot account for the paradox. As before, in the multiple regression of column 8, institutional quality is the main explanation for the capital inflows in the last thirty years and log GDP per capita becomes insignificant. Column 9 repeats column 8 using log GDP per capita (constant 1996 U.S. dollars) instead of the PPP log GDP per capita, obtaining a similar result.

To get a sense of the magnitude of the effect of institutional quality on inflows of direct and portfolio equity investment, we will perform the following exercise: based on the results shown in column 4, if we move up from the 25th percentile (Syria) to the 75th percentile (the United Kingdom) in the distribution of the index of institutions, we have \$77 more inflows per capita over the sample period on average. This represents a 100% increase in inflows per capita over the sample mean, which is \$39. Results shown in column 8 imply a 70% increase over the sample mean (an

TABLE 4.—OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA II: IMF FLOWS DATA (DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA, 1970–2000)

	Whole World (1)	Whole World (2)	Whole World (3)	Base Sample (4)	Base Sample (5)	Base Sample (6)	Base Sample (7)	Base Sample (8)
Log GDP per capita (PPP) in 1970	1.03***	0.99***	0.82***	1.14***	1.11***	0.91***	0.13	
	(0.22)	(0.17)	(0.14)	(0.24)	(0.19)	(0.16)	(0.18)	
Log GDP per capita (1996 \$) in 1970								0.20
								(0.15)
Average institutional quality, 1984–2000							0.65***	0.59***
							(0.15)	(0.14)
Log average years of schooling, 1970–2000	0.12			0.06			−0.10	−0.18
	(0.16)			(0.18)			(0.15)	(0.19)
Log average distantness, 1970–2000		−0.68			−0.58		−0.29	−0.31
		(0.69)			(0.72)		(0.58)	(0.60)
Average restrictions to capital mobility, 1970–2000			−1.54***			−1.83***	−1.23***	1.17***
			(0.53)			(0.60)	(0.46)	(0.44)
R^2	0.39	0.38	0.42	0.39	0.40	0.45	0.55	0.55
Countries	92	97	97	81	81	81	81	81

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. Samples: 98-country whole world sample includes all countries with data available for inflows of capital, GDP per capita, and institutional quality, excluding outliers and countries with population less than a million; 92-country sample excludes countries with missing human capital data; 97-country sample excludes countries with missing restrictions to capital mobility data. The base sample is composed of 81 countries for which all the main explanatory variables are available. Average inflows of capital per capita, 1970–2000, include inflows of direct and portfolio equity investment from the IMF's IFS. Inflows are expressed in constant 1996 U.S. dollars. See table 1 and appendix A in the working-paper version for detailed explanations of all the variables and sources.

TABLE 5.—OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA: KLSV FLOWS DATA (DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA, 1970–2000)

	Whole World (1)	Whole World (2)	Base Sample (3)	Base Sample (4)	Base Sample (5)	Base Sample (6)	Base Sample (7)	Base Sample (8)	Base Sample (9)
Log GDP per capita (PPP) in 1970	4.89***	1.19	4.87***	0.85	3.09***	4.53***	3.65***	0.36	
	(0.73)	(0.79)	(0.75)	(0.83)	(0.84)	(0.95)	(0.72)	(0.83)	
Log GDP per capita (1990 $) in 1970									0.55
									(0.34)
Average institutional quality, 1984–97		2.39***		2.54***				2.16***	2.02***
		(0.41)		(0.43)				(0.52)	(0.45)
Log average years of schooling, 1970–97					3.84***			0.85	0.74
					(1.34)			(1.23)	(1.13)
Log average distantness, 1970–97						−3.54		−1.60	−0.48
						(3.90)		(3.33)	(2.92)
Average restrictions to capital mobility, 1970–97							−6.17***	−2.73	−2.49
							(2.17)	(2.04)	(2.09)
R^2	0.49	0.64	0.48	0.64	0.51	0.49	0.52	0.65	0.66
Countries	61	61	58	58	58	58	58	58	58

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. Samples: 61-country whole world sample includes all countries with data available for inflows of capital, GDP per capita, and institutional quality, excluding outliers. The base sample is composed of 58 countries for which all the main explanatory variables are available. Average inflows of capital per capita, 1970–1997, are the flows of foreign claims on domestic capital in constant 1990 U.S. dollars, from the KLSV data set. See table 1 and appendix A in the working-paper version for detailed explanations of all the variables and sources.

increase of $66). These results imply a significantly large effect of institutional quality on foreign investment.

Table 6 reports the result of the same specifications using the LM data, obtaining similar results.

C. *Are the Results Driven by Multicollinearity?*

One might worry that the results are spurious because of the high correlation between GDP per capita and institutions. A multiple regression captures the direct effect of institutional quality on capital inflows. GDP per capita also depends on institutional quality, creating an indirect effect. Given the high correlation between them we may not be able to identify the individual effects. We undertake a number of tests to show that indeed we are capturing the independent effect of institutions and that multicollinearity is not driving our results.

Panel A of figure 3 plots the residuals from the regression of average inflows of direct and portfolio equity investment per capita on average institutional quality against the residuals from the regression of log GDP per capita in 1970 on average institutional quality. The Frisch-Waugh theorem says the coefficient from this regression is exactly the same as the one for GDP per capita in the multiple regression. Thus the slope of the fitted line is 0.14 as shown in column 4 of table 3. Similarly, panel B of the same figure plots the residuals from the regression of average inflows of direct and portfolio equity investment per capita on log GDP per capita in 1970 against the residuals from the regression of institutions on log GDP per capita in 1970. By the Frisch-Waugh theorem the slope of the fitted line is 0.75 as shown in column 4 of table 3.[37] It is clear from the figures that the exogenous component of log GDP per capita cannot explain the cross-country variation in capital inflows per capita but the exogenous component of the index of institutions can. What is also clear from the figures is that the strong positive relation between the institutional quality index and the capital inflows per capita is evidently not due to the specific outliers. Recently "opened up" economies like East Asian countries, for example, might be a group of outliers driving the results. It is clear from the figure that our results are not driven by capital account liberalization episodes but rather by countries, which, ceteris paribus, have very high levels of institutional quality, such as Denmark, Sweden, the Netherlands, Norway, and the United Kingdom. We repeat the same exercise for our "preferred" KLSV data base sample (reported as figure 5 in the working-paper version, Alfaro, Kalemli-Ozcan, & Volosovych, 2005). The slopes of the fitted lines in panels A and B correspond to the coefficients in column 4 of table 5.

Another way to think about the above exercise is the following. It is clear that GDP per capita and the index of institutions have a common component and each can be written as a linear function of the other and an error term. We argue that the "variable-specific" component of the index of institutions—defined as the residual from the regression of average institutional quality on log GDP per capita in 1970—has the explanatory power, and that the "variable-specific" component of GDP—defined as the residual from the regression of log GDP per capita in 1970 on average institutional quality—does not have any explanatory power.[38]

[37] The Frisch-Waugh theorem can be shown as follows: to establish the conditional correlation for the variable of interest, that is institutional quality, and given the main regression, $F_i = \mu + \alpha \log Y_i + \beta I_i + \varepsilon_i$, we run $I_i = \lambda_0 + \lambda_1 \log Y_i + \varepsilon_i$ and $F_i = \gamma_0 + \gamma_1 \log Y_i + \nu_i$, then we run $\nu_i = \zeta + \theta\varepsilon_i + \omega$. By the Frisch-Waugh theorem $\theta = \beta$.

[38] We run a regression of average capital inflows per capita on average institutional quality and the "variable-specific component" of log GDP per capita in 1970 (the residual from the regression of log GDP per capita in 1970 on average institutional quality) and confirm that this independent component of log GDP per capita in 1970 has no effect. When we run a regression of average capital inflows per capita on log GDP per capita in

TABLE 6.—OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA: LM FLOWS DATA (DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA, 1970–2000)

	Whole World (1)	Whole World (2)	Base Sample (3)	Base Sample (4)	Base Sample (5)	Base Sample (6)	Base Sample (7)	Base Sample (8)	Base Sample (9)
Log GDP per capita (PPP) in 1970	1.80***	0.32	1.92***	0.32	1.14***	1.70***	1.29***	−0.01	
	(0.38)	(0.25)	(0.40)	(0.29)	(0.42)	(0.36)	(0.40)	(0.32)	
Log GDP per capita (1996 $) in 1970									−0.18
									(0.22)
Average institutional quality, 1984–98		1.36***		1.36***				1.18***	1.24***
		(0.30)		(0.31)				(0.34)	(0.36)
Log average years of schooling, 1970–98					2.26***			0.21	0.35
					(0.81)			(1.07)	(1.12)
Log average distantness, 1970–98						−2.45*		−1.44	−1.36
						(1.41)		(1.26)	(1.29)
Average restrictions to capital mobility, 1970–98							−3.25**	−1.77	−1.93
							(1.52)	(1.29)	(1.28)
R^2	0.27	0.51	0.29	0.51	0.34	0.33	0.35	0.53	0.53
Countries	60	60	56	56	56	56	56	56	56

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. Samples: 60-country whole world sample includes all countries with data available for inflows of capital, GDP per capita, and institutional quality, excluding outliers. The base sample is composed of 56 countries for which all the main explanatory variables are available. Average inflows of capital per capita, 1970–1998, are the flows of foreign claims on domestic capital in constant 1996 U.S. dollars, from the LM data set. See table 1 and appendix A in the working-paper version for detailed explanations of all the variables and sources.

We also calculated additional diagnostic tests. As shown by Belsley (1991), one can calculate a condition index as a means for determining when there are collinear relations among the columns of a data matrix X. The condition index equals the square root of the largest eigenvalue divided by the smallest eigenvalue. When there is no collinearity at all, the eigenvalues and the condition index will all be equal to 1. As collinearity increases, the eigenvalues will be both greater and smaller than 1, where eigenvalues close to 0 indicate a multicollinearity problem, thus the condition index will increase. Belsley shows that if the condition index is bigger than 15 then multicollinearity is a concern, and if it is greater than 30 it is a very serious concern. We calculate the condition indices for the regression shown in column 4 of table 3 and column 4 of table 5. The indices are 14.6 and 12.6 respectively, indicating that multicollinearity is not a concern for our results.

We also undertook two different simulation exercises, which were different regression diagnostic tests performed using the KLSV base sample of 58 countries. These were Monte Carlo simulations and a perturbation exercise based on Beaton, Rubin, and Barone (1976).[39] All of these tests show that our results are not spurious because of highly correlated variables.

In addition to all of these tests, none of our robustness regressions, as shown next, show any big sign and magnitude changes, which are typical indicators of multicollinearity.

D. Robustness Checks

One source of endogeneity can come from the possibility that both inflows and institutional quality might be determined by an omitted third factor. We believe the extensive robustness analysis undertaken in this section shows this not to be the case.

Table 7 shows the results of adding extra control variables. Some of our robustness variables are available for only the 1990s: therefore corresponding regressions are only for the 1990s. Column 1 investigates the role of log average inflation volatility, which captures average macroeconomic instability. This variable turns out to be insignificant. Because the lack of flows can be due to heavy taxation, we also add corporate income tax as another policy variable. As shown in column 2, our results are robust to the inclusion of this variable.[40] Institutional quality remains positive and significant. Another variable that might play a role is trade.[41] As shown in column 3, our results are robust to the inclusion of average trade openness defined as the sum of exports and imports as a share of output. The

1970 and the "variable-specific" component of average institutional quality instead, which is the residual from the regression of average institutional quality on log GDP per capita in 1970, we find that the independent component of the index of institutions clearly has the explanatory power and this is exactly what drives our results. By the Frisch-Waugh theorem, the coefficients on the "variable specific" components are the same as in the multiple regression.

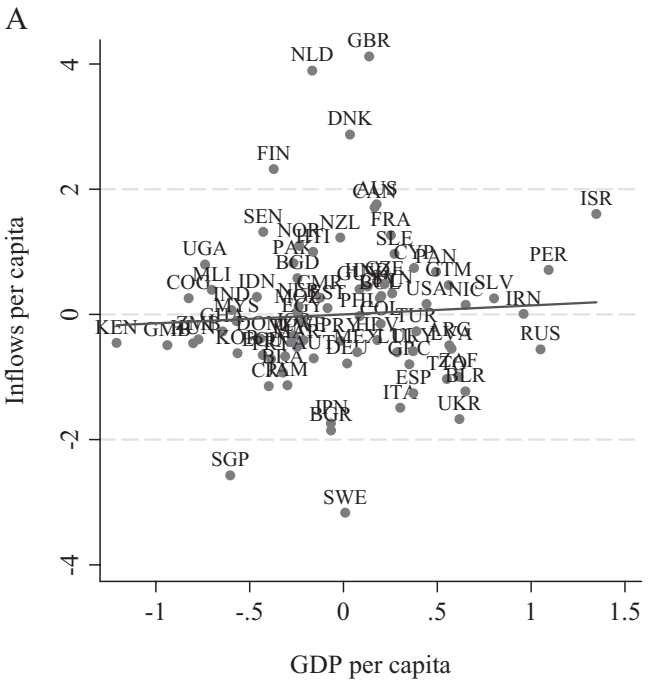
[39] The details and results are reported in the working-paper version; Alfaro, Kalemli-Ozcan, and Volosovych (2005). We thank an anonymous referee for encouraging us to do these exercises, which strengthened our paper.

[40] This variable is available for the 1990s only. In addition, the significance of this variable is not robust to our other samples. Hence we decided not to include it as a main explanatory variable.

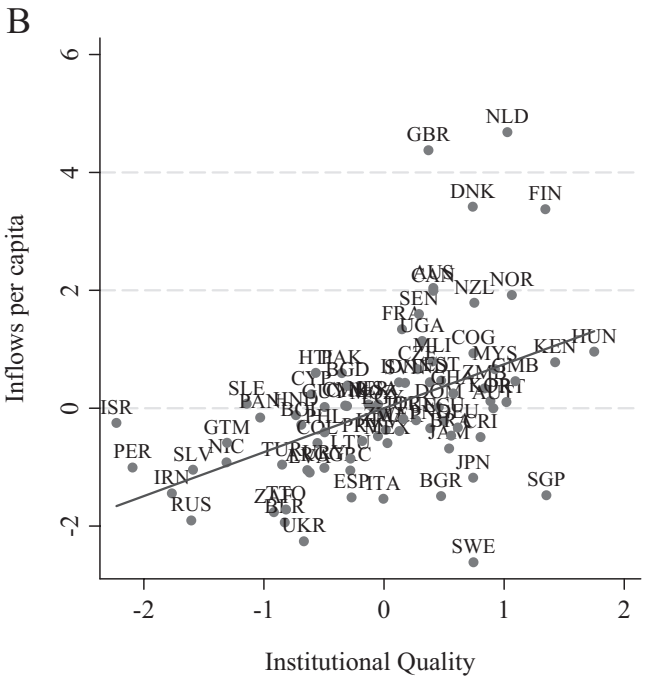
[41] Mundell (1957) shows commodity movements and factor movements to be substitutes. Markusen (1983) and Svensson (1984) show that whether trade and factor mobility are complements or substitutes depends on the assumptions made with respect to factor intensities, technology, and preferences.

FIGURE 3.—CONDITIONAL CORRELATION PLOTS FROM REGRESSION OF INFLOWS OF CAPITAL PER CAPITA ON INSTITUTIONAL QUALITY AND GDP PER CAPITA: BASE SAMPLE OF 81 COUNTRIES

A. CORRELATION OF INFLOWS OF CAPITAL PER CAPITA AND LOG GDP PER CAPITA AFTER CONTROLLING FOR INSTITUTIONAL QUALITY



B. CORRELATION OF INFLOWS OF CAPITAL PER CAPITA AND INSTITUTIONAL QUALITY AFTER CONTROLLING FOR LOG GDP PER CAPITA



Notes: Inflows are inflows of direct and portfolio equity investment from the IMF's IFS in 1996 U.S. dollars. GDP per capita is 1996 PPP basis from Penn World Tables, Ver. 6.1. Panel A plots the residuals from the regression of average inflows of capital per capita, 1970–2000, on average institutional quality, 1984–2000, versus the residuals from the regression of log of GDP per capita in 1970, the variable of interest, on average institutional quality, 1984–2000; a constant is included in both regressions. The line represents the fitted line from this regression. By Frisch-Waugh theorem, the coefficient in this regression is exactly the same as the coefficient on log GDP per capita in 1970 in the multiple regression including both log GDP per capita and institutional quality as reported in column 4 of table 3. Hence, the slope of the line is 0.14. Panel B is constructed in the same fashion, with institutional quality being the variable of interest, thus the slope of the line is 0.75.

TABLE 7.—ROBUSTNESS CHECKS FOR OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA I: KLSV DATA
(DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA)

Time Period	1970–97 (1)	1990–97 (2)	1970–97 (3)	1990–97 (4)	1990–97 (5)	1970–97 (6)	1970–97 (7)	1970–97 (8)
Log GDP per capita (PPP) (initial year)	0.83	3.19	0.91	−3.13	−0.94	0.63	0.83	0.94
	(0.85)	(3.80)	(0.83)	(4.76)	(4.65)	(0.89)	(0.86)	(1.02)
Average institutional quality (different periods)	2.56***	6.31***	2.49***	10.00***	8.00**	2.46***	2.58***	2.34***
	(0.45)	(2.07)	(0.43)	(3.28)	(3.17)	(0.51)	(0.58)	(0.55)
Log average inflation volatility, 1970–97	0.15							
	(0.73)							
Average corporate tax rate, 1970–97		−0.68**						
		(0.27)						
Log average trade openness, 1970–97			0.83					
			(0.87)					
FDI restrictions in 1990				−1.38				
				(2.30)				
FDI incentives in 1990					−4.77*			
					(2.67)			
Average paved roads, 1970–97						0.02		
						(0.02)		
Log average bank assets, 1970–97							−0.16	
							(1.02)	
Log average stock market value traded, 1970–97								0.27
								(0.27)
R^2	0.64	0.59	0.65	0.47	0.49	0.65	0.66	0.62
Countries	58	42[a]	58	33[a]	33[a]	57[a]	58	50[a]

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. GDP per capita (PPP) is 1970 value in columns marked 1970–97, 1990 value in columns marked 1990–97. Average institutional quality covers 1984–97 in columns marked 1970–97, 1990–97 in columns marked 1990–97. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources. [a]Limited sample due to missing data.

institutional quality variable remains highly significant. Trade, however, has no effect.[42] Columns 4 and 5, respectively, test the effects of restrictions and incentives to FDI. The restriction index is the sum of four dummies for exchange controls, exclusion of foreign firms from certain strategic sectors, exclusion of foreign firms from other nonstrategic sectors, and restriction on the share of foreign ownership.[43] The incentive index is a dummy for incentives for foreigners to invest in specific industries or geographic areas.[44] Only the incentive index enters significantly. The role of institutional quality, on the other hand, remains positive and significant. As seen in column 6, the results are robust to using variables that proxy government infrastructure. We use the percentage of paved roads in total roads, averaged over the sample period, as a measure of infrastructure. Because of complementarities between public and private capital, the former can be considered another potential omitted factor of production that affects the productive opportunities in an economy. The effect of this variable is positive, but not significant. We also use financial market development as another variable that represents good domestic fundamentals. In theory, higher levels of financial development lead to higher productivity of capital.[45] We try several standard measures of credit market development, namely liquid liabilities of the financial system, total credit to private sector, and credit by deposit money banks to private sector (all as shares of GDP, averaged over the sample period). We report the results with bank assets in column 7. We also try measures of capital market development. We use total value traded on the stock market (shown in column 8) and stock market capitalization (as shares of GDP, averaged over the sample period). Both turn out to be insignificant. Inclusion of these measures together with the credit market variables and/or on their own did not change the overall picture.

Table 8 looks at some other indicators. As explained before, it is hard to separate the effects of the incentive structure (institutions) on the adoption of new technologies from the TFP itself. Hence it may be the case that our institutional quality variable is a proxy for TFP differences. However, we do not have a good measure that captures international TFP differences given the fact that technology can be transferred and imitated. Hence the empirical literature on growth tends to calculate TFP measures as a residual of growth rates minus factor accumulation weighted by their relative contribution to production. We

[42] Lane (2004) finds a positive association between trade openness and the level of external debt. He argues that this result supports theories of constrained access to international credit markets.

[43] Since this variable includes a capital control component, we also use this index without our restrictions to the capital mobility variable, obtaining similar results.

[44] We also used the other incentive variables, namely tax concessions, nontax concessions, and special promotion for exports, and got similar results. These indices were coded by Wei (2000) following a detailed description compiled by PricewaterhouseCoopers. Corporate tax rate is also from Wei. Unfortunately these variables are available only for one year, where that year changes between 1990 and 1997 from country to country. Hence, we decided not to include them among the main explanatory variables.

[45] Note that financial market development can also be considered a measure of asymmetric information as it mitigates information problems. In a standard frictionless general equilibrium model in the manner of Arrow-Debreu, financial intermediaries are redundant. Information asymmetries or transaction costs are required to justify the existence of financial intermediaries.

TABLE 8.—ROBUSTNESS CHECKS FOR OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA II: KLSV DATA
(DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA)

Time Period	1970–97 (1)	1970–97 (2)	1970–97 (3)	1970–97 (4)	1994–97 (5)
Log GDP per capita (PPP) (initial year)	0.84		0.91	0.68	8.43***
	(1.61)		(0.84)	(0.86)	(3.16)
Average institutional quality (different periods)	2.54***	2.44***	2.49***	2.55***	8.19***
	(0.50)	(0.46)	(0.43)	(0.43)	(3.18)
Log average TFP, 1970–97	0.02				
	(3.48)				
Log capital stock per capita in 1970		0.73			
		(0.64)			
Oil dummy			−1.13		
			(1.41)		
Sub-Saharan dummy				−2.12	
				(1.40)	
Malaria in 1994					6.54
					(5.53)
R^2	0.64	0.64	0.64	0.65	0.46
Countries	58	58	58	58	48[a]

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. GDP per capita (PPP) is 1994 value in column 5, 1970 value in the other columns. Average institutional quality covers 1994–97 in column 5, 1984–97 in the other columns. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. [a]48-country sample due to missing data on the dependent variable for the year 1994. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

also construct a similar proxy variable for TFP by solving for A in equation 1 and assuming the value of $\alpha = 1/3$. We also calculate TFP growth rates as the growth rate of per capita output minus one-third of the growth rate of the per capita capital stock. We calculate both of these variables for every year and every country in our sample period. As seen in column 1, average level of TFP growth has an insignificant effect. The results with the TFP growth rate are the same. If we use these variables alone, both turn out to be positive and significant. Our institutional quality variable remains positive and significant. We repeat the analysis using capital stock per capita instead of GDP per capita as a measure of the Lucas Paradox as shown in column 2. Neoclassical theory suggests that capital will flow from the capital-abundant country to the capital scarce-country. From another point of view, this exercise also can be viewed as evidence for the presence of externalities in the localization of production: capital goes where capital is. We use the 1970 value of the domestic capital stock per capita since this will be the relevant value for the future inflows. As shown in column 2 of table 8, the results are very similar. Institutional quality remains the main explanation for the Lucas Paradox. If capital stock is used on its own, it turns out to be positive and significant. We also used an oil country dummy, a sub-Saharan country dummy, and existence of malaria, all of which turn out to be insignificant.

We also experiment with some other variables for fundamentals. For example, we use land because it can be another potential omitted factor of production, such as human capital, and hence countries with less land may have low marginal productivity of capital. This variable turns out to be insignificant and thus we do not report the results. We also use the ratio of external debt to GDP, which turns out to be insignificant, and hence not reported. Our capital control measure is an average of four dummy variables as explained before. We try two of these measures on their own: restrictions on payments for capital transactions and surrender or repatriation requirements for export proceeds. The results are qualitatively the same and therefore are not reported.

The institutional quality variable is a composite index of the various components. We use each component of this index independently to see which ones are driving the result. Government stability, internal conflict, noncorruption, law and order, democratic accountability, bureaucratic quality, and investment profile seem to be important determinants of capital inflows. Other components such as external conflict, nonmilitarized politics, and protection from religious tensions turn out to be insignificant. We do not report these results for space considerations.[46]

In table 9, to test the robustness of the results obtained using the distantness variable as a measure of asymmetric information, we try several other measures for asymmetric information. First, as shown in columns 1 and 2, we use the sovereign debt rating from Standard & Poor's (S&P) and Moody's as a measure of sovereign risk. These data reflect the assessment of each government's capacity and willingness to repay debt according to its terms. S&P's appraisal of each sovereign's creditworthiness is based on economic and financial performance and political factors. They observe that "willingness to repay is a qualitative issue that distinguishes sovereigns from most other types of issuers. Partly because creditors have only limited redress, a government can (and does) default selectively on its obligations, even when it possesses the financial capacity for timely debt service." Thus, although this measure is highly correlated with the ICRG variables, their objective and methodology are quite different. In order to eliminate any possible perception bias, ICRG does not use any outside expert opinion,

[46] The results are available from the authors on request.

TABLE 9.—ROBUSTNESS CHECKS FOR OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA III: KLSV DATA
(DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA)

Time Period	1990–97 (1)	1990–97 (2)	1970–97 (3)	1990–97 (4)
Log GDP per capita (PPP) (initial year)	−1.17	−2.66	0.78	0.89
	(3.67)	(4.65)	(0.81)	(3.13)
Average institutional quality (different periods)	8.26**	8.18**	2.44***	6.97***
	(3.50)	(3.46)	(0.42)	(2.22)
Average sovereign risk, Moody's, 1990–97	−0.11			
	(0.52)			
Average sovereign risk, S&P, 1990–97		−0.42		
		(0.42)		
Log average reuters, 1970–97			0.29	
			(0.36)	
Average foreign bank asset share, 1990–97				10.65
				(6.89)
R^2	0.45	0.46	0.65	0.49
Countries	36[a]	35[b]	58	49[c]

Notes: All regressions include a constant and are estimated by OLS with White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. GDP per capita (PPP) is 1970 value in column 3, 1990 value in the other columns. Average institutional quality covers 1984–97 in column 3, 1990–97 in the other columns. [a]Limited 36-country sample due to missing data on Moody's sovereign ratings. [b]Limited 35-country sample due to missing data on S&P's sovereign ratings. [c]Limited 49-country sample due to missing data on foreign bank assets. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

such as influential investors who might have assets in the rated country. S&P, on the other hand, relies on this from time to time. These variables turn out to be negative but not significant.[47] Our institutional quality variable is robust to the inclusion of the sovereign risk variable. In column 3 we use a variable called Reuters. This variable is the number of times the country is mentioned in Reuters. This measure should potentially reflect the international business community's awareness about the country that they are investing in. The sign is positive, but the coefficient is not significant. Then we try foreign banks (share of foreign banks with at least 50% of foreign capital in total banks) and accounting practices (an index for the degree of transparency in accounting) as alternative measures of asymmetric information. Both enter with correct signs but are not significant. We also tried accounting practices from Wei (2000) and get similar results.[48] Of course, these measures may be endogeneous, and hence distantness is our "preferred" measure. Finally we use distantness as weighted by population instead of GDP. The results are the same as before.

We estimate our main regressions using data on total capital inflows, including *debt* from the LM data set (results are reported in table 12 in the working-paper version. Alfaro, Kalemli-Ozcan, & Volosovych, 2005). Adding debt inflows to the inflows of direct and portfolio equity investment represents total inflows of capital per capita. The results are similar.

We repeat the analysis for the decades in our sample period. Institutional quality remains the main explanation for the Lucas Paradox for the different decades and subperiods except for lower significance in the 1980s (results are reported in table 13 in the working-paper version, Alfaro, Kalemli-Ozcan, & Volosovych, 2005). We conjecture that the lower significance of the institutional quality variable during the 1980s can be accounted for by the general cutoff of lending in the international capital markets following Mexico's announcement to halt foreign interest payments on August 15, 1982, which marked the beginning of the international debt crisis.[49] Notice that our composite institutional quality index starts in 1984, the first year covered by the ICRG data. As shown in figure 2, our composite index does not change much over our sample period. Thus we use the average value of the index for the 1970s and 1980s.

IV. Institutions and the Lucas Paradox: IV Estimates

It is possible that capital inflows affect the institutional quality of a country. More inflows can generate incentives to reform and create an investor-friendly environment.[50] Moreover, most institutional quality measures are constructed ex post, and the analysts may have had a natural bias in "assigning" better institutions to countries with higher capital inflows. Another source of endogeneity can come from the possibility that both inflows and institutional quality might be determined by an omitted third factor. We believe the extensive robustness analysis that is undertaken shows that this is not the case.

As a first cut, table 10 regresses average capital inflows over 1985–1997 on institutional quality in 1984 and log GDP per capita in 1984. There is a positive and significant effect of presample institutions on the subsequent thirteen years of capital inflows per capita. The coefficient that is reported in column 2 is higher than the one reported in column 4 of table 5, as expected. Institutional quality can

[47] Most emerging markets do not have a sovereign rating before the early 1990s. Hence, we run this regression for the 1990s decade only.

[48] The results are available from the authors on request.

[49] As Eichengreen and Lindert (1989) observe, during the 1980s private creditors tended to withhold capital from potential borrowers in all developing countries, not just the conspicuous problem debtor countries.

[50] See Rajan and Zingales (2003).

account for 59% of the variation. Log GDP per capita does not have any additional explanatory power, where the partial R^2 is 0.0.

Our second approach is to run IV regressions using instruments that are not subject to reverse causality and can account for the institutional variation. La Porta et al. (1997, 1998) emphasize the importance of the legal origins on the current institutions. They examine the laws governing investor protection, the enforcement of these laws, and the extent of concentration of firm ownership across countries. They find that countries with different legal histories offer different types of legal protection to their investors. Most countries' legal rules, either through colonialism, conquest, or outright borrowing can be traced to one of four distinct European legal systems: English common law, French civil law, German civil law, and Scandinavian civil law. They show that countries whose legal rules originate in the common-law tradition offer the greatest protection to investors. As far as law enforcement is concerned, German civil law and Scandinavian civil law countries emerge superior. The French civil-law countries offer both the weakest legal protection and the worst enforcement. These legal origin variables have been increasingly adopted as exogenous determinants of institutional quality in the economic growth literature.

In contrast, Acemoglu, Johnson, and Robinson (2001, 2002) emphasize the conditions in the colonies. They argue that it is not the identity of the colonizer or the legal origin that matters, but whether the European colonialists could safely settle in a particular location. If the European settlement was discouraged by diseases or where the surplus extraction was beneficial via an urbanized and prosperous population, the Europeans set up worse institutions. Thus, they argue that historical mortality rates of European settlers are valid instruments for current institutions of former colonies. They also claim that the legal origin is a poor instrument for institutional quality, in particular for institutions that protect property rights and that it is hard to make a case that legal origins do not have any direct effect on the relevant outcome variables such as income levels. They stress that successful instruments have to be *theoretically* excludable from the empirical model used by the econometrician and that undertaking overidentification tests is not enough. As the result, we use log European settler mortality rates as an instrument for institutions, which is an excludable instrument as shown below.

TABLE 10.—OLS REGRESSIONS OF CAPITAL INFLOWS PER CAPITA: KLSV FLOWS DATA (DEPENDENT VARIABLE IS AVERAGE CAPITAL INFLOWS PER CAPITA, 1985–1997)

	(1)	(2)
Institutional quality in 1984	4.53***	3.60***
	(0.57)	(1.02)
Log GDP per capita (PPP) in 1984		2.65
		(2.64)
R^2	0.59	0.59
Countries	54	54

Notes: All regressions include a constant and are estimated by White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. The regressions are estimated using 54 countries out of 58-country base sample due to missing data for Bangladesh, Iran, Nicaragua, and Senegal in the year of 1984. Average inflows of capital per capita, 1985–1997, are the flows of foreign claims on domestic capital in constant 1990 U.S. dollars, from the KLSV data set. See appendix A in the working-paper version for detailed explanations of all the variables and sources.

TABLE 11.—IV REGRESSIONS OF CAPITAL INFLOWS PER CAPITA: IMF FLOWS DATA

	(1)	(2)
Panel A: Two-Stage Least Squares		
Average institutional quality, 1984–97	0.97***	1.76**
	(0.16)	(0.85)
Log GDP per capita (PPP) in 1970		−1.18
		(1.09)
Panel B: First Stage for Average Institutional Quality in 1984–1997		
Log European settler mortality	−0.87***	−0.27*
	(0.15)	(0.14)
Log GDP per capita (PPP) in 1970		1.04***
		(0.16)
R^2	0.43	0.68
Panel C: Ordinary Least Squares		
Average institutional quality, 1984–97	0.75***	0.63***
	(0.14)	(0.15)
Log GDP per capita (PPP) in 1970		0.23
		(0.17)
Countries	45	45

Notes: Panel A reports the two-stage least squares estimates, instrumenting for institutional quality by log settler mortality; panel B and panel C report the first stage and the OLS regression, correspondingly. All regressions include a constant and are estimated by White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. The regressions are estimated using 45 former colonies out of 81-country base sample with available mortality data. Average inflows of capital per capita. 1970–2000 include inflows of direct and portfolio equity investment in constant 1996 U.S. dollars, from the IMF's IFS. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

Table 11 presents the results of the two-stage least squares regressions in panel A, the associated first-stage regressions in panel B, and the OLS counterpart in panel C. We have 45 countries since 45 out of our 58 country base sample are the former colonies where we have the log settler mortality data available. As shown in column 1, average institutional quality has a causal effect on average inflows of direct and portfolio equity investment per capita, where average institutional quality is instrumented by log European settler mortality. The first-stage regression shows the significant effect of log settler mortality on institutional quality with an R^2 of 0.39.[51] The estimated coefficient is higher than the OLS counterpart that is shown in panel C and also higher than the one reported in table 3, since IV regression corrects for both endogeneity and the attenuation bias caused by the measurement error in the index of institutions. In fact, the results suggest that measurement error in the index of institutions is a more serious concern then reverse causality. Column 2 adds log GDP per capita in 1970 as an additional control. The qualitative results are the same. Of course the estimated coefficients are much higher here given the collinearity between log European settler mortality and log GDP per capita.

[51] This is similar to the first-stage regression in Acemoglu, Johnson, and Robinson (2001), where they regress the average risk of expropriation (which is one of the components of our index of institutions) on log settler mortality. Their estimated coefficient is −0.61 (0.13) with an R^2 of 0.27.

TABLE 12.—TESTS FOR VALIDITY AND EXCLUDABILITY OF INSTRUMENTS: IMF FLOWS DATA

Panel A: Second Stage with Log Settler Mortality as Exogenous Variable	
Average institutional quality, 1984–2000	0.95***
	(0.36)
Log European settler mortality	−0.02
	(0.34)
Panel B: First Stage for Average Institutional Quality in 1984–1997	
British legal origin	−0.34
	(0.32)
English language	1.68***
	(0.54)
Log European settler mortality	−0.63***
	(0.12)
R^2	0.53
p-value (*J*-test)	0.70
Countries	45

Notes: Panel A reports the two-stage least squares estimates instrumenting for institutional quality with British legal origin and English language. Log settler mortality enters into the regression as an exogenous variable; panel B reports the corresponding first stage and *p*-value for Hansen overidentification test (*J*-test), where the null hypothesis is that the instruments for average institutional quality are valid. All regressions include a constant and are estimated by White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. The regressions are estimated using 45 former colonies out of 81-country base sample with available mortality data. Average inflows of capital per capita, 1970–2000, include inflows of direct and portfolio equity investment in constant 1996 U.S. dollars, from the IMF's IFS. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

TABLE 13.—IV REGRESSIONS OF CAPITAL INFLOWS PER CAPITA: KLSV FLOWS DATA

	(1)	(2)
Panel A: Two-Stage Least Squares		
Average institutional quality, 1984–97	3.77***	5.59***
	(0.85)	(1.83)
Log GDP per capita (PPP) in 1970		−2.39
		(1.78)
Panel B: First Stage for Average Institutional Quality in 1984–1997		
Log European settler mortality	−1.02***	−0.59***
	(0.19)	(0.19)
Log GDP per capita (PPP) in 1970		0.55***
		(0.21)
R^2	0.38	0.60
Panel C: Ordinary Least Squares		
Average institutional quality, 1984–97	2.22***	2.15***
	(0.63)	(0.58)
Log GDP per capita (PPP) in 1970		0.11
		(0.34)
Countries	35	35

Notes: Panel A reports the two-stage least squares estimates, instrumenting for institutional quality by log settler mortality; panel B and panel C report the first stage and the OLS regression, correspondingly. All regressions include a constant and are estimated by White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, ** 5%, and *10% significance. The regressions are estimated using 35 former colonies out of 58-country base sample with available mortality data. Average inflows of capital per capita, 1970–1997, are the flows of foreign claims on domestic capital in 1990 constant U.S. dollars, from the KLSV data set. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

To get a sense of the magnitude of the effect of institutional quality on inflows of direct and portfolio equity investment, we will perform the following exercise: based on the results shown in column 1, if we move up from the 25th percentile (Peru) to the 75th percentile (Australia) in the distribution of the index of institutions, we have $79 more inflows per capita over the sample period on average. This represents almost a fivefold increase in inflows per capita over the sample mean, which is $16. Given the causal effect, these results imply an impressively large effect of institutional quality on foreign investment. Notice that the quantitative effect obtained from the IV regression is much larger than the one obtained from the OLS regression due to the attenuation bias in the OLS regression.

Table 12 reports the results of the tests for validity and excludability of the instrument, following Acemoglu, Johnson, and Robinson (2001). Instrumenting average institutional quality with other instruments—British legal origin and English language—column 1 shows that log European settler mortality is excludable from the main regression. The overidentification tests also show that the instruments are valid. We use Hansen's overidentification test (*J*-test) to check the null hypothesis of whether the instruments for institutions we choose are valid. *P*-values for the overidentification test are reported in the table. We cannot reject the hypothesis that our instruments are appropriate since all of the *p*-values far exceed the conventional 5% significance level. Tables 13 and 14 repeat the same exercise for the KLSV data. We have 35 countries for the same reason, that is, the availability of the settler mortality data. The results are similar.

V. Conclusion

Our objective in this paper has been to analyze empirically the role of different theoretical explanations behind the lack of flows of capital from rich countries to poor ones. We undertake a systematic empirical study to evaluate the role of the alternative explanations behind the Lucas Paradox, which include differences in fundamentals and capital market imperfections. Our empirical evidence shows that for the

TABLE 14.—TESTS FOR VALIDITY AND EXCLUDABILITY OF INSTRUMENTS: KLSV FLOWS DATA

Panel A: Second Stage with Log Settler Mortality as Exogenous Variable	
Average institutional quality, 1984–97	1.96**
	(0.89)
Log European settler mortality	−1.83
	(1.15)
Panel B: First Stage for Average Institutional Quality in 1984–1997	
British legal origin	−1.51***
	(0.36)
English language	2.78***
	(0.41)
Log European settler mortality	−1.00***
	(0.14)
R^2	0.65
p-value (*J*-test)	0.56
Countries	35

Notes: Panel A reports the two-stage least squares estimates instrumenting for institutional quality with British legal origin and English language. Log settler mortality enters into the regression as an exogenous variable; panel B reports the corresponding first stage and *p*-value for Hansen overidentification test (*J*-test), where the null hypothesis is that the instruments for average institutional quality are valid. All regressions include a constant and are estimated by White's correction of heteroskedasticity. Standard errors are in parentheses denoting ***1%, **5%, and *10% significance. The regressions are estimated using 35 former colonies out of 58-country base sample with available mortality data. Average inflows of capital per capita, 1970–1997, are the flows of foreign claims on domestic capital in 1990 constant U.S. dollars, from the KLSV data set. See table 1 and appendix A in the working-paper version for more detailed variable descriptions and sources.

period 1970–2000, institutional quality is the leading causal variable explaining the Lucas Paradox.

Our findings also generate implications for the patterns of international flows during the last century. Obstfeld and Taylor (2004) characterize four different periods in terms of the "U-shaped" evolution of capital mobility. An upswing in capital mobility occurred from 1880 to 1914 during the gold standard period. Before 1914, capital movements were free and flows reached unprecedented levels. The international financial markets broke up during World War I. In the 1920s, policymakers around the world tried to reconstruct the international financial markets. Britain returned to the gold standard in 1925 and led the way to restoring the international gold standard for a short period. Capital mobility increased between 1925 and 1930. As the world economy collapsed into depression in the 1930s, so did the international capital markets. World War II was followed by a period of limited capital mobility. Capital flows began to increase starting in the 1960s, and further expanded in the 1970s after the demise of the Bretton Woods system. In terms of the Lucas Paradox. Obstfeld and Taylor (2004) argue that capital was somewhat biased toward the rich countries in the first global capital market boom before 1914, but it is even more so today. If the Lucas Paradox characterized to a certain extent the pre-1914 global capital market, and if it persists today to the extent that poorer countries receive even less flows than during the pre-1914 boom, what is the explanation? We argue that it is differences in institutional quality among the poor and rich countries.

The Lucas Paradox has received a lot of attention as the various explanations behind the puzzle have different and sometimes opposite policy responses. Our results suggest that policies aimed at strengthening the protection of property rights, reducing corruption, and increasing government stability, bureaucratic quality, and law and order should be a priority for policymakers seeking to increase capital inflows to poor countries. Recent studies emphasize the role of institutions in achieving higher levels of income, but they remain silent on the specific mechanisms. Our results indicate that foreign investment might be a channel through which institutions affect long-run development.

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APPENDIX A

Data Descriptions and Sources

The full description of the variables and the detailed explanation of their calculation is available in the working-paper version.

	Main Variables
Inflows of direct and portfolio equity investment per capita (IMF), 1970–2000	Inflows are expressed in constant 1996 U.S. dollars. Constructed from the data on inflows of direct and portfolio equity investment from the IMF's IFS (the IFS lines 78bed and 78bmd respectively). The data in current U.S. dollars are deflated by the U.S. CPI with base year 1996 = 1 and divided by midyear population.
Stocks of foreign capital (KLSV), 1970–1997	Foreign claims on domestic capital in 1990 constant U.S. dollars, from Kraay et al. (2000, 2005).
Stocks of foreign capital (LM), 1970–1998	Foreign claims on domestic capital, from Lane and Milesi-Ferretti (2001). The data in current U.S. dollars are deflated by the U.S. CPI with 1996 = 1.
Inflows of direct and portfolio equity investment per capita out of KLSV and LM stock data	Inflows are obtained by first-differencing the stock estimates of KLSV and LM. For conversion to per capita terms, the midyear total population is used.
Population, 1970–2000	Total population from World Development Indicators (WDI), World Bank (2004).
Consumer price index	The U.S. CPI with base year 1996 = 1 is from WDI, World Bank (2004).
GDP per capita in 1970 in 1996 PPP dollars	GDP in 1996 dollars at PPP from Penn World Tables, Ver. 6.1, Heston, Summers, and Aten (2002).
GDP per capita in 1970 in constant U.S. dollars	GDP from WDI, World Bank (2004). We adjust the base years by using U.S. CPI (1990 for the KLSV data and 1996 for the IMF and LM data).
Institutional quality, 1984–2000	This is a composite index, which is the sum of all yearly rating components from *International Country Risk Guide,* the PRS Group (2001). The index is rescaled to range from 0 to 10, where a higher score means lower risk. See the working-paper version for details.
Years of Schooling, 1970–1999	Average years of secondary, higher, and total schooling in the total population, data in five-year intervals over 1970–1995 and 1999. Data from Barro and Lee (2000).
Distantness, 1970–2000	The weighted average of the distances in thousands of kilometers from the capital city of the particular country to the capital cities of the other countries, using the total GDP shares of the other countries as weights, averages across a particular time period.
Restrictions to capital mobility, 1971–2000	The mean value of four dummy variables: exchange arrangements; payments restrictions on payments for current transactions, payments restrictions on payments for capital transactions; and surrender or repatriation requirements for export proceeds. Coding from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions,* various issues.
	Additional Controls Used in the Robustness Analysis
Inflation volatility, 1970–1997	The standard deviation of annual CPI percentage change divided by the average of the annual inflation over the particular time period, from WDI, World Bank (2004).
Corporate tax rate, 1997	Corporate tax rates from *KPMG's Corporate Tax Rates Survey,* KPMG (2004).
Trade openness, 1971–1997	Sum of exports and imports of goods and services as a share of GDP from WDI, World Bank (2004).
FDI incentives and restrictions, 1990–1997	Indices on incentives and restrictions to FDI, constructed by Wei (2000) based on the textual information from PricewaterhouseCoopers.
Paved roads, 1990–1997	The percentage of paved roads in total. Data from WDI, World Bank (2004).
Bank assets, 1970–1997	Claims on domestic nonfinancial sector by deposit money banks as a share of GDP from Beck, Demirguc-Kunt, and Levine (2005).
Stock market value traded, 1970–1997	Total shares traded on the stock market exchange as a share of GDP from Beck, Demirguc-Kunt, and Levine (2005).
Total factor productivity (TFP), 1970–1997	TFP is estimated as the Solow residual from the neoclassical production function, $y = Ak^{\alpha}$, as y/k^{α}, where y is GDP per capita, k is domestic capital stock per capita, and $\alpha = 0.3$. Data are from KLSV.
Capital stock per capita in 1970	Domestic capital stock including gold reserves per capita in 1970 expressed in constant 1990 dollars at PPP, from Kraay et al. (2000) taken from Penn World Tables, Ver. 5.6., Summers and Heston (1991).
Oil dummy variable	A dummy for the major oil-exporting countries (OPEC members and Bahrain, Ecuador, Gabon, and Oman).
Malaria, 1994	The proportion of a country's population at risk of falciparum malaria transmission from Arthur and Sachs (2000).
Sovereign risk, Moody's, 1990–1997	An index based on Moody's sovereign bond ratings recoded from letter scores; a higher score means greater risk.
Sovereign risk, S&P, 1990–1997.	An index based on Standard & Poor's long-term foreign currency–denominated sovereign debt ratings. Index numbers recoded from letter scores; a higher score means greater risk.
Reuters, 1987–2000	Number of times a country is mentioned in Reuters. Source is Bond, Bond, and Oh (2001), from Reuters database.
Foreign bank asset share, 1990–1997	The share of foreign bank assets in total banking sector assets from Beck, Demirguc-Kunt, and Levine (2005).
Legal origin	Origin of formal legal code in the country: English common law, French civil law, German civil law, and Scandinavian civil law, from La Porta et al. (1997, 1998).
English language	Fraction of the population speaking English as a mother tongue, from Hall and Jones (1999).
European settlers mortality	Historical European settlers' mortality rates from Acemoglu, Johnson, and Robinson (2001), measured in terms of deaths per annum per 1,000 "mean strength."

APPENDIX B

Samples

Countries marked with an asterisk (*) are excluded from the corresponding base sample.

World, IMF Flows 98 Countries		Base, IMF Flows IV reg., 45 Countries	World, KLSV Flows 61 Countries	Base, KLSV Flows IV reg., 35 Countries	World, LM Flows 60 Countries
Albania (ALB)*	Morocco (MAR)	Argentina	Algeria*	Argentina	Algeria*
Algeria (DZA)*	Mozambique (MOZ)	Australia	Australia	Australia	Argentina
Angola (AGO)*	Namibia (NAM)*	Bangladesh	Austria	Bangladesh	Australia
Argentina (ARG)	Netherlands (NLD)	Bolivia	Bangladesh	Bolivia	Austria
Armenia (ARM)*	New Zealand (NZL)	Brazil	Bolivia	Brazil	Bolivia
Australia (AUS)	Nicaragua (NIC)	Cameroon	Brazil	Cameroon	Botswana
Austria (AUT)	Niger (NER)	Canada	Cameroon	Canada	Brazil
Azerbaijan (AZE)*	Nigeria (NGA)*	Chile	Canada	Chile	Canada
Bangladesh (BGD)	Norway (NOR)	Colombia	Chile	Colombia	Chile
Belarus (BLR)	Oman (OMN)*	Congo Rep.	China	Congo	China
Bolivia (BOL)	Pakistan (PAK)	Costa Rica	Colombia	Costa Rica	Colombia
Brazil (BRA)	Panama (PAN)	Dominican Rep.	Congo	Dominican Rep.	Costa Rica
Bulgaria (BGR)	Papua New Guinea (PNG)	Ecuador	Costa Rica	Ecuador	Côte d'Ivoire*
Burkina Faso (BFA)*	Paraguay (PRY)	Egypt	Côte d'Ivoire*	Egypt	Denmark
Cameroon (CMR)	Peru (PER)	El Salvador	Denmark	El Salvador	Dominican Rep.
Canada (CAN)	Philippines (PHL)	Guatemala	Dominican Rep.	Guatemala	Ecuador
Chile (CHL)	Portugal (PRT)	Guayana	Ecuador	Honduras	Egypt
Colombia (COL)	Russia (RUS)	Haiti	Egypt	India	El Salvador
Congo (COG)	Saudi Arabia (SAU)*	Honduras	El Salvador	Indonesia	Finland
Costa Rica (CRI)	Senegal (SEN)	India	Finland	Jamaica	France
Côte d'Ivoire (CIV)*	Sierra Leone (SLE)	Indonesia	France	Malaysia	Germany
Croatia (HRV)	Singapore (SGP)	Jamaica	Germany	Mexico	Guatemala
Cyprus (CYP)	Slovenia (SVN)	Kenya	Greece	Morocco	India
Czech Rep. (CZE)	South Africa (ZAF)	Malaysia	Guatemala	New Zealand	Indonesia
Denmark (DNK)	Spain (ESP)	Mexico	Honduras	Nicaragua	Israel
Dominican Rep. (DOM)	Sweden (SWE)	Morocco	India	Pakistan	Italy
Ecuador (ECU)	Trinidad & Tobago (TTO)	Mozambique	Indonesia	Pern	Jamaica
Egypt (EGY)	Tunisia (TUN)	New Zealand	Iran	Senegal	Japan
El Salvador (SLV)	Turkey (TUR)	Nicaragua	Ireland	South Africa	Jordan
Estonia (EST)	Uganda (UGA)	Niger	Israel	Sri Lanka	Korea
Ethiopia (ETH)*	Ukraine (UKR)	Pakistan	Italy	Trinidad & Tobago	Kuwait
Finland (FIN)	United Kingdom (GBR)	Panama	Jamaica	Tunisia	Malaysia
France (FRA)	United States (USA)	Papua New Guinea	Japan	United States	Mexico
Gabon (GAB)*	Uruguay (URY)	Paraguay	Jordan	Uruguay	Morocco*
Gambia (GMB)	Vietnam (VNM)*	Peru	Korea	Venezuela	Netherlands
Germany (DEU)	Zambia (ZMB)	Senegal	Malaysia		New Zealand
Ghana (GHA)	Zimbabwe (ZWE)	Sierra Leone	Mexico		Norway
Greece (GRC)		South Africa	Morocco		Oman*
Guatemala (GTM)		Trinidad & Tobago	Netherlands		Pakistan
Guinea (GIN)*		Tunisia	New Zealand		Panama
Guyana (GUY)		Uganda	Nicaragua		Paraguay
Haiti (HTI)		United States	Norway		Peru
Honduras (HND)		Uruguay	Oman*		Philippines
Hungary (HUN)		Zambia	Pakistan		Portugal
India (IND)		Zimbabwe	Peru		Saudi Arabia
Indonesia (IDN)			Philippines		Singapore
Iran (IRN)			Portugal		South Africa
Israel (ISR)			Senegal		Spain
Italy (ITA)			South Africa		Sri Lanka
Jamaica (JAM)			Spain		Sweden
Japan (JPN)			Sri Lanka		Syria
Jordan (JOR)			Sweden		Thailand
Kazakhstan (KAZ)*			Syria		Trinidad & Tobago
Kenya (KEN)			Thailand		Tunisia
Korea (KOR)			Trinidad & Tobago		Turkey
Latvia (LVA)			Tunisia		United Kingdom
Lithuania (LTU)			Turkey		United States
Madagascar (MDG)*			United Kingdom		Uruguay
Malaysia (MYS)			United States		Venezuela
Mali (MLI)			Uruguay		Zimbabwe
Mexico (MEX)			Venezuela		