**Impact of FDI, ODA and Migrant Remittances on Economic Growth in Developing Countries: A Systems Approach**

**By**

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**Abstract**

This paper seeks to investigate the relative contributions of foreign direct investment (FDI), official development assistance (ODA) and migrant remittances to economic growth in developing countries. We use a systems methodology to account for the inherent endogeneities in these relationships. In addition, we also examine the importance of institutions, not only for growth directly, but in the interactions between institutions and the other sources of growth. It is, we believe, the first paper to consider each of these variables together. We find that all sources of foreign capital have a positive and significant impact on growth when institutions are taken into account.

Keywords: Growth, FDI, Official Development Assistance, Remittances, Institutions

JEL Classification: C33 F24 F43 F35 O43 O24

1. Introduction

With the increased focus in the international community on development within the poorest countries of the world, via the Millennium Development Goals, attention has turned to the relative importance of the various forms of capital flows, and their effectiveness in alleviating poverty.

Overseas capital flows, comprising of foreign direct investment (FDI), official development assistance (ODA) and migrant remittances have grown significantly over the past 20 years. Despite this, economists have never considered the combined impact of each of these variables on economic growth. Our main contribution in this paper is to address this shortcoming using a new approach, while further considering the importance of institutions when determining the relative effectiveness of international capital flows. The literatures on the individual growth impacts of FDI (see for example Lim (2001), and Hansen and Rand (2006)) and foreign aid (see Hansen and Tarp (2001) and Doucouliagos and Paldam (2006)) are relatively well developed. In contrast, the literature which looks at the impact of migrant remittances on growth is more limited. This paper’s second key contribution is to build on this limitation.

Our analysis is set within the context of the current debate on the importance of institutions for development. This issue was highlighted by President Obama on his first visit to Africa in 2009. There are strong arguments, based on the analysis of La Porta et al (1997) and Acemoglu (2005) for believing that institutions improve and accelerate development. In much of this literature, (see North (1990) and Landes (1998)) it is argued that European nations achieved prosperity because they embraced institutions that encouraged private initiative and innovation. For this reason, if developing countries in Africa, Asia and South America are to experience similar success, they need to adopt institutions in a similar vein. This includes imposing constitutional constraints on the ability of the government to expropriate, protecting private property against predation by other private agents and ensuring that contracts can be enforced in independent and impartial courts of law.

This emphasis on the importance of governance is consistent with the view of scholars in institutional economics that see strong property rights of private agents leading to low transactions costs of exchange as the basis for economic prosperity. However, there are two separate fundamental dimensions to this problem. It is not merely the quality of institutions that impacts on development but also stability (i.e. the risk that current, even well-functioning, institutions may be overthrown). This instability will have a negative impact on the ability of FDI, ODA and migrant remittances to help foster consistently strong economic growth. Indeed, Barro (1991) shows that growth rates are positively related to political stability.

The remainder of the paper is set out as follows. In the next section we discuss regional trends in GDP growth, FDI, ODA and migrant remittances for our sample (1984-2008). In section 3 we provide a simple theoretical model and use it to discuss the empirical growth literature for each source of foreign capital. Of particular importance is a detailed look at the literature on remittances and evidence as to why they should be viewed as a vehicle for investment. In section 4 we discuss our empirical specification and how it overcomes the endogeneity issues common in the literature. In section 5 we review the data used. In section 6 we discuss our results and in section 7 we conclude.

2. Data Trends

This section discusses the trends in each of our endogenous variables. The data on GDP growth, overseas development assistance and migrant remittances are taken from the World Bank’s World Development Indicators (WDI). The data on FDI inflows are taken from UNCTAD.

Figure 1 shows the GDP per capita growth rate between 1984 and 2008 for a number of developing regions. Clearly GDP per capita growth has been positive for each region over much of the sample. Yet all regions, excluding East Asia & Pacific, have experienced negative growth rates at some point. This is particularly true for Sub-Saharan Africa which experienced negative growth for at least 11 years, across the sample, and at one stage (1992) saw growth at a catastrophic rate of -3.79 percent.

**Figure 1 here**

In contrast, the growth rates in Asia have been consistently higher - in some cases over 10 percent (even accounting for the financial crisis in 1997). Since 2002 all regions have experienced positive rates of economic growth, yet growth has fallen considerably since 2008. GDP clearly has a cyclical pattern reflecting the swings of the business cycle. Despite this, the pattern of migrant remittances, overseas development assistance and foreign direct investment is quite different. Figure 2 shows workers remittances to the developing regions. From a fairly low base in 1984, with each region’s series broadly in line with one another, there appears to be an explosion around the mid 1990’s. This is most notable for Asia and Latin America & Caribbean. What is particularly striking is a comparison of the data on migrant remittances with the data on official development assistance (Figure 3). As can be seen, for many of the regions, workers remittances are far higher than overseas aid. Considering there has been a vast and controversial literature on the impact of aid on growth, it is perhaps surprising that there have been so few studies that have looked at the growth impacts of migrant remittances.

**Figure 2 here**

Figure 3 plots trends in overseas development assistance (ODA). Interestingly, ODA is fairly constant over the period for each of the regions (exceptions being Sub-Saharan Africa (SSA) and the Middle-East and North Africa). Aid appears to be quite volatile in comparison to remittance flows. ODA falls considerably by approximately $5 billion in SSA between 1994 and 2000 but since then it has increased by about $40 billion. This reflects the political economy of aid donorship of developed countries in recent years.

**Figure 3 here**

Figure 4 shows inward FDI flows. As the data is taken from UNCTAD the regions differ slightly compared to the other figures above. Nevertheless, FDI is also volatile for each of the regions but does have a positive trend. The data reveals that FDI is significantly larger than the other two sources of foreign capital. Unsurprisingly the data also shows the vast amount of FDI being done in China and South East Asia. Interestingly, since 2004 there has also been a significant pickup in FDI to Africa.

**Figure 4 here**

3. Theoretical Model and Literature Review

The underlying theory we use is motivated by a standard growth model where foreign direct investment (FDI), overseas development assistance (ODA), and migrant remittances are all introduced as components of investment (see Burnside and Dollar (2000), Catrinescu et al. (2004)). We follow Herzer and Morrissey (2009) and assume that each financial flow finances the investment that determines economic growth. The impact of each variable can be represented in an aggregate production function of the following form:

,  (1)

Where  is output,  is total factor productivity,  is the capital stock and the parameter  measures the marginal product of capital[[2]](#endnote-2). For simplicity, we assume that the capital stock depreciates fully each period so that the end-of-period capital stock  is equal to domestic investment. Assuming further that investment is the aggregate of public and private investment and that public investment is partly financed by aid, whilst private investment is composed of gross capital formation, foreign direct investment and remittances, we can write the production function as:

 (2)

where  is government investment spending,  is Overseas Development Assistance (ODA),  is the share of ODA used for public investment purposes,  is domestic investment,  is foreign direct investment,  is remittances and  is the share of remittances devoted to private investment[[3]](#endnote-3). Aid can influence growth directly or via public investment, whilst FDI and remittances[[4]](#endnote-4) generate growth via external private sources. The impact of institutions is modelled via the TFP term. We will now discuss each of these growth enhancing channels by surveying the existing literature.

*3.1 Foreign Direct Investment*

Theoretically there are a number of ways in which FDI can cause economic growth. As a starting point the standard Solow-type neoclassical model suggests that FDI increases economic growth by adding to the capital stock. Further, most micro-based analysis of the impact of foreign investment, see for example Aitken and Harrison (1999), or Haddad and Harrison (1993), suggest that foreign owned production is more productive than domestically owned production, and this assumption has formed the basis of a theoretical literature, based on the models of Grossman and Helpman (1991) and Rivera-Batiz and Romer (1991). Drawing on the work of Romer (1990) and Aghion and Howitt (1992) this approach seeks to link FDI flows, to the wider literature that embeds endogenous technological change theories into general equilibrium models to analyse the relationship between international trade, technological change and growth.

For instance, Rivera-Batiz and Romer (1991) outline two channels for the transfer of technological knowledge: (i) the transmission of ideas which can be traded independently of goods, and (ii) trade in intermediate and capital goods that embody technology. It is argued that FDI has an impact on both of these channels, thus generating endogenous growth; see for example Borenzstein et al (1999) or Balasubramanyam et al (1996). .

Although the impact of FDI on growth seems to have attained the status of what Herzer et al. (2007) have called a “stylised fact”, a more careful reading of the literature may be required. For example, it might be the case that FDI just crowds out domestic investment. In addition, as Agosin and Mayer (2005) argue, different types of FDI, for example mergers and acquisitions, may have no impact on the capital stock. It may just transfer resources from domestic to foreign residents with no resulting impact on domestic productivity via spillovers. Indeed, as Gorg and Greenaway (2004) have shown in their survey of the literature - only 6 out of 25 studies have found a positive relationship between spillovers from foreign owned firms to domestic owned firms.

It is interesting to note that while much of this literature highlights the potential endogeneity problem (that countries with greater potential for growth are more likely to attract FDI), it is also fair to say that, due to data limitations, attempts to address this have been rather limited. Equally, much of the literature that discusses the importance of institutions only focuses on one element of governance, typically corruption. However, as Gerry et al (2008) and Aidis (2010) point out, this is erroneous. Rather, institutional quality is multidimensional, and that focusing on only one element of it is likely to produce ambiguity, especially in cross country studies. We seek therefore to address both of these issues. As we discuss above, we examine the importance of institutions in the context of the extent to which they contribute to growth when combined with inward capital flows, but also the extent to which institutions attract those flows. Azman-Saini et al (2010) for example discuss this in the context of financial liberalization, but not in terms of institutions more generally.

*3.2 Official Development Assistance*

Official Development Assistance (ODA) and the reform conditions surrounding it underpin the international community’s development strategy. As pronounced on many occasions, and argued for by notable economists and celebrities, many countries are committed to achieving the policy goal of contributing 0.7% of GNP as ODA. This target has faced much criticism and it is notable that many countries, in particular the United States, have not signed up to it yet. Indeed, very few countries who have stated that they would achieve the target are yet to do so, and in the current economic climate implementation will be increasing difficult. The moral argument in favour of foreign aid, as summarised by Riddell (2007), is based on a number of factors. These include arguments based on solidarity or what could be called a humanitarian imperative. They also stem as a response to the extreme poverty and inequality faced by individuals in the developing world. Many proponents of foreign aid take the view that ODA can enhance human freedom (Sen 1999) and help to secure a safer and more peaceful world. This suggests that the performance of foreign aid can be assessed via a number of different metrics. We choose economic growth, the most common metric used by economists.

The literature that examines the impact of foreign aid on economic growth has generated much controversy. There have been a number of papers that have found statistical evidence either way. This empirical discrepancy feeds through into the popular media, with commentators from different poles of the political spectrum sensationalising the debate. It is often felt that opponents of aid take the view that it is a form of wealth distribution, whereby poor people in rich countries send money directly to rich people in poor countries (Bauer 1972). Whereas proponents of ODA make the case on altruistic grounds (Stern 1974), they have a more optimistic view of the impact of foreign aid.

Several survey papers review the cross-country growth literature in some detail. Some have been critical (Doucouliagos and Paldam 2006); whilst others have been more optimistic (Hansen and Tarp 2000).

The benchmark study in this field, described by Easterly et al. (2004) as seminal, is by Burnside and Dollar (2000). They find that on its own aid has no effect on growth, although when it is interacted with a “sound” monetary and fiscal policy environment there is a conditional effect. Other papers have found similar results using other conditioning variables: e.g. Burnside and Dollar (2004) interact aid with the level of law and order; Chauvet and Guillaumont (2004) look at the impact of political stability; Guillaumont and Chauvet (2001) look at external shocks; and Svenson (1999) controls for the effects of democracy. Nevertheless, other studies reject these findings. Easterly et al. (2004) re-estimate Burnside and Dollar (2000) with new data and find far less evidence that aid has a positive impact on growth even when accounting for institutions. In addition, Alesina and Weder (1999) find that more corrupt countries do not receive less aid. This result is attenuated by Brautigam and Knack (2004) who show that high levels of aid in Africa are associated with a deterioration in governance.

It is perhaps not surprising that the cross-country growth literature has yielded such mixed results. Critics of this approach argue that growth is a complex process in which many other variables should be taken into consideration. Indeed, the effectiveness may be heterogeneous across countries in that the context of each individual country should be taken into consideration. Additionally, the impacts may vary over different time horizons and differ depending on the type of aid given.

Another problem the literature has tried to address is the issue of endogeneity. This is endemic in much cross-country growth research. In terms of the aid-growth debate, it might be that aid just increases when there is a natural or humanitarian disaster; or, it may increase in countries that are economically successful. To address this issue, the common approach in the literature is to use instrumental variables estimation, but if these instruments are weak (or invalid) the results become highly questionable.

We address these critiques by using a systems approach to determine whether ODA has a positive impact on economic growth and whether it is conditional on bureaucratic quality – our measure of institutional capacity. This approach takes into consideration the other sources of overseas capital flows and controls for endogeneity by using the 3SLS systems estimator that has not been used before.

*3.3 Remittances*

The relatively limited literature concerned with the relationship between migrant remittances and economic growth is no less controversial than the literatures discussed above. Three notable studies published in close succession rather contradict each other. Chami et al. (2003) find that remittances have a negative impact on economic growth. They build a simple theoretical model that motivates remittances through altruism at the family level. This methodology can be contrasted with the “portfolio” approach whereby remittances can be viewed in a manner similar to the other sources of capital flows. Their empirical analysis provides evidence that remittances are counter-cyclical; suggesting that remittances increase when economies are on a downward path. However, the methodology they use does not fully account for endogeneity. They use the US income gap and interest rate gap as instrumental variables for remittances and run a simple 2SLS model. Lucas (2005) is critical of this choice; he argues that the insignificance of the interest rate gap in the first stage regression does not seem to eliminate the endogeneity bias. This means that their results are quite questionable. In addition, the data Chami et al. (2003) use ends in 1998 and, as the authors recognise, is not particularly comprehensive over the sample.

Giuliano and Ruiz-Arranz (2009) use a different empirical strategy and find support for the “portfolio” approach. As is well known, financial sector development is at an early stage in many developing countries and it is thought that remittances can act as a mechanism to ease credit constraints. They use Systems Generalised Method of Moments, following the methodologies of Anderson and Hsiao (1981), Arellano and Bond (1991) and Blundell and Bond (2000), to control for endogeneity and find that remittances have a positive impact on economic growth in countries that have a lower level of financial sector development. This suggests that there is a threshold which countries have to pass through which eventually renders the effects of remittances minimal. Not only do they use a simple dummy variable to show this but they also provide robustness checks by splitting the sample and by using threshold estimation.

A particularly important section of Giuliano and Ruiz-Arranz (2009) paper is that the authors also look at the relationship between remittances and investment. For remittances to be growth enhancing, some economists argue that they must have a direct link to domestic investment rather than just being used for domestic consumption. The lack of evidence for this channel is most likely to be the reason why there is such a small literature on the impact of remittances on economic growth. Some studies, (see Taylor 1992 and Adams and Cuecuecha 2010) have found a link, with the latter finding it through education. But as far as we know, Giuliano and Ruiz-Arranz (2009) are the first authors to estimate an investment equation that includes remittances. They state that it is “remarkable” that the coefficient estimate corresponding to the remittance variable is positive and significant across all specifications. This is an important result which needs further research; but nevertheless renders future studies that look at the link between remittances and economic growth useful.

One limitation of the Giuliano and Ruiz-Arranz (2009), as they point out, is that the study does not fully take into account other possible country characteristics, including institutional aspects. Catrinescu et al. (2009) seek to address this by using a dynamic panel GMM specification, employing the data from the Inter Country Risk Guide (ICRG). They only focus on remittances, and do not consider other sources of growth.

In summary, it is clear that the literature on the relationship between economic growth and migrant remittances is in its infancy. There is good evidence to believe that remittances have a positive impact on economic growth but further research is needed. To build on previous work this paper enhances the literature by using a different econometric approach that has not been used before. The studies discussed above use GMM but this methodology does not allow for the use of time invariant dummy variables. Further, studies that employ a dynamic framework, but use as instruments variables with high degrees of persistence are liable to not appropriately correct for endogeneity. This is also true for cross country indices with low variance across time, such that estimators which rely on lags (or differences in lags) as instruments may not be reliable.. For this reason we take advantage of a 3SLS panel systems estimator that controls for these problems.

*3.4 Institutions*

In recent years the role of institutions and the impact they have had on development has received considerable attention. As Rodrik (2000) points out, development policy during the 1980’s had an excessive focus on price reform, i.e. privatisation and liberalisation. By the 1990’s this over reliance became apparent and created divisions between the neo-classical economics of the Washington institutions (the IMF and the World Bank) and the developing countries they were trying to serve. It has become clear that institutions act as the bedrock of a successfully functioning mixed economy in that the market is seen as being embedded in these institutions.

Indeed, the joint winner of the 2009 Nobel Prise in Economic Sciences, Elinor Ostrom, was awarded for her analysis of economic governance and the role of institutions. The classic reference here is North (1973, 1981). However, key papers by La Porta (1997) and Acemoglu (2001) have begun to look in more detail in terms of the classification of different types of institution. La Porta (1997) stresses the importance of property rights whilst Acemoglu (2001) focuses on colonial origins – in other words initial conditions. As Rodrik (2004) points out there is now widespread agreement among economists that institutional quality holds the key to prevailing patterns of prosperity around the world.

To control for institutions in cross-country growth research it is common to interact institutional variables with the core regressor of interest. For example, in terms of the aid literature, Burnside and Dollar (1997) use the effectiveness of monetary and fiscal policy; whilst in the literature on remittances, Giuliano and Ruiz-Arranz (2009) use financial sector development. Nevertheless, despite the theoretical basis for considering the joint importance of institutions and capital flows, building on the seminal work of Crawford and Ostrom (1995), it is perhaps surprising that much of the empirical literature fails to take institutions into account. In simple terms, where host country institutions fail to protect intellectual property rights, or the rights of minority investors, then this will impact on the extent to which FDI will stimulate growth. This occurs not merely through a reduction in the propensity of firms to invest in the country, but will also impact on technology transfer, and the extent to which inward investors engage with the host country firms. This phenomenon is widely discussed in the spillovers literature, in the context of firm level linkages (Smarzynska-Javorcik 2004), but the importance of institutions in this context is not discussed.

One can therefore extend this analysis to the links between institutions and aid or remittances. The effectiveness of aid is surely dependent on the quality of the bureaucracy to interact with aid agencies in the deployment of all sort of development assistance. Finally, the maintenance of law and order in the host country must be an important determinant of an individual’s decision to send money overseas[[5]](#endnote-5). Presumably a breakdown in law and order would have a significant impact on the likelihood of remittances being expropriated via an intermediary. Overall therefore, we stress the importance of interactions with capital flows, over and above the partial relationships that have been considered elsewhere.

4. Estimation and Econometric Considerations.

A common problem in cross-county growth research (Temple 1999) is the endogeneity between growth and the sources of growth, in this case the flows of capital into a country. Numerous authors have commented on this within the single equation framework, though have been unable to more than partially solve this through the use of instruments as lags. Our methodology uses a 3-Stage Least Squares panel systems estimator that treats economic growth, foreign direct investment, overseas development assistance and migrant remittances as endogenous. We analyse the impact of each of the endogenous variables on each other and examine a number of other control variables common to the literature on growth. The approach we take has not been used before.

Because the problem of endogeneity is such a core issue in the estimation of cross-country growth regressions we use an approach that differs from the existing literature. Instead of controlling for potential endogeneity with instrumental variables estimation our preferred strategy is to jointly estimate equations 3-6 below, allowing for simultaneity between GDP growth, foreign direct investment, overseas development assistance and workers remittances.

(3-6)

Where  is per capita GDP growth; is foreign direct investment as a percentage of GDP;  is official development assistance as a percentage of GDP;  is migrant remittances as a percentage of GDP;  is the initial level of GDP (capturing convergence[[6]](#endnote-6));  is investor profile (captures the quality of the investment environment);  is law and order (captures the quality of the judicial system);  is bureaucratic quality; and the vector  contains a number of additional control variables: (1) Gross Capital Formation; (2) trade as a percentage of GDP; (3) human capital; (4) population growth; (5) inflation; (6) landlocked dummy; (7) regional dummies for Asia, Latin America and Sub-Saharan Africa (8) an interaction between Remittances and the HDI index[[7]](#endnote-7); and (9) interaction terms between our institutional ICRG variables and the endogenous variables. The interactions used are the following:





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The coefficients estimated for each of these interaction terms tells us whether institutions enhance the effects of the endogenous variables on growth. We only include them in the growth equation, the results of which are in our 2ndspecification below. Finally, the vector is a subset of  as we do not include all of the control variables in each equation.

The rationale for choosing the interaction terms are as follows. In terms of the first term (FDI interacted with investor profile), as noted in the introductory sections, there is a large literature on the relationship between FDI and corruption, which further hints at the combined impact of these variables on growth. This can be considered, for example, in terms of the large literature on FDI and international technology transfer, see for example Borenzstein et al (1998). This literature suggests that FDI does facilitate international technology transfer, but that the benefits from this are determined by the host countries ability to assimilate the technology. Further, as Driffield et al (2010) show, the transfer of technology is in part determined by the protection of intellectual property rights in the home country. Secondly, we interact aid with bureaucratic quality, on the basis that the better the bureaucracy, the better aid will be used and distributed. Thirdly, we interact law and order with remittances. Private sector remittances include both licensed and unlicensed intermediaries, with lower levels of law and order protection being associated with higher levels of theft and wastage. This is in the context of the issues outlined in Saltz, (1992) who examines the apparent inverse relationship between FDI and growth, and offers a wide range of possible explanations, including institutional deficiencies and lack of human capital in the host country.

The four equations are then estimated simultaneously. The reason why we allow for simultaneity is that attempts to find a suitable instrument for FDI in the GDP equation in the literature has been less than convincing, and has typically relied on variables that also enter the GDP equation (see Vu and Noy (2009) or Chowdhury, and Mavrotas (2006)) . While the use of panel data to estimate systems of simultaneous equations is well understood, this generally involves converting the data to differences and estimating the system by either three stage least squares (3SLS) or generalised methods of moments (GMM) using lagged values as instruments to generate orthogonality conditions on differenced data. This is a straightforward simultaneous equations estimator following Holtz-Eakin et al. (1988) or Cornwell et al. (1992), which allows for individual effects both within individual equations and in the covariance matrix between the equations, based on the more general approach of Arrellano and Bond (1991) or the more recent Blundell and Bond (1998) GMM systems estimator. These approaches rely on employing lagged values as instruments; so with short panels of unbalanced data such estimation reduces the number of observations dramatically.

However, an additional problem that we face is that the data contains some time-invariant variables (for example the location variable, the landlocked dummy and the ICRG data which varies marginally over time). As such, one cannot adopt one of these approaches, as differencing the data becomes infeasible. We therefore adopt the 3SLS “within” estimation with error components suggested by Baltagi and Li (1992), based on Baltagi (1981). In practice this involves estimating equations (1 to 4) separately using a standard “within estimator”[[8]](#endnote-8) method, and then calculating the covariance matrix between the equations using the errors. The data are then transformed by dividing through by the square root of the covariance, and finally equations (1 to 4) are estimated by 3SLS employing the transformed data.[[9]](#endnote-9) As the use of 3SLS over 2SLS implies further restrictions in the model, these restrictions can be tested again using a standard Hausman F-test, and in all cases these restrictions are not rejected.

We run a number of specifications using annual data and using data averaged over 5 yearly periods[[10]](#endnote-10). The annual approach is uncommon in the literature because the data for GDP Growth is noisy (see Figure 1). As Harrsion (1996) points out, one of the problems in using annual data to identify the determinants of long-run growth is that short-run or cyclical fluctuations could affect the observed relationship between policy variables and growth. Nevertheless, we find that the performance of the two specifications offer similar results. This gives further weight to the use of the 3SLS systems methodology

5. Data

The core data used in this study is taken from the World Bank’s World Development Indicators (WDI). Our dependent variable is GDP per capita growth. The other endogenous variables ODA, FDI and workers remittances[[11]](#endnote-11) are expressed as a percentage of GDP. Other variables taken from the WDI are trade as a percentage of GDP, population growth and inflation. The FDI data is from UNCTAD, the human capital data is taken form Barro and Lee (2000) and the data on institutions is taken from the Inter Country Risk Guide (ICRG). We use three of the ICRG measures: (1) Bureaucratic Quality (maximum score of 4) measures the bureaucracy’s ability to adapt to changes in policy or interruption in government services. Countries that have an independent bureaucracy, autonomous of political interference, for example in recruitment, obtain a higher rating; (2) Law and Order (maximum score of 6) is a measure based on two sub-components. One of which is the strength and impartiality of the judicial system, the other is an assessment of the observance of the law; and (3) Investment Profile (maximum score of 12) is an assessment of the factors that affect the risk of an investment. This measure is split up in to three sub-components - contract viability, profit repatriation and payment delays.

We construct an unbalanced panel of annual observations from 1984 to 2007[[12]](#endnote-12) and an unbalanced panel that contains 5 year averages. Our data contains almost the entire sample of developing countries from the WDI (see Table A1 in the appendix).

6. Results

Table 1 reports the results for the baseline specification of our 3SLS estimation on annual data[[13]](#endnote-13). These results exclude the interaction terms. Our main focus for this specification is the growth equation. As can be seen, FDI and remittances both have a positive and significant impact on GDP growth. This is consistent with previous studies by Hansen and Rand (2006) and Catrinescu (2009). In contrast, overseas development assistance appears to have a negative and significant impact on GDP growth, following Easterly et al. (2004). When we interact remittances with the HDI dummy (which equals 1 for countries with ‘medium human development’ and 0 for countries with ‘low human development’) there is no significant impact. This suggests that remittances are just as important to countries with a low HDI score compared to countries with a ‘medium’ HDI score. This somewhat contradicts Giuliano and Ruiz-Arranz (2009) observation that remittances have a greater impact in countries with a lower level of financial sector development. Additionally, we also observe a positive and significant parameter estimate for the initial level of GDP suggesting growth divergence amongst the countries in our panel.

**Table 1 here**

The parameter estimates for two of the institutional variables law & order and bureaucratic quality are positive and significant signifying that the maintenance of an impartial judicial system and a general abeyance of the law in conjunction with a productive bureaucracy are good for growth. In contrast, the parameter estimate for the protection of property rights is negative but insignificant. This suggests that property rights protection may be less important compared to the other two factors for developing country growth.

In addition, the estimated coefficient for human capital is positive which supports Mankiw, Romer and Weil (1992); the coefficient estimate for trade as a percentage of GDP is positive, providing evidence similar to Sachs and Warner (1995); the coefficient estimate associated with inflation is negative, suggesting that macroeconomic instability is bad for growth (see Barro 1991); and finally, the coefficient estimate for population growth is negative, consistent with Solow (1956).

**Table 2 here**

Table 2 reports the results for the 3SLS estimation with institutional interaction terms as the endogenous variables in the growth equation. The results show that FDI and remittances again have a positive impact on growth and that aid has a negative impact on growth. However, when we interact each of these variables with the ICRG variables all sources of foreign capital, including ODA, generates growth. This suggests that institutions matter. FDI interacted with investor protection contributes significantly. This may be interpreted as countries with higher levels of investor protection attract “better” FDI. This may be in the form of newer technology, with better IPR protection encouraging international technology transfer. Equally, countries with better investor protection attract larger scale FDI, where firms are willing to take bigger ownership stakes. This again encourages more technology transfer. Similar results are found for the ODA and remittances interactions. As suggested above, remittances are more effective in stimulating growth where those remittances are protected by law and order, and aid is more effective in countries with an effective bureaucracy.

In addition to these results, conditional divergence is again observed with the coefficient associated with the initial level of GDP positive and significant. The estimates for the other variables are again as expected: trade as a percentage of GDP (+), human capital (+), inflation (-) and the landlocked dummy (-).

In contrast to the results for the baseline specification, it is also important to analyse the other equations in the system. We do this because this is our preferred specification and we observe some important results.

The first result to consider is the coefficient estimates for the initial level of GDP in the FDI, ODA and remittance equation. It would appear that countries with a high level of initial GDP (in our case GDP in 1984) receive less FDI and aid. This seems plausible. In contrast, the coefficient estimate in the remittance equation is positive. One interpretation for this might be that migrant remitters may have migrated from emerging economies at the beginning of our sample. For this reason it is not surprising to see a positive coefficient estimate.

The next result is the coefficient estimate for ODA as a percentage of GDP in the FDI equation. The estimate is negative suggesting that in countries where there are significant levels of aid, FDI is limited. This is consistent with the positive coefficients in the FDI equation for investor profile and law & order. This suggests that firms are unlikely to do FDI in regions with low levels of development.

Another interesting result can be seen for the coefficient estimate in the ODA equation for remittances as a percentage of GDP. The estimate is large in magnitude and significant signifying that remittances and aid go hand in hand. This can also be observed in the remittance equation in terms of the ODA coefficient.

The coefficient estimates for inflation also generate some noteworthy conclusions. Inflation appears to have a negative impact on foreign direct investment and official development assistance compared to migrant remittances. This is perhaps due to two underlying factors. Firstly, migrants may not understand the inflationary environment of the destination country - they may suffer from money illusion. In contrast, it might be that migrants send remittances regardless of the level of macroeconomic instability in the destination country. This is consistent with the theory that remittances ease credit constraints in developing countries (see Giuliano and Ruiz-Arranz (2009)).

Another coefficient estimate that is of significance is the landlocked dummy variable. It would appear that being landlocked has no discernable negative impact on the ability to do FDI or on the amount of official development assistance. In contrast, the coefficient for the landlocked dummy in the remittance equation is negative. Presumably we observe this pattern because it is far harder to migrate away from landlocked countries in order to send remittances.

Finally, and perhaps the most significant additional result from our analysis concerns the effectiveness of aid targeting. As can be seen in the growth equation, ODA only appears to have a positive impact on growth conditional on the quality of the bureaucracy to disseminate it. However, if we look at the coefficient for bureaucratic quality in the ODA equation it comes out as negative and significant. This suggests ODA is directed to countries with a poor bureaucratic quality – adding weight to the idea that aid is poorly targeted (see Brautigam and Knack (2004)).

*Robustness*

As a robustness check we also do the analysis using data averaged over 5-year periods. This is commonplace in the growth literature and important because annual GDP per- capita growth tends to be ‘noisy’ (see Figure 1). The results for the 3SLS Systems Estimator are provided in Table A5 in the Appendix for the model which includes institutional interaction terms with our endogenous variables. The results are similar to the specifications that use annual observations. Once again FDI, ODA and remittances all have a positive impact on growth once institutions are taken into consideration. And again the coefficient for Bureaucratic Quality in the ODA equation is negative and significant – suggestive of poor aid targeting. These results provide good support for the use of our 3SLS systems approach in the future as it performs well using annual observations. It would appear that the ‘noise’ problem of annual GDP per-capita growth is not as severe as once thought when using this methodology.

7. Conclusion

It is clear from our analysis that both foreign direct investment and migrant remittances have a positive impact on growth in developing countries. In addition, this is attenuated by a better institutional environment; in that countries that protect investors and maintain a high level of law and order will experience enhanced growth. In contrast, the relationship between aid and growth is not as clear cut. On its own aid appears to have a negative impact on growth and it appears to be poorly targeted. But when there is enough bureaucratic quality aid does begin to make a difference.

Interestingly, the magnitude of the coefficient estimates for FDI and remittances in the growth equation are very similar at 0.1246 and 0.1101 respectively. This suggests that remittances are nearly as important as FDI in terms of generating economic growth. This is a significant result considering the literature that looks at the impact of remittances on growth has been so limited and it adds to the growing belief that remittances are a vehicle for investment. Also, it must be stated that the remittance figures are likely to significantly underestimate the true level of remittances. This means that the impact of remittances on growth may be even more significant.

The importance of institutions has received renewed consideration recently, not only with the recognition of Elinor Ostrom’s Nobel Prize, but also the emphasis placed on these issues by President Obama. While the phrase “institutions matter” is a widely used one, it is surprising how little has been done in terms of seeking to quantify this, particularly in the context of the low growth rates of many of the poorest countries. We show here that improved institutional quality, not only attracts more inward investment, but also that this investment has a greater impact on growth. The policy lessons for this are clear.

These results give a good deal of credence to the “Washington consensus”, in that in terms of growth rates institutions matter. This builds on the work by North (1973, 1981), La Porta (1997) and Acemoglu (2001). However, our results also illustrate why there has been so much controversy surrounding the importance of institutions in recent years. In themselves the institutional variables are not strongly linked to economic growth. However, they are strongly correlated with all three types of capital flow. Further, investor protection, bureaucratic quality and the maintenance of law and order increase the extent to which inward capital flows stimulate economic growth. This analysis therefore hints at evidence for Rodrik’s (2004) theory that even if a country is below its potential steady-state level of growth, moderate movements in growth enhancing variables, in this case FDI and remittances may be the trigger that generates a sizeable growth payoff.

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Appendix

**Table A1 here**

**Table A2 here**

**Table A3 here**

**Table A4 here**

**Table A5 here**

Appendix

**Table A1: Sample Countries**

|  |
| --- |
| Country |
| Afghanistan | Cuba | Lebanon | Saudi Arabia |
| Algeria | Djibouti | Lesotho | Senegal |
| Angola | Dominica | Liberia | Seychelles |
| Antigua and Barbuda | Dominican Republic | Libya | Sierra Leone |
| Argentina | Ecuador | Macao, China | Singapore |
| Aruba | Egypt, Arab Rep. | Madagascar | Solomon Islands |
| Azerbaijan | El Salvador | Malawi | Somalia |
| Bahamas, The | Equatorial Guinea | Malaysia | Sri Lanka |
| Bahrain | Eritrea | Maldives | St. Kitts and Nevis |
| Bangladesh | Ethiopia | Mali | St. Lucia |
| Barbados | Fiji | Marshall Islands | St. Vincent and the Grenadines |
| Belize | Gabon | Mauritania | Sudan |
| Benin | Gambia, The | Mauritius | Suriname |
| Bermuda | Ghana | Mayotte | Swaziland |
| Bhutan | Grenada | Mexico | Syrian Arab Republic |
| Bolivia | Guam | Moldova | Tajikistan |
| Bosnia and Herzegovina | Guatemala | Mongolia | Tanzania |
| Botswana | Guinea | Morocco | Thailand |
| Brazil | Guinea-Bissau | Mozambique | Timor-Leste |
| Brunei Darussalam | Guyana | Myanmar | Togo |
| Bulgaria | Haiti | Namibia | Tonga |
| Burkina Faso | Honduras | Nepal | Trinidad and Tobago |
| Burundi | Hong Kong, China | Nicaragua | Tunisia |
| Cambodia | India | Niger | Turkmenistan |
| Cameroon | Indonesia | Nigeria | Uganda |
| Cape Verde | Iran, Islamic Rep. | Oman | United Arab Emirates |
| Cayman Islands | Iraq | Pakistan | Uruguay |
| Central African Republic | Jamaica | Palau | Uzbekistan |
| Chad | Jordan | Panama | Vanuatu |
| Chile | Kazakhstan | Papua New Guinea | Venezuela, RB |
| China | Kenya | Paraguay | Vietnam |
| Colombia | Kiribati | Peru | West Bank and Gaza |
| Comoros | Korea, Dem. Rep. | Philippines | Yemen, Rep. |
| Congo, Dem. Rep. | Korea, Rep. | Puerto Rico | Zambia |
| Congo, Rep. | Kuwait | Qatar | Zimbabwe |
| Costa Rica | Kyrgyz Republic | Rwanda |  |
| Cote d'Ivoire | Lao PDR | Samoa |   |

**Table A2: Descriptive Statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable  | Observations | Mean | Std. Dev. | Min | Max |
| GDPpc Growth | 3121 | 1.789 | 6.472 | -50.490 | 90.070 |
| ln Initial GDP | 2760 | 22.042 | 2.067 | 17.164 | 26.766 |
| ln GCF | 2909 | 3.050 | 0.431 | 0.565 | 4.733 |
| ln FDI %GDP | 2780 | 0.379 | 1.925 | -13.279 | 5.972 |
| ln ODA %GDP | 2908 | 0.983 | 2.090 | -9.234 | 5.488 |
| ln REM %GDP | 2227 | 0.434 | 1.790 | -4.605 | 5.551 |
| ln REM × HDI | 2227 | 0.381 | 1.641 | -4.605 | 5.551 |
| ln Trade %GDP | 2993 | 4.269 | 0.604 | 0.425 | 6.137 |
| ln Human Capital | 1823 | 1.299 | 0.645 | -0.994 | 2.348 |
| Population Growth | 3452 | 1.980 | 1.602 | -44.410 | 17.360 |
| Inflation | 2688 | 59.541 | 739.164 | -17.640 | 24411.030 |
| Landlocked | 3528 | 0.184 | 0.387 | 0 | 1 |
| ASIA | 3528 | 0.293 | 0.455 | 0 | 1 |
| LA & CAR | 3528 | 0.163 | 0.370 | 0 | 1 |
| SSA  | 3528 | 0.293 | 0.455 | 0 | 1 |
| ICRG IP | 2185 | 6.436 | 2.297 | 0 | 12 |
| ICRG L&O | 2185 | 3.125 | 1.290 | 0 | 6 |
| ICRG BQ | 2185 | 1.668 | 0.960 | 0 | 4 |

**Table A3: Variable Correlations**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 1 | ln Initial GDP | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | ln GCF | 0.193 | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 | ln FDI %GDP | -0.122 | 0.178 | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4 | ln ODA %GDP | -0.738 | -0.223 | -0.074 | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 | ln REM %GDP | -0.162 | 0.130 | 0.052 | 0.214 | 1.000 |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 | lnREM × HDI | -0.148 | 0.128 | 0.051 | 0.213 | 0.957 | 1.000 |  |  |  |  |  |  |  |  |  |  |  |
| 7 | ln Trade %GDP | -0.489 | 0.303 | 0.427 | 0.152 | 0.247 | 0.258 | 1.000 |  |  |  |  |  |  |  |  |  |  |
| 8 | ln Human Capital | 0.325 | 0.287 | 0.298 | -0.574 | -0.043 | -0.003 | 0.294 | 1.000 |  |  |  |  |  |  |  |  |  |
| 9 | Population Growth | -0.307 | -0.272 | -0.254 | 0.476 | -0.064 | -0.085 | -0.067 | -0.502 | 1.000 |  |  |  |  |  |  |  |  |
| 10 | Inflation | 0.050 | -0.023 | -0.076 | -0.036 | -0.095 | -0.098 | -0.100 | 0.021 | -0.008 | 1.000 |  |  |  |  |  |  |  |
| 11 | Landlocked | -0.305 | -0.107 | 0.014 | 0.293 | -0.168 | -0.144 | 0.013 | -0.263 | 0.263 | 0.053 | 1.000 |  |  |  |  |  |  |
| 12 | ASIA | 0.399 | 0.305 | -0.139 | -0.175 | 0.146 | 0.160 | -0.028 | 0.210 | -0.075 | -0.046 | -0.238 | 1.000 |  |  |  |  |  |
| 13 | LA & CAR | 0.120 | -0.139 | 0.187 | -0.290 | -0.051 | -0.044 | -0.059 | 0.351 | -0.252 | 0.100 | -0.038 | -0.431 | 1.000 |  |  |  |  |
| 14 | SSA  | -0.510 | -0.234 | -0.058 | 0.523 | -0.167 | -0.196 | 0.024 | -0.519 | 0.480 | -0.040 | 0.423 | -0.337 | -0.415 | 1.000 |  |  |  |
| 15 | ICRG IP | -0.026 | 0.266 | 0.386 | -0.226 | 0.096 | 0.114 | 0.339 | 0.284 | -0.211 | -0.114 | 0.114 | -0.054 | 0.006 | 0.052 | 1.000 |  |  |
| 16 | ICRG L&O | 0.087 | 0.310 | 0.228 | -0.215 | -0.146 | -0.133 | 0.189 | 0.227 | -0.129 | -0.065 | 0.067 | 0.159 | -0.143 | -0.017 | 0.239 | 1.000 |  |
| 17 | ICRG BQ | 0.342 | 0.280 | 0.145 | -0.391 | -0.125 | -0.086 | 0.088 | 0.331 | -0.249 | -0.039 | -0.152 | 0.158 | -0.087 | -0.149 | 0.276 | 0.338 | 1.000 |

**Figure 1: GDP per capita Growth**



**Figure 2: Workers Remittances**



**Figure 3: Official Development Assistance**



**Figure 4: Inward FDI**



**Table 1: 3SLS Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model 1: 3SLS | Growth Equation | FDI Equation | ODA Equation | Remittance Equation |
| Dependent Variable | GDPpc Growth | FDI %GDP | ODA %GDP | REM %GDP |
| Initial GDP | 0.074\*\* | 0.173 | -0.242\*\* | 0.039 |
|  | (0.024) | (0.123) | (0.083) | (0.113) |
| GCF | 0.013 |  |  |  |
|  | (0.025) |  |  |  |
| GDPpc Growth |  | -3.229 | 3.492\* | -2.844 |
|  |  | (2.592) | (1.868) | (2.463) |
| FDI %GDP | **0.071\*\*** |  | 0.454\*\* | -0.278\*\* |
|  | (0.848302E-02) |  | (0.052) | (0.079) |
| ODA %GDP | **-0.056\*\*** | 0.650\*\* |  | 1.065\*\* |
|  | (0.011) | (0.066) |  | (0.054) |
| REM %GDP | **0.055\*\*** | -0.339\*\* | 0.638\*\* |  |
|  | (0.014) | (0.056) | (0.030) |  |
| REM × HDI | 0.009 |  |  |  |
|  | (0.014) |  |  |  |
| Trade %GDP | 0.031 | -0.0469 | 0.486\*\* | -0.256\* |
|  | (0.024) | (0.179) | (0.118) | (0.168) |
| Human Capital | 0.158\*\* |  |  |  |
|  | (0.053) |  |  |  |
| Population Growth | -0.010 | -0.910\*\* | 0.925\*\* | -0.909\*\* |
|  | (0.015) | (0.115) | (0.079) | (0.112) |
| Inflation | -0.001\*\* | -10.971\*\* | 9.874\*\* | -9.886\*\* |
|  | (0.110986E-04) | (1.132) | (0.843) | (1.167) |
| Landlocked | 0.077\*\* | 0.371661\* | -0.077774 | -0.05616 |
|  | (0.033) | (0.234) | (0.171) | (0.225) |
| ASIA | 0.116\*\* | -0.375701\* | 0.047088 | -0.168577 |
|  | (0.048) | (0.230) | (0.167) | (0.222) |
| LA & CAR | 0.160\*\* | 1.66915\*\* | -1.20906\*\* | 0.919505\*\* |
|  | (0.043) | (0.246) | (0.185) | (0.252) |
| SSA  | 0.240\*\* | -0.203 | 0.990\*\* | -1.847\*\* |
|  | (0.049) | (0.309) | (0.217) | (0.271) |
| ICRG IP | -0.005 | -0.061 | 0.0151 | -0.007 |
|  | (0.006 | (0.046) | (0.034) | (0.045) |
| ICRG L&O | 0.0759\*\* | 0.373\* | -0.156\*\* | -0.005 |
|  | (0.015) | (0.085) | (0.063) | (0.084) |
| ICRG BQ | 0.022\* | 0.541\*\* | -0.693\*\* | 0.799\*\* |
|  | (0.012) | (0.103) | (0.071) | (0.099) |
| Constant | -4.19507\*\* | 14.2044\*\* | -22.2928\*\* | 29.350\*\* |
|   | (0.875) | (3.524) | (2.414) | (3.123) |
| Mean of dependent variable | 0.110 | 1.259 | 2.706 | 1.893 |
| SD of dependent variable | 0.192 | 7.07336 | 9.469 | 8.497 |
| SSR | 5369.17 | 191286 | 137323 | 169669 |
| SE of Regression | 2.414 | 14.411 | 12.211 | 13.573 |
| Variance of residuals | 5.82971 | 207.694 | 149.102 | 184.222 |
| R-Squared | 0.207273 | 0.116 | 0.283 | 0.0957 |
| serial correlation (p)[[14]](#endnote-14) | 2.12 (0.077) | 2.04 (0.08) | 1.54 (0.189) | 1.07 (0.370) |

**Table 2: 3SLS Results with Institution Interaction Terms**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model 2: 3SLS Interactions | Growth Equation | FDI Equation | ODA Equation | Remittance Equation |
| Dependent Variable | GDPpc Growth | FDI %GDP | ODA %GDP | REM %GDP |
| Initial GDP | 0.0527\*\*  | -0.2762\*\*  | -0.4227\*\*  | 0.4193\*\*  |
|  | (0.0067) | (0.032) | (0.047) | (0.048) |
| GCF | 0.0317\*  |  |  |  |
|  | (0.0182) |  |  |  |
| GDPpc Growth |  | 6.4145\*\*  | 7.74488\*\*  | -8.0552\*\*  |
|  |  | (1.633) | (1.64544) | (1.881) |
| FDI %GDP | **0.1246\*\***  |  | -1.3074\*\*  | 1.3118\*\*  |
|  | **(0.0277)** |  | (0.074) | (0.071) |
| ODA %GDP | **-0.1232\*\***  | -0.5491\*\*  |  | 0.9907\*\*  |
|  | **(0.0120)** | (0.052) |  | (0.0421) |
| REM %GDP | **0.1101\*\*** | 0.5450\*\*  | 0.9771\*\*  |  |
|  | **(0.0520)** | (0.036) | (0.032) |  |
| Trade %GDP | 0.1582\*\* | 0.7064\*\*  | 1.0805\*\*  | -1.045\*\*  |
|  | (0.0296) | (0.1521) | (0.208) | (0.211) |
| Human Capital | 0.0143 | 0.0861 |  |  |
|  | (0.0195) | (0.130) |  |  |
| Population Growth | 0.09676\*\*  | -0.6387\*\*  | -0.8453\*\*  | 0.8522\*\*  |
|  | (0.0264) | (0.131) | (0.210) | (0.206) |
| Inflation | -0.0001\*\*  | -2.3634\*\*  | -2.5888\*\*  | 2.6720\*\*  |
|  | (0.00003) | (0.770) | (1.215) | (1.204) |
| Landlocked | -0.0685\*  | 0.4673\*  | 0.7317\*  | -0.7370\*  |
|  | (0.0450) | (0.263) | (0.417125) | (0.411) |
| ASIA | 0.1820\*\*  | -1.1029\*\*  | -1.6296\*\*  | 1.648\*\* |
|  | (0.0403) | (0.218) | (0.344) | (0.339) |
| LA & CAR | 0.3084\*\*  | -1.2797\*\*  | -2.2735\*\*  | 2.2606\*\*  |
|  | (0.070242) | (0.305) | (0.455) | (0.457) |
| SSA  | 0.1808\*\*  | -0.917\*\*  | -1.3484\*\*  | 1.347\*\*  |
|  | (0.0783) | (0.375) | (0.585) | (0.577) |
| ICRG IP | -0.0323\*\*  | 0.1407\*\*  | 0.1932\*\*  | -0.192\*\*  |
|  | (0.0099) | (0.051) | (0.081) | (0.080) |
| ICRG L&O | -0.01453 | 0.1012\*  | 0.1397 | -0.1459 |
|  | (0.0117) | (0.068) | (0.106) | (0.105) |
| ICRG BQ | 0.11092\*\*  | -0.476\*\*  | -0.8360\*\*  | 0.8298\*\*  |
|  | (0.0238) | (0.115) | (0.172) | (0.173) |
| ICRG IP × FDI | **0.03688\*\*** |  |  |  |
|  | (0.0046) |  |  |  |
| ICRG L&O × REM | **0.00202\*\*** |  |  |  |
|  | (0.0007) |  |  |  |
| ICRG BQ × ODA | **0.00272\*\*** |  |  |  |
|  | (0.0005) |  |  |  |
| Constant | -6.7401\*\*  | 39.2179\*\*  | 60.3388\*\*  | -60.7379\*\*  |
|   | (1.07722) | (4.49349) | (6.75241) | (6.709) |
| Mean of dependent variable | 0.106778 | 1.23046 | 1.74827 | 2.00668 |
| SD of dependent variable | 0.178248 | 6.5623 | 9.14974 | 8.26089 |
| SSR | 13368.8 | 360124 | 906847 | 915348 |
| SE of Regression | 3.80992 | 19.7741 | 31.3789 | 31.5256 |
| Variance of residuals | 14.5155 |  = 391.014 | 984.633 | 993.863 |
| R-Squared | 0.29924 | 0.2982828 | 0.236166 | 0.203952 |
| Serial correlation (p) | 1.99 (0.094) | 2.09 (0.080) | 1.88 (0.112) | 1.00 (0.407) |

1. Please address correspondence to Chris Jones, Economics and Strategy Group, Aston Business School, Aston Triangle, Birmingham, B4 7ET, United Kingdom; email: c.jones2@aston.ac.uk; phone: +44(0)1212043361. [↑](#endnote-ref-1)
2. With  equal to 1 we have the standard AK endogenous growth model; whilst  less than 1 implies diminishing marginal product and a model in the style of Solow (1956). [↑](#endnote-ref-2)
3. Where  is the share of remittances that goes to domestic consumption. [↑](#endnote-ref-3)
4. It has commonly been thought that remittances will only have an impact on domestic consumption rather than domestic investment. For this reason economists have underestimated the contribution of remittances on economic growth. There is a very limited literature that explores the relationship between remittances and investment; however Giuliana and Ruiz-Arranz (2009) provide evidence across a range of specifications showing a positive relationship. [↑](#endnote-ref-4)
5. In Catrinescu et al. (2008) the interaction term between Law & Order and Remittances is positive and significant in contrast to many of the other ICRG indicators they use. [↑](#endnote-ref-5)
6. This is not to be confused with initial conditions. Remarkably, Comin, Easterly and Gong (2010) find that technology in 1500 is associated with the wealth of nations today. [↑](#endnote-ref-6)
7. This variable is included to determine whether remittances have a greater impact on countries with a higher level of Human Development. To calculate this variable we split the sample into two. Countries included in the category ‘Medium Human Development’ according to the World Bank Human Development Report (2006) are coded with a 1. Countries in the category ‘Low Human Development’ are coded with a 0. This variable is then interacted with Migrant Remittances. It is important to point out that the HDI score does not change overtime we just use the 2006 data. [↑](#endnote-ref-7)
8. For both equations the random effects estimator rejects the restriction of fixed effects. [↑](#endnote-ref-8)
9. With panel data, there is also the concern that the standard errors on some coefficients are biased downwards due to correlation across years. The standard “clustering” algorithm is employed to allow for this – see for example Petersen (2006). However, in practice the panels used here are relatively unbalanced, such that the difference between the clustered and unclustered standard errors is small. [↑](#endnote-ref-9)
10. The last period is only 4 years. [↑](#endnote-ref-10)
11. The data available in the WDI for the variable migrant remittances is entitled ‘workers remittances, compensation of employees, and migrant transfers’. Giuliano and Ruiz-Arranz (2009) use this measure in their study, however they find that for some countries the inclusion of ‘compensation of employees’ (which is often payments to embassy staff, or the like) can bias the remittance data. We do not make these adjustments as they do acknowledge that the correlation pre and post adjustment remains at 0.92. In addition we also, like them, acknowledge that remittances through informal channels (not reflected in the data) may be substantial. It is impossible, like other papers in this literature, to account for them. [↑](#endnote-ref-11)
12. The start data of 1984 is chosen because the ICRG data begins in this year. [↑](#endnote-ref-12)
13. Table A4 in the Appendix produces results for single-equation estimates for each of the 4 equations. These estimates are derived using GMM, but clearly show that the 3SLS systems approach yields more reliable results. [↑](#endnote-ref-13)
14. This is based on the Wooldridge (2002) test, see Wooldridge (2002) pp. 194-202 [↑](#endnote-ref-14)