Growth Effects of Foreign Direct Investment: What Role for Liberalisation and Absorptive Capacity?[1]

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Abstract: this paper aims to contribute to the ongoing debate over the role of host country factors in conditioning the growth effects of foreign direct investment (FDI). Within a general cross-country growth empirics framework, a newly compiled dataset is used to test the hypothesis that countries which adopt a liberal approach to the regulation of FDI benefit more from a given flow of foreign investment. As an extension, the relevance of trade policies and investments in human capital is also considered in conjunction with investment policies. The results suggest investment policies are directly relevant with a stronger relationship between FDI and growth observed for countries that adopt more liberal FDI policies. There is also some evidence of complementarity between liberal investment polices and openness to trade in enhancing the growth effects of FDI. However, the impact of the interaction between investment policies and human capital is less clear.

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1. INTRODUCTION

Since Hymer's (1976) articulation of foreign direct investment (FDI) as a unique package of knowledge and capital, it has been recognised that FDI can play an important role in driving productivity growth through a number of different mechanisms. FDI may facilitate the diffusion of new technology, spur competition in factor and product markets and generate economies of scale for suppliers of foreign affiliates. Equally, however, different hypotheses have asserted that the magnitude of these positive effects may be contingent on a range of host country factors. Such factors influence the type of foreign investment a country will tend to attract and the ability of indigenous agents to benefit from the presence of foreign owned or controlled firms. Liberal policy settings, which provide foreign investors the freedom to manage offshore facilities free of government intervention, may be important for creating an environment that is conducive to attracting the most dynamic and productive forms of foreign investment. Also, absorptive capacity of the host country, broadly interpreted in terms of various supply side factors, especially human capital, may be required to ensure the diffusion of new technologies from multinational enterprises to their foreign affiliates and then, perhaps ultimately, on to local firms.

The view that gains from FDI depend on host country factors is supported by some micro- and macro-level empirical studies (Lipsey 2002). While the weight of empirical results derived from cross-country studies tends to find some positive link between FDI and growth outcomes, often this appears to be conditional on the country adopting a particular policy stance, or on the level of absorptive capacity. In this vein, specific factors assessed in macro-level studies include host country trade policies and levels of human capital, as well as other supply side factors which determine absorptive capacity. In addition, case studies and several formal empirical studies using firm or industry level data have assessed the impact of FDI related policies (hereafter investment policies).[2] These contributions highlight the adverse consequences of restrictive, interventionist policies for multinational enterprise (MNE) affiliates as well as local firms operating alongside. However, there is very little analysis of the impact of investment policies at the macroeconomic level, which is in part likely to reflect the lack of data available specifically concerned with investment policies.

[2] For example Moran (1998, 2001)

The objective of this paper is to fill this gap in the literature by applying a new cross-country dataset on investment policies to a cross-country growth empirics framework. The data was compiled using a range of qualitative information and covers the period 1970 to 2000 for 89 countries, allowing for an assessment of the relevance of investment policies in a representative sample of countries over a lengthy span of time. The relevance of investment policies are examined in isolation and then also in conjunction with measures of trade openness and human capital. This enables a broad assessment of the role of liberalisation and absorptive capacity in conditioning the growth effects of FDI. The remainder of the paper is structured as follows. Section two outlines hypotheses concerning how host country factors influence gains from FDI. Section three provides a brief overview of the data on investment policies applied in this analysis, including the method used in compilation. Section four presents the results from cross-country growth regressions and section five concludes.

2. GROWTH EFFECTS OF FOREIGN DIRECT INVESTMENT

The inflow of FDI impacts upon host country welfare and production through a myriad of channels. In addition to augmenting the capital stock, thereby facilitating capital deepening, FDI brings about complex changes in the structure of host country production. The presence of foreign controlled firms can heighten competition which may generate productivity improvements amongst local producers if they respond by reducing slack in factor utilisation (Keller 2001). Alternatively, technically superior foreign firms may drive local firms out of the market, particularly where foreign firms enter into industries with high fixed costs, and where 'market stealing' raises average costs (Aitken and Harrison 1999). As illustrated in theoretical models by Rivera-Batiz and Rivera-Batiz (1991), Rodriguez-Clare (1996) and Markusen and Venables (1999) the presence of foreign firms may also stimulate additional demand for local intermediate inputs, in the process facilitating productivity gains. Such increases in productivity may derive from higher demand encouraging local suppliers to introduce new varieties of intermediate goods, for the benefit of downstream local and foreign firms. Alternatively, new demand can generate higher productivity amongst local suppliers in the presence of increasing returns to scale production.

Moreover, FDI may act as a conduit for the diffusion of new technology, from MNE firms operating at the global technology frontier. Since FDI represents the extension of managerial control over a foreign affiliate it not only provides an enabling link for knowledge diffusion

but also a motive, since parent companies will seek to extract the maximum return from their ownership of the affiliate. Furthermore, on account of knowledge being non-rivalrous and only partially excludible, technology supplied to foreign affiliates by their parent companies may leak or 'spills over' to other firms (Romer 1993). This process can occur through a number of channels including demonstration effects, backward and forward linkages and the turnover of labour employed in foreign affiliated firms (Blomstrom and Kokko 1998).

2.1 The Relevance of Host Country Factors

One view of FDI implicitly assumes that every dollar of investment generates precisely the same net impact on the host economy. This is assumed to be the case irrespective of the motive of the direct investor, the policies and conditions prevailing in the host country or the composition of the investment. An alternative view is that FDI has heterogenous effects on the host country that will be influenced by a range of host country factors. In this regard, one hypothesis contends that host country policy settings influence the nature of incoming FDI, with a more liberal policy environment likely to attract the kind of MNE activity that is most conducive to generating positive effects on the host economy. A second hypothesis is that superior absorptive capacity will facilitate greater knowledge diffusion through FDI, where absorptive capacity is determined by a range of supply side factors, particularly human capital.

2.1.1 Host country policies

A number of analytical contributions have highlighted how host country policies that shape the general operating environment for multinational production can affect the impact of FDI on economic growth. Many of these ideas are articulated by Balasubramanyam et al (1996) and by Moran (1998 and 2001), who synthesises evidence from extensive MNE investment case studies. These hypotheses can be generalised in the following manner. Open trade policies and liberal investment policies that do not restrict the freedoms of foreign investors are likely to give rise to the presence of foreign affiliates which are more efficient, technologically advanced and more likely to generate positive externalities in the host country. At least two particular mechanisms are highlighted as being important.[3]

[3] Another issue explored in early contributions by Bhagwati (1973, 1978 and 1985) and Brecher and Diaz-Alejandro (1977) is that in the presence of trade barriers, under certain circumstances an expansion in import competing production will lead to

First, open trade and liberal investment policies will encourage export platform or 'efficiency-seeking' FDI which features a number of characteristics that are highly conducive to generating positive externalities in the host country.[4] Export oriented affiliates are more likely to have access to the full stock of propriety knowledge held by the parent company since they form one part of a global supply chain and therefore represent a vital component of the overall operations of a MNE. Export oriented affiliates will also have a strong desire to establish close commercial relationships with local upstream suppliers to ensure the reliable supply of local inputs and maintain quality standards, particularly important in the context of international production, which may encourage technology spillovers. Finally, export platform production is likely to be associated with larger production facilities that provide greater opportunities for local suppliers to reap economies of scale and introduce new varieties of intermediate inputs.

Moreover, all types of foreign affiliates operating within an open and competitive environment, including those serving the host market, are likely to be more x-efficient and more inclined to make investments in human capital, research and development and other activity to secure new technology, all of which may give rise to technology spillovers (Bhagwati 1973, 1978 and 1985 and Balasubramanyam et al. 1996). This idea is consistent with the predictions of the theoretical model of spillovers by Wang and Blomstrom (1992) where greater market competition spurs MNE parent companies to invest more in the technological capabilities of their foreign affiliates in order to ensure that they can maintain a competitive edge in the host country market.

Second, investment policies that require foreign investors to form joint ventures with local investors may deter technology transfer, to the detriment of the foreign affiliate and, if this limits opportunities for technology spillovers, local firms also. One reason for this is that parents may have concerns about knowledge leaking from their affiliate to local rivals. This idea is consistent with the internalisation motive for FDI where direct investment is undertaken specifically to limit the potential for rival firms to gain access to their technology (Caves 1996). A second reason is that a prohibition on full foreign ownership may reduce the

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a net reduction in national income. This adverse effect is exacerbated if it is assumed that profits accruing to foreign capital are not subject to domestic taxes.

[4] See Kravis and Lipsey (1982), Kumar (1994 and 1998) and Shatz (2004) for empirical evidence on country factors that influence the location of efficiency-seeking FDI.

financial return on technology transfer (Ramachandran 1993). As shown by Teece (1977), technology transfer to foreign affiliates involves non-trivial costs. In considering technology transfer, the parent company therefore faces a trade off between these costs and the higher revenue stream generated by giving an affiliate a greater technological advantage over rival firms. Where technology transfer costs are fixed and profits diluted due to shared ownership, there will be less of an incentive to undertake technology transfer.

A number of empirical micro-level studies provide direct evidence on the detrimental affects of restrictive investment policies for technology transfer. Mansfield and Romeo (1980) report that the time taken for new technology to be introduced to foreign production facilities from US based firms is lower for wholly owned affiliates compared with joint ventures. Using Indian firm level data Ramachandran (1993) reports that wholly owned affiliates receive greater technology transfer from parent companies, as proxied by the number of staff exchanges. Also using Indian firm level data, Vishwasrao and Bosshardt (2001) find that the liberalisation of investment policies to allow majority foreign ownership in the early 1990s spurred a rise in the amount of innovative activity undertaken by foreign firms. Using data on Japanese MNE affiliates operating in a number of countries Urata and Kawai (2000) find that higher levels of Japanese ownership is associated with greater technology transfer. Finally, Kokko and Blomstrom (1995) find that the adoption of a variety of interventionist investment policies, including ownership restrictions, deters technology transfer between US parent companies and their affiliates operating in a number of countries.

2.1.2 Host country absorptive capacity

Aside from host country policies, a separate stream of the literature suggests that productivity gains from FDI will be influenced by host country absorptive capacity, determined by human capital and other supply side factors. This idea can be viewed as one particular element of the broader absorptive capacity hypothesis concerning mechanisms of technology diffusion. In the context of FDI, however, absorptive capacity has a distinct interpretation. Namely, supply side factors may constrain the diffusion and utilisation of superior technology made available through direct investors. This includes both constraints on the ability of MNE affiliates to introduce new technology available from the parent company as well as constraints on the ability of local firms to acquire new technology from MNE affiliates. Accordingly, while FDI

flows may provide a potential conduit for international technology diffusion such technology may not necessarily flow to foreign affiliates or be absorbed by local firms.

A common interpretation of absorptive capacity is premised on complementarity of embodied knowledge of workers and technology. This complementarity arises from better educated workers being more adept at using new technology and being more likely to incorporate technological advances in to their working routine at a faster rate (Nelson and Phelps 1966). As a result, higher levels of absorptive capacity reduce the cost of technology transfer (Wang and Blomstrom 1992). For multinational production, in tangible terms sufficient absorptive capacity may mean that there is no need to invest in special training for their workers when introducing new production techniques (or such training may be less costly). Alternatively it may mean that technical services sourced by foreign affiliates from local firms are less expensive and more readily available. For local firms seeking to benefit from technology spillovers sufficient absorptive capacity will mean that local entrepreneurs and their workers have the ability to learn and implement new technical aspects of foreign affiliated production.

In the model of technology driven growth by Borensztein et al (1998), human capital plays an important role in facilitating the introduction of new technology by foreign investors. Employing a product variety approach, the rate of growth is proportional to the rate at which new varieties of intermediate capital goods are introduced. It is assumed that no domestic innovation is undertaken so all new varieties are sourced from abroad by foreign investors. The process of sourcing and installing new technology is assumed to be costly and the decision to install based on a profitability condition. Human capital helps facilitate technology transfer by improving the marginal product of new varieties of intermediate goods and therefore the number of varieties that meet the profitability condition. In a model that employs a similar setup Glass and Saggi (1998) highlight a role for local research and development capacity rather than the embodied knowledge of local workers. Technology transferred through FDI is disaggregated into low and high technology. MNE investments associated with the former can be located anywhere but high technology investments can only viably be located in countries with at least a basic research and development capacity where costs associated with technology transfer are lower. Hence, this approach is premised on the idea that a threshold level of indigenous technological capability is required before certain forms of new technology may be introduced.

Case study evidence suggests that human capital is indeed important for ensuring foreign investors establish new production facilities and continue to introduce innovations. For example, McKendrick et al (2000) argue that the availability of adequate human capital was not only an important factor in attracting US electronics firms to establish production in Singapore in the first place but also allow foreign manufacturers to diversify the nature of production within the country and surrounding regions. Rasiah (1994) also highlights the importance of local subcontractors upgrading their technical and human capital base in order to supply foreign affiliates in the Malaysian electronics industry. In particular, as the presence and sophistication of foreign operators increased through the 1980s many small local suppliers that were managed by their owners needed to expand their technical skill capability to maintain contracts to supply increasingly sophisticated products.

2.2 Cross-Country Empirical Evidence

A number of empirical studies examine whether host country factors condition gains from FDI using a general cross-country growth approach which makes use of different variables to capture relevant host country policies and absorptive capacity. The general methodology involves regressing long run growth on FDI and other relevant control variables. Relevant country factors are incorporated in the analysis by interacting the FDI variable with a variable capturing some particular host country factor. A statistically significant coefficient on the interaction term suggests the host country factor being tested does affect the link between FDI and growth. An alternative is to use data on host country factors to divide a universal sample in to sub-samples of countries with similar characteristics. Data from these different samples are then applied to a generic growth specification. Any discernable differences in the correlation between FDI and growth for the sub-samples also lend support for the relevance of host country factors. In general, the results from studies adopting these methods tend to suggest some relevance of host country factors. However, as is the case with many empirical cross-country growth studies, the results are by no means conclusive and some studies generate contradictory results.

Blomstrom et al (1994) test the relevance of host country absorptive capacity by applying general growth equations to different samples. They argue that the level of development will be strongly correlated with a range of factors that shape absorptive capacity such as stocks of human capital. This in turn makes broad indicators of development such as income levels a

good overall proxy for absorptive capacity. On this basis, they apply growth specifications to two groups of developing countries, one low the other higher income. The results support the absorptive capacity hypothesis with the coefficient on the FDI variable positive and statistically significant for the higher income group only. They also refer to tests using interactions terms incorporating human capital and FDI but find no significant effects using this approach.

Using a developing country sample Borensztein et al (1998) find that the interaction between FDI and human capital is positive and significant while the FDI variable by itself is negative and insignificant. These results suggest that human capital and FDI are indeed complementary drivers of growth and that perhaps sufficient human capital is a precondition for countries to benefit from FDI. Balasubramanyam et al (1999) also find qualified support for the importance of absorptive capacity, as determined by human capital. However, other similar studies produce mixed results. Blonigen and Wang (2005) extend the analysis of Borensztein et al (1998) by adding industrialised countries to the sample. The results change considerably, with neither the FDI variable or the interaction with human capital significant for the full sample. Finally, Ram and Zhang (2002) focus on a sample for the 1990s, a period that saw rapid growth in global FDI flows, and find general support for the growth enhancing effects of FDI but little support for the absorptive capacity hypothesis.

In addition to human capital, other factors that might broadly reflect absorptive capacity have been assessed. For example, Alfaro et al (2004) test the hypothesis that financial sector development represents an important aspect of absorptive capacity since access to adequate financial resources may be necessary for firms to make use of more advanced technology diffused through FDI. In various specifications, the FDI variable is interacted with different proxy measures of financial development such as domestic commercial bank assets and private credit. They report that the coefficient on each interaction term is positive and significant, supporting their hypothesis regarding the relevance of financial sector development. Hermes and Lensink (2003) undertake a similar test using private sector credit as an alternative proxy for financial development. Consistent with Alfaro et al, the interaction between these variables and FDI is positive. Durham (2004) also reports results supporting the relevance of financial development. In addition, he tests the relevance of institutional factors by incorporating interactions using proxies for the strength of property rights, the sophistication of business regulations and the extent of host country corruption. The

interaction between FDI and the first two of these factors is found to be positive and significant.

The earliest empirical assessment of the relevance of host country policies is by Balasubramanyam et al (1996) who take the approach of applying general growth specifications to different samples of developing countries based on the nature of the prevailing trade regime. Two different methods are used to divide countries into different sub-samples. First, countries in the full sample are ranked according to trade openness proxied using the ratio of trade to GDP. Next, growth rates are regressed on this measure of openness and structural breaks in the relationship between growth and openness used to identify countries with relatively open and relatively closed trade regimes. As an alternative to this approach, countries are also divided in to two samples based on a World Bank classification of trade regimes. The results suggest the trade regime is important in conditioning the growth enhancing effects of FDI. The coefficient on the FDI variable is found to be positive and statistically significant for the full sample and the sub-sample comprising countries with an open trade regime. In contrast, it was not statistically significant in any of the results based on the sub-sample comprising countries with closed trade regimes. Nair-Reichert and Weinhold (2001) also test the relevance of trade openness, as well as absorptive capacity, using panel data and interaction terms. They find that FDI flows are correlated with growth and that greater openness to trade strengthens this effect. In contrast, no evidence was found to support the absorptive capacity hypothesis.

Carkovic and Levine (2005) argue that many empirical studies of FDI and growth are based on methods that do not adequately address various technical problems highlighted in the general growth empirics literature. One of these is controlling for a wide range of growth determinants. The application of highly parsimonious specifications which fail to account for the wide range of factors that drive growth may generate misleading results. A second problem overlooked in many of the above cited studies is endogeneity bias. It is easy to conceive of a scenario where FDI and growth might be simultaneously determined and formal investigations suggest causality does indeed run both ways between FDI and growth (Choe 2003). Using a technique that alleviates these problems, Carkovic and Levine (2005) examine the impact of FDI on growth and also assess the relevance of a wide range of host country factors. The results from this analysis are mixed but in general do not show any particularly robust correlation between FDI and growth, with the significance of the FDI variable

susceptible to the choice of specification. Likewise, interaction terms incorporating FDI along with human capital and trade openness are found to be significant in a minority of specifications only.

To summarise, the macroeconomic level empirical literature on growth and FDI has produced a diverse set of results. This is likely to be symptomatic of two factors. First, as with the general growth empirics literature, different results are likely to reflect the application of different techniques, specifications and samples. Second, these results also lend support to the notion that FDI does indeed have heterogeneous effects on the host economy, depending upon prevailing policies and other factors. Unfortunately, at this stage, there does not appear to be any conclusive evidence on which factors are most important. Moreover, as yet no macroeconomic level study has focused on the role of investment policies in conditioning the FDI-growth nexus.

3. INVESTMENT POLICY INDICATORS

Existing cross-country indicators of investment related policies are sparse. Furthermore, data that are available are less than ideal for long run analysis due to limited coverage or because they poorly target the most important aspects of investment policies. Two datasets have been developed which use qualitative information to assign numerical values to indicators of national investment policies, including the *Index of Economic Freedom* produced by the Heritage Foundation. In this data set, a score between one and five is assigned to investment policies across a range of areas including national treatment of foreign investors, administrative procedures for undertaking investment, the range of sectors closed to foreign investment and restrictions on FDI related capital transfers. A similar dataset which also uses qualitative information to assign numerical values to different aspects of investment policies is compiled by Shatz (2000). While both these datasets provide numerical indicators of different aspects of the investment regime for a sizeable sample of countries data are available for around one decade only.

Aside from these broad indicators of investment policies, a number of datasets provide information on official or *de jure* capital controls. Controls on the movement of FDI related capital represent one particular type of restriction on the freedoms of foreign investors and in doing so one element of the overall investment regime. Notwithstanding the limitation that

capital control indicators lack information on broader aspects of the investment regime, in general available indicators of capital controls are of limited use. This is because they either do not target the pertinent aspects of capital controls for foreign investors, or like the datasets discussed above, suffer from limited coverage. For example, the IMF has produced a binary indicator of broad capital account restrictions for a large sample of countries from the 1960s onwards, as part of its series Annual Report on Exchange Arrangements and Exchange Restrictions (*AREAER*). However, since many countries adopt heterogeneous approaches towards controlling different types of capital this broad indicator is unlikely to accurately reflect restrictions applying specifically to direct investors (Eichengreen and Mussa 1998). Others have made use of the qualitative information in *AREAER* to compile indicators for specific types of capital control but these are limited. For example Miniane (2004), develops a disaggregated data set back to 1983 but for only 34 countries.

3.1 A New Dataset on Investment Policies

Given the limitations of existing investment policy indicators, particularly with respect to their coverage, a new dataset has been compiled which provides greater coverage and is suitable for longer run analysis. In order to devise a dataset that is informative in providing some indication of the extent of investment policy restrictions prevailing across time and countries, and to ensure the task remained feasible, indicators relating to three separate investment policies have been compiled, drawing on a range of qualitative sources. Given the importance of ownership restrictions in shaping the operating environment for foreign investors, the first indicator (*ownership*) reflects whether countries prohibit wholly owned foreign establishments. The other two indicators reflect restrictions on capital flows specifically affecting foreign direct investors. These are restrictions on the rights of foreign investors to remit earnings on capital, including profits (*profits*), and restrictions on the liquidation and repatriation of foreign owned capital (*liquidation*).

The data set includes a total of 89 countries and for most of these annual observations for each indicator are compiled from 1970 to 2000, the period for which data on FDI flows and other variables of interest are widely available.[5] Each of the three indicators are binary in nature,

[5] The countries included in the dataset are: Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Canada, Central African Republic, Chile, China, Colombia, Costa Rica, Democratic Republic of Congo, Republic of Congo, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Finland, France, Gabon, Germany, Ghana, Greece, Guatemala, Guinea, Guyana, Honduras, Hong Kong, India,

signalling the presence or otherwise of each type of policy restriction. A scale system that accurately reflects the severity of restrictions does offer advantages. However, compiling data using this approach requires substantially more information. In addition, a scale approach inevitably requires the exercise of a good deal more judgement in assigning values and in doing so may increase the risk of introducing measurement error. Another limitation of the dataset is that it by no means covers all relevant investment policies. Ideally other factors such as requirements to use specified quantities of locally produced intermediate inputs or labour and obligations relating to technology sharing with the host country government or local firms would also be incorporated. However, good information relating to these policies is difficult to assemble for a large sample of countries.

Notwithstanding some limitations, the three policy indicators outlined above do target some pertinent aspects of investment policies and are suitable for analysing the role of investment policies in conditioning gains from FDI. Efficiency-seeking FDI will be discouraged by the presence of restrictions on both capital flows and on ownership. In addition, the presence of ownership restrictions will reduce the incentive for costly technology transfer from the parent company to the affiliate, irrespective of whether the affiliate is an export platform or serves the host market.

The specific criterion used to code ownership was whether full foreign ownership of an enterprise was prohibited in every sector. This included a requirement for new investments to be joint ventures from the outset or an obligation for an initially fully foreign owned venture to incorporate local equity within a specified time frame. That is, whether any requirements for dilution of ownership existed. Applying this strict standard enables, in principle, the inference that all FDI flowing to countries with this type of restriction represents equity in joint ventures only. An alternative approach would be to define a variable capturing the existence of ownership restrictions in some, rather than all, sectors. However, this may not provide any useful indication of the proportion of direct investment that is subject to ownership restrictions. Many countries, including some industrialised, have historically imposed foreign equity limits in sensitive sectors but it is possible that these have been of

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Indonesia, Iran, Ireland, Israel, Italy, Japan, Jordan, Kenya, Korea, Kuwait, Madagascar, Malaysia, Mauritius, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Saudi Arabia, Senegal, Singapore, South Africa, Spain, Sri Lanka, Sweden, Syria, Taiwan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Zambia and Zimbabwe.

little interest to foreign investors. In cases such as this, countries that selectively impose equity limits on foreign investment in some sectors may actually impose ownership restrictions on a very small proportion of total FDI.

A complication in coding *ownership* is that many countries have historically adopted foreign investment codes which on the surface appear liberal but subject investment proposals to a screening process that may unofficially favour joint ventures. To address this problem, ownership restrictions were also coded where there was clear evidence of a *de facto* requirement for local participation. This inevitably requires exercising judgement to distinguish between authorities holding a preference for joint ventures but adopting a pragmatic approach on the one hand, and on the other, taking a hostile and dogmatic view of foreign investment and insisting on joint ventures. To ensure consistency with the stringent criterion outlined above, a *de facto* requirement for local participation was assumed to exist where governments adopted an overtly hostile attitude to foreign investment. Such a policy stance was invariably signalled by episodes of widespread nationalisation of foreign assets, often in conjunction with declarations of socialist intensions by newly installed regimes. Where ownership restrictions were coded on the basis of this type of information, it was assumed that such restrictions existed until there was a clear indication of change in official attitudes. This was usually assumed to occur where authorities introduced a new investment code that did not stipulate blanket ownership restrictions as described above.

For the two capital control related indicators, the decision to code restrictions was based on the presence of controls that impinge on the rights of investors to transfer FDI related capital. This includes overt restrictions as well as the existence of ceilings on the amounts that could be transferred at any one time, phasing requirements or special taxes that applied to transfers. Restrictions were also coded where there existed a requirement to seek prior authorisation or approval. However, exceptions were made where there was clear evidence that as a matter of practice, approval was invariably given automatically. One concern in the context of *liquidation* is that a waiting period requirement before investors can liquidate the proceeds of their investment might not actually represent any meaningful impediment given that FDI is associated with long term commitments. Nevertheless, to ensure consistency, restrictions were coded for this indicator wherever any waiting period applied.

Following the approach adopted by others who have compiled data on *de jure* capital controls, the first step involved reviewing text descriptions in the *AREAER* for each country from 1970 to 2000. Produced annually since 1950 as part of a requirement set out in the IMF's Articles of Agreement, this publication contains text descriptions of trade and exchange related policies prevailing in most IMF member countries. Generally, these descriptions include details on matters such as exchange rate arrangements, payments for imports of goods and invisible items as well as proceeds from exports and restrictions on capital flows, both inward and outward. The coverage of policy descriptions has largely remained unchanged since the inception of the report. Details contained in each report are based on information provided by national authorities, media reports and other sources and the final version is agreed to by both IMF staff and authorities in member countries as reflecting an accurate account of policies prevailing at any point in time.

Text descriptions in the *AREAER* under the heading of 'capital' cover any special arrangements or limitations attached to the inflow or outflow of capital and were the primary source of information. In each publication it is reported that when regulations on foreign capital also cover the income thereon (such as dividends and profits), they are usually dealt with in this section rather than under the heading of 'payments for invisibles'. Nevertheless, there are many instances where regulations relating to the transfer of income derived on foreign capital are detailed under the latter heading and this text was also used for the purposes of compiling the data. If any country description contained a reference consistent with the above criteria for each policy indicator then a value of 'zero' was recorded to indicate the presence of a particular restriction, otherwise 'one' was recorded.

A limitation of the *AREAER* is that the level of detail provided on investment policies (and indeed other trade and exchange related policies) varies considerably from country to country. While descriptions for some countries are comprehensive, for others they are sketchy or even missing altogether. This is especially true for information relating to *de jure* ownership restrictions while information on *de facto* ownership restrictions as defined above is essentially non-existent. As such, while the *AREAER* provided a good starting point, and for some parts of the dataset complete coverage of relevant policies, there was a need to use a variety of supplementary sources. Unfortunately no other single source contains consolidated information on investment policies so a wide variety of sources were drawn upon. These

included various reports by the World Bank, United Nations, Economist Intelligence Unit, commercial country guides by the US Government and a range of other material.

3.2 Overview of Investment Policy Indicators

The final data set covers a diverse group of countries with a broad geographic and economic representation. Out of the total of 89 countries in the dataset, 20 are classified as industrialised, 13 are located in the Middle East or North Africa, 21 in sub-Sahara Africa, 20 in Latin American or the Caribbean region and 15 from Asia or the Pacific.[6] There are four dominant features in the data, the first of which is the persistence of prevailing policies. Most countries have either never imposed any of the three restrictions or had them in place for an extended period. In this way, investment policies appear to mirror trade policies which, at a general level at least, are also highly persistent (see for example Sachs and Warner (1995)). Out of the full sample, 23 countries have never imposed any of the three policy restrictions. While this group is dominated by industrialised countries it also includes a small number of developing countries. Figure 1 highlights the persistence of policy restrictions using kernel density estimates (smoothed histograms). For each policy indicator, the frequency of episodes featuring restrictions is plotted according to the duration of the episode. The clear pattern which emerges is that where restrictions have been imposed they have generally remained in place for at least a decade and often more than two decades. This is especially true for the *profit* and *liquidation* indicators.

There is clear evidence that the incidence of all forms of restrictions has fallen during the three decades examined. As with the general move towards international trade liberalisation, the dominant global trend regarding these particular investment policies since the 1970s is also towards countries adopting a more liberal stance. Furthermore, reinforcing the persistence of policy settings, once liberalisation has occurred, instances of policy reversal are rare. The general trend towards liberalisation is highlighted in figure 2, which plots the evolution of the three policy variables across time for the full sample. In general the incidence of restrictions was quite stable during the 1970s and early 1980s before widespread liberalisation occurred during the late 1980s and early 1990s. Regarding the pattern of liberalisation within individual countries, some countries introduced restrictions after 1970

[6] Industrialised countries are defined by membership of the OECD prior to its expansion in the 1990s.

but no country has a record of removing ownership restrictions and then reinstating them. For the two capital control indicators there are a few instances where countries liberalise and then temporarily reintroduce profit or liquidation restrictions during periods that coincide with capital account crises (for example Turkey and Argentina), but these are rare. As with ownership restrictions, the dominant trend is to liberalise and remain restriction free.

Another dominant feature of the data is the greater incidence of capital control related restrictions compared with ownership restrictions (figure 2). A total of 45 countries (none of which are classified as industrialised) have imposed ownership restrictions at some point. In comparison, the incidence of capital control related restrictions is higher. A total of 55 countries have at some point imposed profits restrictions and 61 imposed liquidation restrictions. In many cases countries that adopted one form of capital control restriction also imposed the other type, particularly during the 1970s and early 1980s. As a result, there is evidence of a positive global correlation between profit and liquidation restrictions. Furthermore, in general countries which have adopted ownership restrictions have also imposed one or both type of capital control restriction. However, the reverse is not true with many countries adopting some form of capital control restriction without imposing ownership restrictions.

The incidence of restrictions varies across major country groupings. The incidence of all types of restrictions is generally highest in African and Middle Eastern countries and, not surprisingly, the lowest in industrialised countries. There are no ownership restrictions coded for the twenty industrialised countries included in the sample and only three have ever imposed profit or liquidation restrictions. The incidence of restrictions across Asian and Latin American and Caribbean countries falls somewhere in between. Hence, liberal investment policies are somewhat correlated with levels of development. The timing of liberalisation is similar across major country groups. This regional concentration of controls to some extent reflects formal economic associations of some form. For example, former French colonies in Africa, which have adopted common exchange arrangements in conjunction with the CFA Franc, tended to adopt the same approach regarding the movement of FDI related capital. Likewise, South American countries, which formed part of the Andean Community, adopted similar policies regarding ownership and profit restrictions through the 1970s and 1980s.

4. GROWTH EMPIRICS

4.1 Methodology and Data

The three investment policy indicators are used to test the hypothesis that more liberal policies enhance the growth dividend from FDI. The approach taken here is to estimate a series of general growth equations for different samples based on prevailing investment policies and to examine differences in the estimated coefficient on FDI for these different samples.[7] Any evidence that FDI is more productive or robustly correlated with growth in the sample comprising countries with liberal policies is interpreted as supporting the relevance of these policies in conditioning gains from FDI. An alternative method for examining the relevance of investment policies would be to interact each policy indicator with FDI. However, since the policy indicators are binary and highly time invariant such an approach leads to a problem of co-linearity. To illustrate, for a country that applies a particular investment policy restriction, both the policy indicator and the interaction term will take the value of zero. Alternatively, where a particular policy restriction does not apply, the policy indicator variable will take a value of one and the interaction term will take the same value as the FDI variable. As a result of this co-linearity, many estimates incorporating FDI-investment policy interaction terms were found to be insignificant.

In addition to examining the relevance of investment policies, the impact of trade openness and human capital on the productivity of FDI are also assessed. These factors are assessed alone and in conjunction with investment policies. Since measures of trade openness and human capital used in the analysis are both continuous variables the co-linearity problem associated with interacting the investment policy indicators described above does not arise. Therefore trade openness and human capital are assessed by interacting them with FDI.

In an attempt to ameliorate model uncertainty and ensure results were not affected by missing variables, as a starting point a number of specifications employing a variety of explanatory variables are estimated using the full sample. From here all explanatory variables are incorporated in all specifications, to ensure results are as robust as possible. To counter endogeneity bias arising from omitted variables and simultaneity, and to extract maximum

[7] Almost all countries for which investment policy data have been compiled are included in the analysis. Kuwait, Oman, Saudi Arabia and United Arab Emirates are omitted due to lack of data on output and investment.

information from the data, a panel data approach is used. This enables the use of fixed effects techniques that control for unobservable country heterogeneity as well as the use of lagged values of explanatory variables as instruments. In order to remove the effects of short run fluctuations, following the approach adopted in a number of other growth studies, five year averages of the data are used. With data on FDI flows and investment policies spanning from 1970 to 2000, taking five year averages yields a maximum of six observations per country, one of which is lost as an instrument.

In each specification the dependent variable is the annualised growth rate of per-capita output over a five year period. Each explanatory variable represents the annual average over a five year period. The exception is lagged per-capita output (*Initial per-capita output*) which is included to capture the effects of conditional convergence. This variable is the log level of per-capita output at the beginning of each five year block in the panel. In addition to this convergence term, the other core explanatory variables included in each specification are proxies for the rate of domestic investment (*Domestic investment*) and foreign investment (*FDI*), where the former represents total investment less foreign investment. From a methodological point of view it makes no difference whether foreign investment is included alongside total investment or domestic investment only. The decision to include domestic investment is made purely on presentational grounds, to allow an easy direct comparison of the standalone impact of FDI across different specifications. The general specification used can be summarised as:

$$\ln y_{it} - \ln y_{it-\tau} = \beta \ln y_{it-\tau} + \alpha f_{it} + \delta k_{it} + \gamma x_{it} + \lambda_i + \varepsilon_{it} \qquad (1)$$

where y is per-capita output, f changes in the stock of foreign investment (*FDI*), k changes in the stock of domestic investment (*Domestic investment*), x a vector of other control variables, λ unobservable country heterogeneity and ε the error term.

Given the limited availability of capital stock data for FDI and other forms of investment, ratios of investment spending to GDP are used to proxy the rate of domestic and foreign capital accumulation. Since international price data provide a more meaningful comparison in a cross-country context than data based on local currency measures, output and total investment expenditures are taken from the Penn World Table (PWT) and measured on a PPP

basis. Since data on FDI, which are sourced from the UN *World Investment Report*, are measured in current US dollars, raw FDI data were first converted to a PPP measure using the investment deflators from the PWT.[8] To summarise, *Domestic investment* was derived by subtracting the ratio of FDI to GDP from the ratio of total investment expenditure to GDP, all measured on a PPP basis.

Amongst the control variables, the stock of human capital (*Education*) is based on educational attainment data by Barro and Lee (1999). The main measure used is total years of schooling amongst the working age population with years of secondary schooling used as an alternative in some specifications. This variable is entered in level form by itself to capture the role of human capital in driving innovation and faster technology diffusion. As noted above, in addition, this term is interacted with *FDI* to examine the absorptive capacity hypothesis in some specifications. Openness to international trade (*Openness*) is proxied using the revealed openness measure, the ratio of total trade to GDP. Like *Education* this variable is entered by itself, to capture the direct impact of trade openness on growth and also as an interaction with *FDI* to assess the impact of trade policies on the productivity of FDI. Other explanatory variables are incorporated to control for other growth determinants. First, the level of financial development (*Financial depth*) is proxied using the ratio of M2 to GDP. Second, the size of government (*Government consumption*) is the ratio of government consumption expenditure to GDP. Third, a measure of macroeconomic stability (*Inflation*) which is the annual change in the GDP price deflator. Finally, a broad proxy for institutional quality, or more specifically the strength of property rights protection (*Contract intensive money*) proposed by Clague et al (1999). This measure is constructed as the proportion of broad money held in forms other than currency. It is premised on the idea that the level of confidence economic agents have in contract enforcement and property rights will be reflected by their willingness to hold wealth in forms that depend on contract enforcement, including financial instruments other than currency. The primary attraction of this variable over alternative measures of institutional quality is that it is objective, in that it reflects the actions of independent economic agents, and is widely available.

The ratio of trade to GDP is a crude proxy for trade openness which may reflect a range of country factors that influence trade propensity as well as underlying policies. These include

[8] See data appendix for details.

size, with smaller and less diversified countries expected to trade more, resource endowment, with oil rich countries in particular likely to trade more, or geography, with landlocked countries possibly trading less as a result of being unable to make direct use of sea transport. When openness is regressed on these variables the residual term reflects openness net of the influence of these variables which may be a superior proxy of underlying trade policies. To derive an alternative proxy of trade policies *Openness* was regressed on population and two dummy variables, one for whether a country is landlocked and another reflecting whether exports are dominated by mineral fuels (including oil). The reported coefficient on the population variable was negative and significant, supporting the prior expectation that more populous countries tend to trade less. In contrast, both dummy variables were insignificant. Therefore, *Openness adjusted* is simply the residual from regressing *Openness* on population.

Estimating the model using a fixed effects method is ideal given the likelihood that at least some unobservable country specific factors are correlated with some or all of the explanatory variables.[9] However, applying a fixed effects transformation creates problems for a model of the general form in equation (1). In particular, it will necessarily induce a new type of endogeneity bias resulting from a correlation between the lagged output term and the transformed error term (Caselli et al. 1996).

An estimation technique that addresses these problems and is employed in this analysis is proposed by Arellano and Bond (1991). The first step in this estimation procedure is to eliminate unobservable heterogeneity by first differencing. Next, the problem of *Initial per-capita output* being endogenous in the transformed model is addressed by using a second order (and higher) lag of this variable as an instrument. This approach will be valid so long as there is no second order serial correlation, something which is tested in each estimation. The third step in the estimation procedure is to instrument other explanatory variables again using lags as instruments. A feature of the Arellano Bond estimator is that higher order lags of explanatory variables are used as instruments, rather than first order lags only. This provides efficiency gains by expanding the set of available instruments. To ensure this approach is valid, a Sargan test of overidentifying restrictions, which assesses the contemporaneous correlation between the set of instruments and the residual, is reported with the results. To

[9] Indeed by construction if there is any unobservable country heterogeneity it will necessarily be correlated with *Initial per-capita output* since per-capita output appears as a dependent term.

summarise, this is a fixed effects estimator which employs a particular instrumental variable structure.

Table 1 provides a summary of each of the variables for the period 1971 to 2000 based on five year averages of annual observations. As one would expect with a large sample of countries there is considerable cross-country diversity. Annual per-capita growth rates vary from a high of 12.2 per cent for Botswana to -11.4 per cent recorded in the Democratic Republic of Congo during the first half of the 1990s. Other countries to experience prolonged episodes of high average growth rates include Jordon during the late 1970s and China during the early 1990s. The range of reported investment rates for both domestic and foreign capital also varies considerably. The highest value for *FDI* is recorded for Belgium at over 23 per cent during the late 1990s. This figure represents a considerable outlier and presumably partly reflects merger and acquisition activity associated with European integration. Hong Kong and Singapore also recorded very high figures for *FDI*. At the other end of the spectrum Botswana, Gabon and Panama all recorded periods of negative net outflows of more than 1.0 per cent of GDP per annum.

Bivariate correlations between most of the variables included in the analysis (reported in table 2) conform to expectations. Growth is positively correlated with the three factor accumulation variables *Domestic investment*, *FDI* and *Education*. Other variables positively correlated with growth include *Openness*, *Financial depth* and *Contractive intensive money*. As expected both *Inflation* and *Government consumption* are negatively correlated with growth. For *FDI* a similar pattern of partial correlations is observed, with all variables except *Inflation* and *Government consumption* showing a positive correlation. This includes *Domestic investment*, indicating an (albeit weak) complementarity between domestic and foreign sourced investment.

4.2 Results

Four main sets of results are presented below in tables 3 to 6.[10] The first set of results (table 3) focuses on the robustness of *FDI* in a range of different specifications drawing on the full sample of up to 89 countries.[11] The estimation process begins with a parsimonious

[10] Tables 4A and 4B contain supplementary results for those reported in table 4.
[11] The number of observations in each equation varies due to differences in data availability for each variable.

specification that incorporates *Initial per-capita output*, *FDI* and *Domestic investment* and then expanded to include a range of other explanatory variables discussed above. The results in table 3 provide evidence on the average effect of FDI on growth across a diverse set of countries.

The results in table 4 focus on whether host country investment policies affect this relationship by examining whether the relationship differs systematically across sub-samples of countries adopting different investment policies. Tables 5 and 6 report results on the role of trade openness and human capital, by examining whether the interaction between these variables and *FDI* is in anyway different before and after controlling for investment policies. All the results reported below are derived using the difference GMM estimator described above. Hence none of the results should be affected by bias arising from country heterogeneity or simultaneity.

4.2.1 FDI and growth in the full sample

Results using the full sample (table 3) suggest that FDI has a strong, positive impact on growth that is insensitive to model specification. Beginning with regression 1, the most parsimonious specification, *Initial per-capita output* has the expected negative sign, indicating support for the conditional convergence hypothesis, while *Domestic investment* and *FDI* feature the expected positive sign. All three variables are significant at the 1 per cent level in this and every other specification reported with this set of results. The first variable added to this parsimonious specification is *Education* and is again positive and significant in this and other specifications reported in table 3. Likewise, *Trade openness* also features the expected positive coefficient and is significant at the 5 per cent level or higher. From here the remaining explanatory variables are added, first individually and then together. First, *Financial depth* is added and found to be positive and significant. *Government consumption* is also significant but features a positive rather than negative sign. Finally *Inflation* and *Contract intensive money* both feature their expected sign and are statistically significant. When all variables are included together *Financial depth* and *Contract intensive money* become insignificant. The output elasticity of domestically sourced capital varies somewhat across specifications but estimates are generally plausible, ranging from a low of around 0.25 up to 0.32. Interestingly, the output elasticity for foreign investment is higher in all specifications, ranging between 0.37 and 0.45. The average output elasticity across domestic

and foreign investment appears to be similar, perhaps a little higher, than output elasticities for total investment derived in studies that adopt a similar methodology.[12]

As noted above, the estimation technique adopted in this analysis requires that there is no second order or higher serial correlation that would negate the use of lagged levels of output as instruments. The p-value of a test for the existence of such serial correlation is reported for each regression, where the null hypothesis is of no second order serial correlation. In every specification reported in table 3 (and indeed almost every result reported in any of the tables) the null hypothesis cannot be rejected at conventional levels of significance, suggesting that serial correlation is not a problem. A Sargan test of overidentifying restrictions for the use of lags of all explanatory variables as instruments is also presented. With this test, the null hypothesis is that the correlation between the instrument set and the residual term is zero. Again in each regression the null cannot be rejected, supporting the validity of using lags as instruments in each regression. Similar results for these two specification tests are reported for other results discussed below.

To summarise these first set of results, the findings are generally consistent with those found in some other similar studies. A range of factor accumulation and policy variables are found to be robustly correlated with growth, including *Domestic investment* and *FDI*. Furthermore, given the magnitude of the coefficients for these two variables, they both appear to be important in explaining variations in growth performance. This result contrasts with those reported by Carkovic and Levine (2005) who find the relationship between FDI and growth is very weak using a similar fixed effects, instrumental variable estimator. The caveat, however, is that these results may obscure a heterogeneous relationship between FDI and growth amongst countries which differ in investment policies and other factors. We now turn to the results which aim to shed light on this issue.

4.2.2 The role of investment policies

Table 4 presents the results from applying a general growth equation to different sub-samples based on prevailing investment policies. Each specification includes the full set of explanatory variables reported in table 3 on the basis that the Sargan test for over-identifying

[12] For example, Dowrick and Rogers (Dowrick and Rogers 2002) estimate output elasticities for total investment of between 0.19 and 0.23.

restrictions does not suggest any problems in incorporating all of these variables. Indeed, the selection of a relatively wide range of explanatory variables should improve the robustness of results. Regression 1 in table 4 is based on a sample where there are no ownership restrictions while regression 2 is based on a sample where ownership restrictions do prevail. Likewise, regressions 3 and 4 report results from samples with and without profit restrictions and regressions 5 and 6 the results from samples with and without liquidation restrictions. By using panel data, policy changes within countries are accounted for since the sample is determined by prevailing policies in each country at each five year interval, rather than for the full thirty year period. This means, for example, that a country which initially maintains a particular investment policy restriction and then liberalises will fall in to both samples, depending on the timing of the policy change.

In regression 1 all coefficients feature the expected sign and are significant except for *Financial depth* which is insignificant and *Contract intensive money* which is negative. As with the results based on the full sample the coefficients on *Domestic investment* and *FDI* are significant at the 1 per cent level. However, the results are notably different for the sample with ownership restrictions (regression 2) and in particular, the coefficient on *FDI* switches to being insignificant. The coefficient on *Domestic investment* also becomes insignificant while results for other variables are mixed. Regressions 3 and 4, based on samples with and without profit restrictions, paint a similar picture for *FDI* which is only positive and significant in the sample without restrictions. One notable difference is that *Domestic investment* remains positive and significant in both samples. Indeed surprisingly, the coefficient is slightly higher where restrictions are applied. Again, the results for the other variables are mixed. Finally, regressions 5 and 6, based on samples determined by the existence of liquidation restrictions, confirm the pattern of the *FDI* coefficient being sensitive to the choice of sample although the difference in results is less dramatic. *FDI* is positive for both samples but lower where restrictions are applied. In contrast the coefficient on *Domestic investment* is higher where restrictions are applied.

A potential problem in interpreting these results is that one might expect returns to all types of investment to be lower in developing countries due to generally inferior institutions and policies. Given that restrictive investment policies are more prevalent in developing countries, it is possible that differences in returns to FDI across different samples may reflect differences between developed and developing countries other than investment policies.

Highlighting this problem are the results based on samples with and without ownership restrictions discussed above, where the coefficient on both *FDI* and *Domestic investment* become insignificant in the sample where ownership restrictions apply. There is no sound reason why this particular policy variable should impact on domestic investment. An alternative explanation for this result is poor quality data. Countries with restrictive investment policies not only tend to be less developed but are also likely to have poorer quality data, making it difficult to identify statistically significant relationships.

To examine these issues two experiments are conducted. First, countries with very poor quality data as determined by the Penn World Tables ranking system are removed from the sample and the regressions reported in table 4 re-estimated.[13] The revised results, reported in table 4A, suggest that data quality may be the culprit for some peculiar results. In particular, in the revised estimates *Domestic investment* is positive and statistically significant in every regression, including where investment policy restrictions apply. In contrast the *FDI* coefficient varies according to prevailing policies, for samples determined by the *ownership* and *profit* indicators. However, the *liquidation* indicator appears to make no difference with *FDI* featuring a very similar, positive coefficient irrespective of whether this particular restriction applied. For the second experiment the regressions reported in table 4 were again re-estimated, this time using data for developing countries only. The results from this exercise are presented in table 4B. For the sample splits based on the *ownership* and *profit* indicators the results are very similar to those discussed above with *FDI* positive and significant only where these restrictions are not applied. However, the results using the *liquidation* indicator are different. Indeed they are counter intuitive with *FDI* positive only where restrictions are applied.

The results from these two simple tests suggest that for the *ownership* and *profit* indicators at least, they are not simply picking up other factors that might reduce the productivity of any form of investment. Specifically, they appear to impact primarily on the productivity of foreign rather than domestically sourced investment. Nonetheless, in light of the odd results reported above applying *liquidation*, and concerns discussed above regarding the validity of this indicator the remainder of the analysis focuses on the impact of the *ownership* and *profit* indicators only. Since the inclusion of both developed and developing countries does not

[13] Countries are omitted from the sample on the basis of having a 'D' rating in the Penn World Tables data quality ranking system. A 'D' rating is applied to the poorest quality data, as determined by various criteria.

appear to effect results for these variables data for both types of countries is used for the remaining results to maximise the available degrees of freedom.

4.2.3 The role of investment policies and trade openness

Having examined the impact of investment policies in isolation, the next set of results examines whether investment policies as well as trade policies and human capital impact on the growth effects of FDI. Table 5 presents results examining whether trade openness enhances the growth effects of FDI alone, and in conjunction with investment policies. Regression 1 is based on the full sample and incorporates all of the explanatory variables used above. In addition, a term interacting *FDI* with *Openness* is added. The results indicate that for this sample greater openness to trade does not enhance the impact of FDI on growth with the interaction term insignificant. To assess whether investment policies have any bearing on this result the same specification is applied to sub-samples comprising countries with liberal investment policies. Regressions 2 and 3 are based on samples of countries without ownership and profit restrictions respectively. In each of these regressions the interaction term remains insignificant. However, in regression 4, once both ownership and profit restrictions are controlled for the interaction term becomes positive and statistically significant.

Regressions 5 to 8 report the results of using the alternative measure of trade openness *Openness adjusted* in lieu of *Openness*. To briefly reiterate, the former is a population adjusted measure of *Openness*. In general the results from using this proxy are similar. For the full sample the interaction term with *FDI* is insignificant as it is once ownership restrictions are controlled for. However, for samples based on countries without profit restrictions the interaction term is positive and significant, as it is for the sample based on countries having neither ownership nor profit restrictions. Overall these results indicate that openness does indeed enhance the growth effects of FDI but only when liberal investment policies are also applied. This is consistent with the view that efficiency-seeking FDI may be particularly conducive to driving higher growth but this type of investment will only be forthcoming if countries adopt an amalgam of sound trade and investment policies.

4.2.4 The role of investment policies and education

The final set of results focussing on the role of human capital is reported in table 6. The results are derived by following essentially the same process as the one described above for trade openness but with measures of human capital interacted with *FDI*. Beginning with regression 1, the interaction of *FDI* and *Education* is incorporated with the full set of explanatory variables and estimated using the full sample. The interaction term is found to be positive and significant, suggesting complementarity between FDI and human capital, but *FDI* is negative and significant. Overall, this result supports the idea that FDI has a positive impact on growth only in countries where some minimum threshold level of human capital has been accumulated.

In regressions 2, 3 and 4 the same specification is applied to samples with no ownership, no profit or neither ownership nor profit restrictions respectively. Once investment policies are controlled for, the results change markedly and appear to be rather unstable. For the sample without ownership restrictions *FDI* becomes positive and statistically significant while the interaction term is insignificant. In countries without profit restrictions both *FDI* and the interaction term are positive and significant. However, when both profit and ownership restrictions are controlled for the interaction term becomes negative while *FDI* remains positive. This latter result counter intuitively suggests higher levels of human capital retards the growth effects of FDI. One possible explanation is that human capital is reflecting general levels of development and that *ceteris paribus*, developing countries tend to gain more from FDI as it promotes technological catch-up or convergence.

To examine whether these results are sensitive to the measure of human capital used, total years of schooling are substituted with total years of secondary schooling (*Education secondary*), also from the Barro-Lee data set. In the full sample (regression 5) both *FDI* and the revised human capital interaction term are positive and significant. Therefore, there is no indication of a threshold effect at work as was the case in the first set of results. Once investment policies are controlled for the results again become unstable. In regression 6, for the sample based on no ownership restrictions the interaction term becomes negative. In regressions 7 and 8, for samples based on no profit or neither ownership nor profit restrictions the interaction becomes insignificant.

Given the sensitivity of results to changes in specification and samples it is difficult to draw firm conclusions. For the full sample it appears human capital does enhance the growth effects of FDI but after controlling for investment policies this affect seems to break down. One interpretation is that once countries adopt liberal investment policies human capital might not matter much, if at all. Since liberal policies are likely to be correlated with higher levels of human capital it is possible that the threshold effects observed in regression 1, where FDI is only beneficial if countries have achieved a sufficient level of human capital, might actually reflect that case that liberal policies are what matter. One could flip this argument around and suggest that liberal policies proxy for better human capital. However, if this were the case then some form of positive complementarity between human capital and FDI should be observable irrespective of investment policies.

5. CONCLUSION

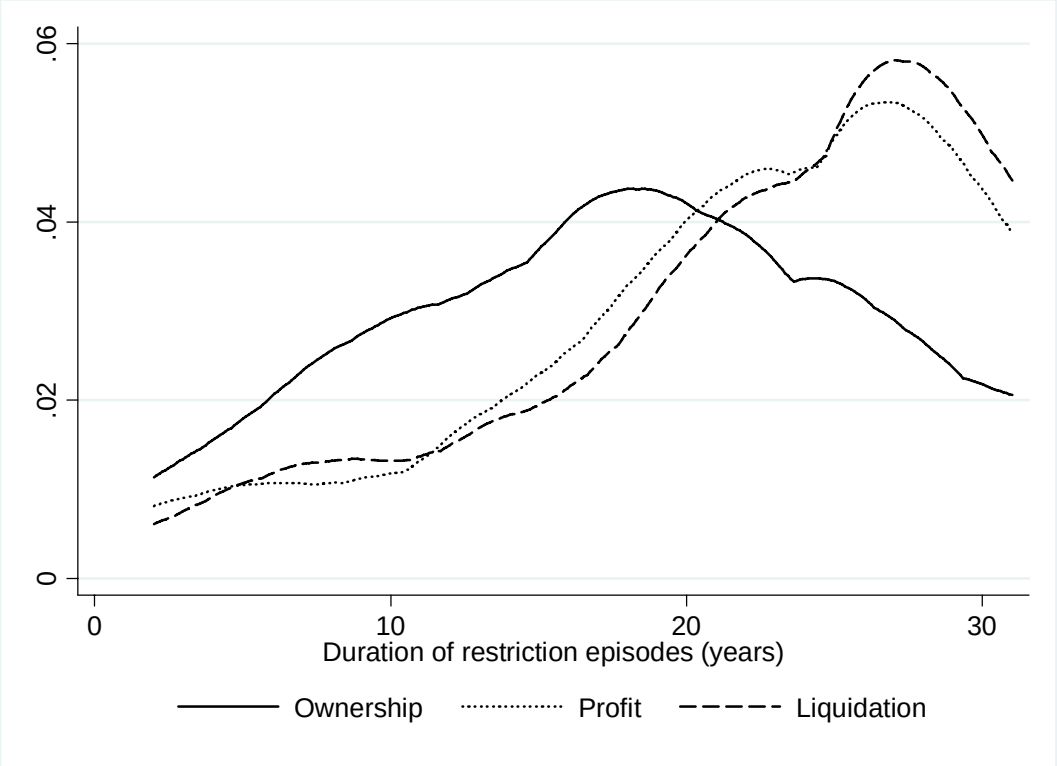
This paper seeks to build on the growing literature which examines how various host country factors affect the link between FDI and economic growth using a cross-country approach. The primary novelty is that it examines the role of investment policies, alone and also in conjunction with trade polices and human capital. A new dataset containing details on three investment policies is introduced and then applied to a variety of empirical models. In light of criticisms levelled at many existing empirical studies of FDI and growth that fail to adopt suitable methodologies, a technique which controls for both unobservable country heterogeneity and uses an instrumental variable approach to address simultaneity bias is used. The results lend support to the hypothesis that investment policies do condition the relationship between FDI and growth. Although the average impact of FDI on growth was found to be positive, this result does not hold for countries with restrictive investment policies.

This result holds for both a universal sample comprising both developed and developing countries and for developing countries alone. Furthermore, once poor quality data was eliminated from the sample it appeared to be the case that investment policies impacted primarily on foreign, rather than domestic capital, suggesting that restrictive investment policies are not simply proxying for a generally poor economic environment. There is also evidence that open trade and liberal investment policies are complementary with greater trade openness enhancing the growth effects of FDI only where liberal investment policies are also

adopted. However, in the case of human capital the impact of investment policies is less clear. Certainly no robust evidence was found to suggest that higher levels of human capital enhance the growth effects of FDI for countries that adopt liberal investment policies.

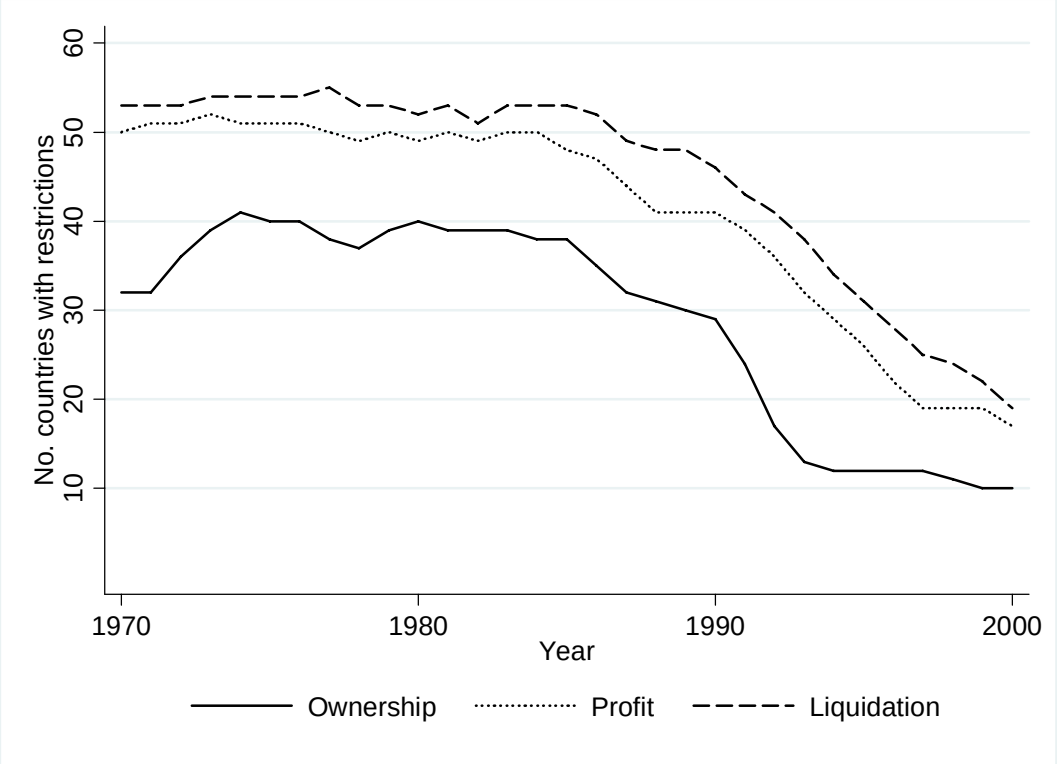
DATA APPENDIX

Figure 1: Duration of episodes featuring restrictions



Note: each series is derived from a kernel density estimate which is a smoothed representation of a histogram. Source: author's calculations, various sources.

Figure 2: Incidence of investment policy restrictions, 1970-2000



Source: author's calculations, various sources.

Table 1. Summary of statistics

	Obs.	Mean	St. deviation	Min	Max
Growth	510	0.02	0.03	-0.11	0.12
FDI	509	0.01	0.02	-0.03	0.23
Domestic investment	509	0.16	0.08	0.00	0.42
Education	462	5.48	2.76	0.14	12.25
Openness	510	0.64	0.47	0.08	3.80
Government consumption	510	0.19	0.10	0.04	0.59
Financial depth	480	0.43	0.25	0.00	1.99
Inflation	493	2.38	1.00	0.47	7.95
Contract intensive money	486	0.80	0.13	0.21	0.98

Source: see data appendix for details.

Table 2. Correlation matrix

	Growth	FDI	Domestic investment	Education	Openness	Government consumption	Financial depth	Inflation	Contract intensive money
Growth	1.000								
FDI	0.228	1.000							
Domestic investment	0.370	0.102	1.000						
Education	0.125	0.287	0.461	1.000					
Openness	0.205	0.642	0.192	0.133	1.000				
Government consumption	-0.172	-0.175	-0.237	-0.328	0.011	1.000			
Financial depth	0.204	0.327	0.435	0.459	0.369	-0.159	1.000		
Inflation	-0.309	-0.274	-0.199	-0.267	-0.239	0.267	-0.378	1.000	
Contract intensive money	0.209	0.252	0.411	0.652	0.129	-0.460	0.427	-0.220	1.000

Source: see data appendix for details.

Table 3. Growth regressions, full sample

	1	2	3	4	5	6	7	8
Initial per-capita Output	-0.034*** (0.009)	-0.033*** (0.008)	-0.048*** (0.005)	-0.05*** (0.003)	-0.061*** (0.005)	-0.054*** (0.003)	-0.055*** (0.004)	-0.06*** (0.003)
Domestic investment	0.26*** (0.032)	0.315*** (0.029)	0.307*** (0.016)	0.325*** (0.013)	0.303*** (0.013)	0.252*** (0.015)	0.261*** (0.01)	0.255*** (0.009)
FDI	0.371*** (0.061)	0.452*** (0.047)	0.426*** (0.036)	0.427*** (0.025)	0.398*** (0.026)	0.38*** (0.031)	0.428*** (0.031)	0.389*** (0.029)
Education		0.007*** (0.002)	0.008*** (0.001)	0.009*** (0.001)	0.009*** (0.001)	0.006*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Openness			0.011** (0.004)	0.017*** (0.004)	0.018*** (0.003)	0.017*** (0.003)	0.011*** (0.003)	0.033*** (0.003)
Financial depth				0.008* (0.005)				-0.006 (0.005)
Government consumption					0.049*** (0.012)			0.055*** (0.009)
Inflation						-0.003*** (0.001)		-0.004*** (0.001)
Contract intensive money							0.035* (0.019)	-0.008 (0.015)
Number of obs.	424	384	384	368	384	376	367	360
Sargan test	0.12	0.27	0.29	0.33	0.59	0.42	0.44	0.97
Serial correlation test	0.31	0.60	0.45	0.44	0.35	0.46	0.49	0.35

Notes: all results derived using (twostep) GMM dynamic panel estimator by Arrelano and Bond (1991). Standard errors are reported in parentheses with ***, ** and * denoting significance at the 1, 5 and 10 per cent level respectively. The dependent variable is annual growth in GDP per-capita output (measured on a PPP basis). All variables except initial per capita output represent averages over non-overlapping five year periods. Initial per capita output is the log level of output at the beginning of each five year period. See data appendix for all definitions and sources.

Table 4. Growth regressions, role of investment policies

	1	2	3	4	5	6
	Ownership		Profit		Liquidation	
	No	Yes	No	Yes	No	Yes
Initial per-capita output	-0.098***	-0.107***	-0.091***	-0.086***	-0.074***	-0.089***
	(0.004)	(0.007)	(0.005)	(0.005)	(0.006)	(0.007)
Domestic investment	0.241***	0.016	0.209***	0.222***	0.174***	0.25***
	(0.011)	(0.031)	(0.011)	(0.025)	(0.021)	(0.025)
FDI	0.364***	-0.321	0.307***	-0.06	0.231***	0.179***
	(0.022)	(0.421)	(0.011)	(0.115)	(0.018)	(0.067)
Education	0.015***	0.005	0.008***	0.003	0.003***	0.008***
	(0.001)	(0.004)	(0.001)	(0.003)	(0.001)	(0.002)
Openness	0.019***	0.128***	0.001	0.112***	0.006**	0.118***
	(0.005)	(0.014)	(0.003)	(0.009)	(0.003)	(0.008)
Financial depth	0.005	-0.079***	-0.035***	0.012*	-0.015***	-0.006
	(0.005)	(0.027)	(0.007)	(0.007)	(0.005)	(0.007)
Government consumption	-0.048***	0.137***	-0.028***	0.13***	-0.086***	0.136***
	(0.016)	(0.023)	(0.01)	(0.011)	(0.032)	(0.013)
Inflation	-0.002***	-0.017***	0.003**	-0.01***	0.001	-0.01***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Contract intensive money	-0.088***	0.085**	0.129***	0.015	0.112***	-0.034*
	(0.013)	(0.036)	(0.02)	(0.027)	(0.021)	(0.019)
Number of obs.	259	77	189	135	172	151
Sargan test	0.96	1.00	1.00	1.00	1.00	1.00
Serial correlation	0.83	0.81	0.42	0.60	0.10	0.16

Notes: as per table 3.

Table 4A. Growth regressions, role of investment policies (improved data quality)

	1	2	3	4	5	6
	Ownership		Profit		Liquidation	
	No	Yes	No	Yes	No	Yes
Initial per-capita output	-0.109***	-0.142***	-0.097***	-0.092***	-0.077***	-0.08***
	(0.003)	(0.017)	(0.005)	(0.008)	(0.006)	(0.003)
Domestic investment	0.252***	0.112***	0.208***	0.386***	0.166***	0.391***
	(0.014)	(0.039)	(0.011)	(0.033)	(0.015)	(0.02)
FDI	0.397***	-1.064***	0.323***	0	0.239***	0.235**
	(0.03)	(0.387)	(0.014)	(0.099)	(0.016)	(0.099)
Education	0.016***	-0.002	0.009***	-0.002	0.004***	-0.003
	(0.001)	(0.007)	(0.001)	(0.004)	(0.001)	(0.003)
Openness	0.013***	0.155***	0.002	0.06***	-0.002	0.063***
	(0.004)	(0.019)	(0.005)	(0.014)	(0.003)	(0.005)
Financial depth	0.012**	-0.052	-0.021***	0.028***	-0.002	-0.001
	(0.005)	(0.032)	(0.007)	(0.009)	(0.005)	(0.007)
Government consumption	-0.029*	0.002	0.001	-0.072***	-0.074***	-0.066***
	(0.015)	(0.034)	(0.012)	(0.026)	(0.02)	(0.019)
Inflation	-0.001*	-0.014***	0.002**	-0.006**	0.005***	-0.002
	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)
Contract intensive money	-0.112***	-0.034	0.101***	-0.075*	0.064***	-0.03
	(0.013)	(0.06)	(0.015)	(0.043)	(0.015)	(0.021)
Number of obs.	255	62	185	120	169	135
Sargan test	0.99	1.00	1.00	1.00	1.00	1.00
Serial correlation	0.72	0.95	0.54	0.31	0.10	0.09

Notes: results based on the regressions reported in table 4 without countries assigned a 'D' ranking on data quality in the Penn World Tables. Other notes as per table 3.

Table 4B. Growth regressions, role of investment policies (developing countries only)

	1	2	3	4	5	6
	Ownership		Profit		Liquidation	
	No	Yes	No	Yes	No	Yes
Initial per-capita output	-0.094***	-0.107***	-0.074***	-0.091***	-0.064***	-0.088***
	(0.003)	(0.007)	(0.008)	(0.008)	(0.011)	(0.006)
Domestic investment	0.188***	0.016	0.194***	0.176***	0.156***	0.225***
	(0.03)	(0.031)	(0.02)	(0.03)	(0.022)	(0.026)
FDI	0.28***	-0.321	0.236***	-0.115	0.063	0.198***
	(0.034)	(0.421)	(0.035)	(0.106)	(0.131)	(0.057)
Education	0.012***	0.005	0.001	0.005	-0.001	0.01***
	(0.002)	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)
Openness	0.014***	0.128***	0.005	0.122***	0.008	0.111***
	(0.004)	(0.014)	(0.004)	(0.009)	(0.005)	(0.013)
Financial depth	-0.006	-0.079***	-0.038***	0.027***	-0.034***	0.003
	(0.011)	(0.027)	(0.009)	(0.007)	(0.012)	(0.004)
Government consumption	-0.071***	0.137***	0.008	0.135***	-0.107*	0.123***
	(0.019)	(0.023)	(0.038)	(0.02)	(0.061)	(0.022)
Inflation	-0.003***	-0.017***	0	-0.008***	0.003	-0.009***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)
Contract intensive money	-0.141***	0.085**	0.045	0.052**	0.141***	0.003
	(0.032)	(0.036)	(0.03)	(0.025)	(0.031)	(0.014)
Number of obs.	159	77	97	129	80	146
Sargan test	1.00	1.00	1.00	1.00	1.00	1.00
Serial correlation	0.82	0.81	0.44	0.75	1.00	0.23

Notes: results based on the regressions reported in table 4 without industrialised countries, as determined by membership of the OECD prior to its expansion in the 1990s. Other notes as per table 3.

Table 5. Growth regressions, role of investment policies and trade openness

	1	2	3	4	5	6	7	8
	Full Sample	No Own.	No Profit	No Own. or Profit	Full Sample	No Own.	No Profit	No Own. or Profit
Initial per-capita output	-0.063***	-0.095***	-0.09***	-0.11***	-0.072***	-0.093***	-0.091***	-0.109***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.003)	(0.005)	(0.006)
Domestic investment	0.255***	0.252***	0.212***	0.246***	0.249***	0.259***	0.224***	0.247***
	(0.012)	(0.011)	(0.019)	(0.013)	(0.012)	(0.015)	(0.018)	(0.014)
FDI	0.386***	0.402***	0.245***	0.263***	0.36***	0.387***	0.268***	0.29***
	(0.048)	(0.047)	(0.03)	(0.028)	(0.034)	(0.034)	(0.019)	(0.024)
FDI x Openness	-0.007	-0.012	0.031	0.036**				
	(0.02)	(0.025)	(0.019)	(0.017)				
FDI x Openness adjusted					0.026	0.004	0.037**	0.035*
					(0.021)	(0.02)	(0.018)	(0.018)
Education	0.006***	0.014***	0.007***	0.014***	0.007***	0.014***	0.006***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Openness	0.037***	0.022***	0.006*	0.014***				
	(0.003)	(0.005)	(0.003)	(0.004)				
Openness adjusted					0.038***	0.023***	0.007**	0.014***
					(0.003)	(0.004)	(0.003)	(0.004)
Financial depth	-0.005	0.004	-0.03***	-0.02***	0.002	0.003	-0.029***	-0.019***
	(0.007)	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
Government consumption	0.066***	-0.05***	-0.029**	-0.004	0.077***	-0.057***	-0.028**	-0.006
	(0.011)	(0.017)	(0.013)	(0.014)	(0.009)	(0.016)	(0.013)	(0.014)
Inflation	-0.005***	-0.002**	0.002	-0.001	-0.005***	-0.002**	0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
Contract intensive money	-0.022	-0.075***	0.118***	0.041**	-0.01	-0.073***	0.115***	0.04**
	(0.015)	(0.017)	(0.025)	(0.019)	(0.017)	(0.016)	(0.024)	(0.019)
Number of obs.	360	259	189	178	360	259	189	178
Sargan test	1.00	0.99	1.00	1.00	1.00	0.99	1.00	1.00
Serial correlation	0.33	0.88	0.55	0.40	0.33	0.91	0.58	0.41

Notes: *Openness adjusted* represents a population adjusted measure of *Openness*, see data appendix for details. Other notes as per table 3.

Table 6. Growth regressions, role of investment policies and human capital

	1	2	3	4	5	6	7	8
	Full sample	No Ownership	No profit	No Own or Profit	Full sample	No Ownership	No profit	No Own or Profit
Initial per-capita output	-0.072*** (0.003)	-0.101*** (0.004)	-0.092*** (0.005)	-0.107*** (0.006)	-0.068*** (0.005)	-0.095*** (0.002)	-0.093*** (0.003)	-0.102*** (0.003)
Domestic investment	0.227*** (0.012)	0.251*** (0.012)	0.227*** (0.014)	0.246*** (0.01)	0.239*** (0.009)	0.287*** (0.019)	0.226*** (0.016)	0.262*** (0.015)
FDI	-0.345*** (0.092)	0.477*** (0.091)	0.105 (0.08)	0.459*** (0.068)	0.245*** (0.04)	0.475*** (0.038)	0.312*** (0.048)	0.329*** (0.037)
FDI x Education	0.08*** (0.01)	-0.014 (0.009)	0.022*** (0.008)	-0.014** (0.007)				
FDI x Education (secondary)					0.023*** (0.008)	-0.013*** (0.005)	0.001 (0.007)	0.002 (0.006)
Education	0.006*** (0.002)	0.015*** (0.002)	0.007*** (0.001)	0.014*** (0.001)				
Education (secondary)					0.009*** (0.001)	0.023*** (0.002)	0.016*** (0.001)	0.023*** (0.001)
Openness	0.059*** (0.005)	0.016*** (0.003)	0.009** (0.004)	0.013*** (0.005)	0.041*** (0.004)	0.016*** (0.004)	0.005 (0.003)	0.01*** (0.003)
Financial depth	-0.011** (0.005)	0.009 (0.006)	-0.036*** (0.008)	-0.019*** (0.006)	-0.016*** (0.005)	-0.001 (0.004)	-0.032*** (0.004)	-0.025*** (0.005)
Government consumption	0.076*** (0.013)	-0.041** (0.017)	-0.014 (0.012)	0.021 (0.015)	0.054*** (0.01)	-0.028* (0.017)	-0.014 (0.017)	0.011 (0.01)
Inflation	-0.006*** (0.001)	-0.003*** (0.001)	0.001 (0.001)	-0.001 (0.002)	-0.002*** (0.001)	0 (0.001)	0.003** (0.001)	0.003*** (0.001)
Contract intensive money	-0.023 (0.021)	-0.11*** (0.014)	0.133*** (0.025)	0.056*** (0.016)	0.03 (0.02)	-0.064*** (0.012)	0.12*** (0.016)	0.065** (0.027)
Number of obs.	360	259	189	178	355	256	187	176
Sargan test	0.98	0.99	1.00	1.00	0.99	1.00	1.00	1.00
Serial correlation	0.27	0.81	0.43	0.44	0.39	0.77	0.58	0.47

Notes: *Education (secondary)* is total years of secondary schooling of workers 25 years and older. Other notes as per table 3.

DATA DEFINITIONS AND SOURCES

Per-capita output: log of real GDP per capita, PPP basis.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

The dependent variable in all regressions is the difference between per-capita output over a five year period. For example, for the last (most recent) block in the panel the value of the dependent variable is the difference between the log of per-capita output in 2000 and 1995.

To ensure that the sample used was as large as possible an interpolation procedure was used to fill in gaps where critical observations of per-capita output were missing (that is observations in 1970 and every five years after to 2000). Within each five year block in the panel a linear trend was applied to calculate missing values.

Total investment: combined private and public investment share of real GDP, PPP basis.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

FDI: annual inflow of FDI as a share of GDP, PPP basis.

FDI series converted from nominal $US measure to PPP basis by dividing nominal series by PPP investment deflator from Penn World Table. This PPP series was then divided by GDP, PPP basis.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/ and UNCTAD, http://www.unctad.org/Templates/Page.asp?intItemID=3199&lang=1

Domestic investment: Total investment less FDI.

Education: total years of schooling of workers 25 years and older.
Education secondary: total years of secondary schooling of workers 25 years and older.
Source: Barro and Lee (2001), http://www.cid.harvard.edu/ciddata/ciddata.html

Openness: the ratio of exports plus imports to GDP, PPP basis.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

Openness adjusted: residuals from regressing Openness on total population.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

The regression applied is as follows (standard error in parentheses):

$$\text{Openness} = 0.6783 - \underset{(0.0001)}{0.0007}*\text{Population}$$

Government consumption: government share of real GDP, PPP basis.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

Financial depth: ratio of broad money (M2) to nominal GDP.
Source: International Financial Statistics and International Financial Yearbook, various editions, lines 34 and 35 (M2), and World Development Indicators CD-Rom 2002 (nominal GDP).

Inflation: annual changes in GDP price deflator.
Source: Penn World Table 6.1, http://pwt.econ.upenn.edu/

Contract intensive money: proportion of broad money (M2) held in forms other than currency.
Source: International Financial Statistics and International Financial Yearbook, various editions, lines 14a (currency holdings) and lines 34 and 35 (M2).

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