Foreign direct investment, financial development and economic growth

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ABSTRACT

FDI may help to raise economic growth in recipient countries. Yet, the contribution FDI can make may strongly depend on the circumstances in the recipient countries. This paper argues that the development of the financial system of the recipient country is an important precondition for FDI to have a positive impact on economic growth. A more developed financial system positively contributes to the process of technological diffusion associated with FDI. The paper empirically investigates the role the development of the financial system plays in enhancing the positive relationship between FDI and economic growth. The empirical investigation presented in the paper strongly suggests that this is the case. Of the 67 countries in data set, 37 have a sufficiently developed financial system in order to let FDI contribute positively to economic growth. Most of these countries are in Latin America and Asia.

1. INTRODUCTION

The contribution of foreign direct investment (FDI) to economic growth has been debated quite extensively in the literature. This debate has clarified the channels through which FDI may help to raise growth in recipient countries. In particular, it has been emphasised that FDI may enhance technological change through spillover effects of knowledge and new capital goods, i.e. the process of technological diffusion. Yet, as some have argued, the contribution FDI can make is strongly dependent on the circumstances in the recipient countries. However, empirical studies investigating the relationship between FDI and economic growth on the one hand, and the role played by the circumstances FDI is confronted with whenever it enters a recipient country on the other hand, are scarce.[1]

This paper argues that the development of the financial system of the recipient country is an important precondition for FDI to have a positive impact on economic growth. The financial system enhances the efficient allocation of resources and in this sense it improves the absorptive capacity of a country with respect to FDI inflows. In particular, a more developed system may contribute to the process of technological diffusion associated with FDI. The contribution of this paper is to investigate empirically the role the development of the financial system plays in enhancing the positive relationship between FDI and economic growth.

The paper is structured as follows. Section 2 provides a description of the discussion of the contribution FDI can make to increased economic growth. The section emphasises the importance of technological diffusion and the role of FDI, as well as the contribution the financial system can make in this respect. Section 3 discusses the data and the empirical methodology. Section 4 discusses the outcomes of the empirical investigation. Finally, section 5 provides a summary and concluding remarks.

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[1] Exceptions are Balasubramanyam *et al.* (1996), Borensztein *et al.* (1998) and Lichtenberg and van Pottelsberghe de la Potterie (1998). For an overview of the literature on the relationship between FDI and economic growth, see De Mello (1997).

2. FDI, THE FINANCIAL SYSTEM, AND ECONOMIC GROWTH: A DESCRIPTIVE THEORETICAL FRAMEWORK

In the new growth literature the importance of technological change for economic growth has been emphasised (Grossman and Helpman, 1991; Barro and Sala-i-Martin, 1995). The growth rate of less developed countries (LDCs) is perceived to be highly dependent on the extent to which these countries can adopt and implement new technologies available in developed countries (DCs). By adapting new technologies and ideas (*i.e.* technological diffusion) they may catch up to the levels of technology in DCs. One important channel through which adoption and implementation of new technologies and ideas by LDCs may take place is FDI. Empirical research has shown that multinational corporations (MNCs) belong to those firms that are technologically very advanced and invest heavily in research and development. Their FDI may have external effects on the process of technological change in the host countries. The advanced technology, new varieties of capital goods and management skills they introduce in these countries may spillover from subsidiaries of MNCs to domestic firms (Findlay, 1978). This knowledge spillover may take different forms. The following channels through which spillovers from FDI may take place, have been distinguished in the literature (Kinoshita, 1998, pp.2-4; Sjöholm, 1999a, p.560): spillovers through (1) demonstration and/or imitation; (2) competition; (3) linkages; and (4) training.

Spillovers through the *demonstration* channel emphasises that technologies used by foreign firms are more advanced than those used by domestic firms, and that these domestic firms may imitate the newer technologies, which will make them more productive. The same may hold for managerial practices introduced by foreign firms. The demonstration effect may take place through direct or indirect contact between firms or through labour turnovers from foreign to domestic firms. The more backward the technological level in the host country in comparison to the level used by the foreign firms, the more domestic firms may profit from imitating and copying these technologies. This appears to reflect the idea of convergence of technological skills.

The *competition* channel stresses that the entrance of foreign firms

intensifies competition in the domestic market. This forces domestic firms to become more efficient, which may lead to upgrading existing technology, or developing (or copying) new technologies and management skills.

The *linkages* channel of spillovers stresses the fact that foreign firms may transfer new technology to domestic firms through transactions with these firms. Such transactions may for example be in terms of the purchase of raw materials or intermediate goods. This may lead to intensive buyer-seller relations with domestic firms in the host country, and as part of these relations foreign firms may provide technical assistance and training to local linkage firms. Moreover, selling to foreign firms may encourage domestic firms to upgrade the production process based on the technical and quality requirements demanded by the foreign buyers, increasing their productivity.

Finally, the *training* channel emphasises that the introduction of new technologies, and domestic firms copying them, needs to be supported by an upgrading of the human capital available domestically. Domestic firms can only adopt these new technologies when the labour force is able to work with them. Therefore, local firms may be stimulated to train their own employees when foreign firms enter the market. This stimulus may be based on one of the other three channels discussed. Thus, perceived opportunities to copy newly introduced technologies, increased competition in domestic markets and/or the existence or development of linkages between foreign and domestic firms may lead to increasing training efforts by domestic firms. This latter point also makes clear that in practice it will be rather difficult to separate the four channels of spillovers.

In any case, it is hypothesised that the spillover of new technologies leads to higher productivity of capital and labour in the host country. The main contribution of FDI is therefore in terms of improving total factor productivity, rather than its contribution in terms of increasing the volume of (physical and human) capital.

The next question is what conditions in the host country are important to maximise the technology spillovers discussed above? In the literature it has been emphasised that the spillover effect can only be successful given certain characteristics of the environment in the host country. These characteristics

together determine the absorption capacity of technology spillovers of the host country. Thus, FDI can only contribute to economic growth through spillovers when there is a sufficient absorptive capacity in the host country. Several country studies have been carried out, providing diverging results on the role of FDI spillovers with respect to stimulating economic growth. Whereas positive effects from spillovers have been found for, *e.g.* Mexico (Blomström and Persson, 1983; Blomström and Wolff, 1994; Kokko, 1994), Uruguay (Kokko, Tansini, and Zejan, 1996) and Indonesia (Sjöholm, 1999b), no spillovers were traced in studies for Morocco (Haddad and Henderson, 1993) and Venezuela (Aitken and Harrison, 1999). These diverging results may underline the crucial role of certain host country characteristics necessary to let FDI contribute positively to economic growth through spillovers.

Some authors argue that the adoption of new technologies and management skills requires inputs from the labour force. High-level capital goods need to be combined with labour that is able to understand and work with the new technology. Of course, the skills required to work with high-level capital goods can be learnt. This, however, demands a minimum educational level in order to be able to learn to work with new technologies. Therefore, technological spillover is possible only when there is a certain minimum, or 'threshold' level of human capital available in the host country (Borensztein, *et al.*, 1998). This suggests that FDI and human capital are complementary in the process of technological diffusion.

Other authors argue that the process of technological spillovers may be more efficient in the presence of well-functioning markets. Under these circumstances, the environment in which FDI operates ensures competition and reduces market distortions, enhancing the exchange of knowledge among firms (Bhagwati, 1978 and 1985; Ozawa, 1992; Balasubramanyam, *et al.*, 1996). In terms of the channels of spillovers discussed above, well-functioning markets provide possibilities for competition and linkage effects of FDI.

Some authors stress that the establishment of property rights – in particular intellectual property rights – is crucial to attract high technology FDI (Smarzynska, 1999). If intellectual property rights are only weakly protected in

a country, foreign firms will undertake low technology investments, which reduces the opportunities for spillover effects and improvements of productivity of domestic firms.

These characteristics may indeed be important to promote the use of absorptive capacity of a country with respect to maximising technology spillovers from foreign firms. Yet, this paper argues that one crucial characteristic of the environment in the host country has not been mentioned in the literature, *i.e.* the development of the domestic financial system. When we reconsider the different channels through which technology spillover may take place, it becomes clear that in many cases domestic firms will need to invest when upgrading their own technology or adopting new technologies, based either on a demonstration effect, a competition effect, and/or a linkage effect. The same holds in case they aim at upgrading the skills of their employees (the training effect). These investments should be financed, however.

The development of the domestic financial system at least partly determines to what extent domestic firms may be able to realise their investment plans in case external finance from banks or stock markets is needed. Moreover, the development of the financial system also influences the allocative efficiency of financial resources over investment projects. Thus, the financial system may contribute to economic growth through two main channels (next to providing and maintaining a generally accepted means of exchange). First, it mobilises savings; this increases the volume of resources available to finance investment. Second, it screens and monitors investment projects (*i.e.* lowering information acquisition costs); this contributes to increasing the efficiency of the projects carried out (see *e.g.* Greenwood and Jovanovic, 1990; Levine, 1991; Saint-Paul, 1992).[2] The more developed the domestic financial system, the better it will be able to mobilise savings, and screen and monitor investment projects, which will contribute to higher economic growth.

Moreover, investment related to upgrade existing or adopt new technologies is more risky than other investment projects. The financial system

[2] See Levine (1997) or Berthelémy and Varoudakis (1996) for good surveys on the role of the domestic financial system and its relationship to economic growth.

in general, and specific financial institutions in particular, may help to reduce these risks, thereby stimulating domestic entrepreneurs to actually undertake the upgrading of existing technology or to adopt new technologies introduced by foreign firms. Thus, financial institutions positively affect the speed of technological innovation, thereby enhancing economic growth (Huang and Xu, 1999). This argument also holds for technological innovation that results from one or more of the channels of technology spillovers from FDI as described above. The more developed the domestic financial system, the better it will be able to reduce risks associated with investment in upgrading old and/or new technologies.

Finally, the development of the domestic financial system may also determine to what extent foreign firms will be able to borrow in order to extend their innovative activities in the host country, which would further increase the scope for technological spillovers to domestic firms. FDI as measured by the financial flow data may be only part of the FDI to developing countries, as some of the investment is financed through debt and/or equity raised in financial markets in the host countries (Borensztein *et al.*, 1998, p.134). Thus, the availability and quality of domestic financial markets also may influence FDI and its impact on the diffusion of technology in the host country. This diffusion process may be more efficient once financial markets in the host country are better developed, since this allows the subsidiary of a MNC to elaborate on the investment once it has entered the host country.

Therefore, in conclusion, FDI and domestic financial markets are complementary with respect to enhancing the process of technological diffusion, thereby increasing the rate of economic growth. This hypothesis can be tested empirically, which will be the subject of the next two sections.

3. DATA AND METHODOLOGY OF EMPIRICAL INVESTIGATION

The data set used in this paper applies to the 1970-1995 period and contains 67 LDCs (see Appendix 2 for a complete list of the countries). For this set of countries data is available for all variables used in this study, which means that the estimations have been carried out with a balanced data set. Table 1 provides basic descriptive statistics for the dependent variable, *i.e.* the per

capita growth rate (*PCGROWTH*) and the crucial variable in this study, *i.e.* gross foreign direct investment inflows as a percentage of GDP *(FDI*). Both variables (and all other variables in this study) are annual averages for the 1970-1995 period.

<INSERT TABLE 1>

The table shows that *PCGROWTH* and *FDI* are not normally distributed. The distribution of these variables is skewed. With respect to *PCGROWTH*, 30 countries have an average growth rate varying between 0 and 2 percent, for 13 countries the growth rate is between 2 and 4, for 5 the growth rate is above 4 percent, and for 19 countries the growth rate is negative. For 42 countries foreign direct investment as a percentage of GDP is between 0 and 1, for 17 countries it is between 1 and 2, for 5 countries between 2 and 3, and for 3 countries between 4 and 5. The largest recipients of foreign direct investment as a percentage of GDP are Swaziland, Trinidad and Tobago and Malaysia.

The methodology of the empirical investigation follows the voluminous growth regression literature, which was stimulated by the seminal paper of Barro (1991). Unfortunately, theory does not provide clear guidance concerning the set of variables that should be included in the growth equation. Depending on the aim of the study and the insights and beliefs of the author(s), different explanatory variables have been included and found to be significant in the literature. Recently, some studies have shown that only a few variables have a robust effect on economic growth (see *e.g.* Levine and Renelt, 1992 and King and Levine, 1993), implying the importance of stability tests. Sala-i-Martin (1997a and 1997b) provides a useful method to test for the robustness of different variables in explaining economic growth. The empirical analysis in this paper closely follows his approach. In particular, the regression analysis for the cross-section of 67 countries is specified as follows:

$$PCGROWTH = \alpha_i + \beta_{i,j} I + \beta_{mj} M + \beta_{z,j} Z + e \qquad (1),$$

where *I, M* and *Z* are vectors of variables and *e* is an error term. *I* is a vector of variables that are "generally accepted" to be important to explain economic growth. *M* is a vector of variables containing the variables of interest in this study. In this study these variables are the log of the FDI to GDP ratio (*LFDI*), and *LFDI* interacted with the log of the private sector bank loans to GDP ratio (*LCREDP*). *LCREDP* is chosen here as a measure of financial development (see below). The vector of *Z* variables contains a limited number of variables from a large set of variables that have been used in the literature to explain per capita economic growth. These variables are used as control variables in the estimations.

The vector of *I* variables contains variables that, according to Levine and Renelt (1992), and King and Levine(1993), have a robust effect on economic growth. These variables are: the log of the initial level of the secondary enrolment rate *(LSECENR),* the log of the initial level of GDP per capita (*LGDPPC*), the variable proxying for financial market development over the 1970-1995 period (*LCREDP*) and the log of the investment share in GDP (*LINVGDP*).

The choice of this vector of *I* variables needs some further explanation. *LSECENR* measures human development and the introduction of *LGDPPC* reflects the process of catch up.

With respect to the choice of the financial development variable, we note that several variables have been suggested in the literature to measure financial development, depending on the specific characteristics of the financial system of interest. These variables focus on the size, the efficiency and/or the relative importance of different financial intermediaries in the total financial system. The problem is that for several of these variables data are only available for a limited number of countries. Therefore in the analysis the log of credit to the private sector as a percentage of GDP (*LCREDP*) is used to measure financial development, since for this variable data are available for all

countries in the data set. Moreover, this variable is used in several other studies (see *e.g.* Demirgüç-Kunt and Levine, 1996).[3]

With respect to *LINVGDP*, regression models are estimated including and excluding this variable in the vector of *I* variables. The reason for this is that the interpretation of a significant coefficient for a certain variable *x* depends on whether or not *LINVGDP* is included in the regression model. If *LINVGDP* is included and the coefficient of variable *x* is significant, this is interpreted as *x* affecting growth via the "level of efficiency". If *LINVGDP* is not included, it is unclear whether variable *x* affects growth via investment or via efficiency. This distinction is of importance to obtain more information with respect to how exactly *FDI* is related to economic growth.

Table 2 presents the correlation matrix for the *I* variables, *PCGROWTH* and *LFDI.*

<INSERT TABLE 2>

4. RESULTS OF THE EMPIRICAL INVESTIGATION

The analysis starts by estimating a number of base equations, *i.e. Z* variables are not yet included in the regression models. The results of these estimations are presented in table 3 (without *LINVGDP*) and table 4 (with *LINVGDP*). The second column in both tables shows the relevance of including the different *I* variables in the model. The tables show that *LGDPPC, LSECENR, LCREDP* and *LINVGDP* have a significant impact on economic growth. In the third column *LFDI* is added to this equation. This variable does not have a significantly positive direct effect on economic growth. This confirms the view that without additional requirements FDI does not enhance economic growth of a country. Borensztein, De Gregorio and Lee (1998) suggest that FDI is only

[3] In the analysis the log of the average money and quasi money to GDP ratio over the 1970-1995 period *(LMGDP)* has also been used to measure financial development. The estimation results are very much in line with the results for *LCREDP*. Results can be obtained from the authors on request.

effective in countries with a high level of human capital. We have tested this hypothesis and the results are presented in column three of tables 3 and 4. Following Borensztein, De Gregorio and Lee (1998) we include the interactive term *LFDI***LSECENR* in the regression model. If we differentiate the model presented in column three of both tables with respect to *LFDI*, we get:

$\Delta(PCGROWTH)/\Delta\ LFDI\ = -0.701+0.351*LSECENR$
(model without *LINVGDP*); and

$\Delta(PCGROWTH)/\Delta\ LFDI\ = -0.617+0.289*LSECENR$
(model with *LINVGDP*).

These outcomes confirm the hypothesis offered by Borensztein, De Gregorio and Lee (1998), *i.e.* the growth effects of FDI depend on the level of human development of a country. The threshold level of *LSECENR* above which *LFDI* has a positive effect on economic growth can be calculated by setting the first derivative of the above equations equal to zero. The threshold levels then equal: (0.701/0.351)=1.997 and (0.617/0.289)=2.135. Since *LSECENR* is the logarithm of the secondary school enrolment rate, the results imply that *LFDI* (and hence also *FDI*) will have a positive effect on growth in countries where the secondary enrolment rate is above 7.4, for model without *LINVGDP* and 8.5, for model with *LINVGDP*.

<INSERT TABLES 3 AND 4>

As explained above, the aim of this paper is to empirically investigate the hypothesis that FDI and domestic financial markets are complementary with respect to enhancing the process of technological diffusion, thereby increasing the rate of economic growth. Therefore, the empirical analysis focuses on the variables *LFDI* and the interactive term *LFDI***LCREDP*, which represent the vector of *M* variables as specified in equation (1). The model presented in column four of tables 3 and 4 directly tests the central hypothesis

of this paper. The outcomes in the tables show that the interactive term *LFDI*LCRED* is positive and significantly related to the dependent variable *PCGROWTH*, whereas *LFDI* alone is significantly negative. This supports the view that FDI only has a positive effect on economic growth if the development of the domestic financial system has reached a certain minimum level. Thus, we find preliminary support for the central hypothesis of this paper.

It may be argued that the results presented in column four of tables 3 and 4 are due to high multi-collinearity between *LSECENR* and *LCREDP* (see table 2). This would mean that the results found are in fact due to the level of human development in a country (*i.e.* the hypothesis forwarded by Borensztein *et al.*), rather than due to the level of financial development. To further investigate this issue we estimate a model incorporating *LFDI*, *LFDI*LCREDP*, and *LFDI*LSECENR*. This model is presented in column five of both tables. If we concentrate on the results for the model including *LINVGDP* (table 4), the results of the estimation show that *LFDI*LCREDP* remains significant; however, *LFDI*LSECENR* becomes insignificant. These results can be interpreted as follows. First, it again confirms the hypothesis that a certain level of financial market development is an important prerequisite for FDI to have a positive effect on economic growth. Second, it suggests that the importance of a certain level of human capital as a prerequisite for the growth effects of FDI is at least partly be explained by the existence of a well-developed financial sector. Moreover, the fact that the variable *LFDI*LCREDP* remains significant in the models where *LINVGDP* is included suggests that FDI affects economic growth mainly via the level of efficiency.[4]

The next step in the empirical analysis is to test the robustness of the above results. In order to investigate this, we conduct a stability analysis in line

[4] We have also explored the relationship between *LFDI* and *LFDI* interacted with a financial development variable as exogenous variables and total investment as a share of GDP as the endogenous variable. In line with Borensztein, De Gregorio and Lee (1998) it appears that *LFDI* and *LFDI* interacted with financial market development do not have a robust effect on investment levels. This confirms that FDI mainly affects growth via the level of efficiency.

with Sala-i-Martin (1997a and 1997b). This stability analysis tests whether the coefficients for *LFDI* and the interactive term *LFDI*LCREDP* remain robust after adding a vector *Z* of a limited number of control variables to the models presented in tables 3 and 4. We define a group of 14 variables from which the additional control variables are taken. These variables are shown to be important for explaining economic growth in several other studies. Since we aim at using a fully balanced data set in our analysis, other possibly relevant variables were not taken into account due to lack of observations. The additional variables we take into account in our analysis are *AIDGDP* (development aid as a percentage of GDP), *BANKL* (bank and trade related lending as a percentage of GDP), *BMP* (black market premium), *CIVLIB* (index of civil liberties), *DEBTGDP* (the external debt to GDP ratio), *DEBTS* (total external debt service as a percentage of GDP), *EINFL* (uncertainty with respect to inflation), *EGOVC* (uncertainty with respect to government expenditures), *EXPGDP* (exports of goods and services as a percentage of GDP), *GOVCGDP* (government consumption as a percentage of GDP), *INFL* (the annual inflation rate), *PRIGHTS* (index of political rights), *STDINFL* (the standard deviation of the annual inflation rate), and *TRADE* (exports plus imports to GDP).[5] In all estimates discussed below, these variables have been transformed into logarithmic form.

The stability test starts by determining all possible combinations of a limited number of the above-presented set of 14 variables. We have chosen to perform the stability test by adding combinations of three, respectively four control variables to the models discussed above. Next, we carry out regression analysis including all variables presented in column 4 from table 3, respectively table 4, as well as all possible combinations of three (respectively four) control variables. This means that in case of three additional variables we estimate 14!/(11! 3!) = 364 different specifications of the model presented in column 3 of tables 3 and 4 (*i.e.* with and without *LINVGDP*). In case we use four additional variables the amount of different specifications equals 14!/(10!4!) = 1,001.

[5] See the appendix for the exact specification and data sources of these variables.

After having estimated all different equation specifications, the next step of the stability test is to look at the distribution of the coefficients of the individual equations, and calculate the fraction of the cumulative distribution function lying on each side of zero. By assuming that the distribution of the estimates of the coefficients is normal and calculating the mean and the standard deviation of this distribution, the cumulative distribution function (*CDF*) can be computed.

More precisely, if β_j is the coefficient for a variable in the specification j of the estimated model and σ_j is the standard error of the coefficient β_j, we proxy the mean and the standard deviation of the distribution by:

$$\overline{\beta} = \frac{\Sigma \beta_j}{n}$$

$$\overline{\sigma} = \frac{\Sigma \sigma_j}{n} \quad .$$

The number of estimated equations is 364 (in case we add combinations of three *Z* variables), respectively 1,001 (when we add combinations of four *Z* variables). In table 5 the mean estimate is presented in the column entitled "COEF" and the mean standard deviation is given in the column entitled "STERR".

Next, we calculate the fraction of the cumulative distribution function lying on the right or left-hand side of zero, using a table for the (cumulative) normal distribution. The test statistic we use is defined as the mean over the standard deviation of the distribution. The column entitled "CDF" in table 5 denotes the larger of the two areas. Finally, as an additional stability test, the last column of the table presents the percentage of all regressions for which the variable of interest (*i.e. LFDI* or *LFDI*LCREDP*) is significant at the 95% level.

The results presented in table 5 show that the coefficients for *LFDI* and the interactive term *LFDI*LCREDP* are very robust. In the models including *LINVGDP* as an additional *I* variable t-values for *LFDI* and *LFDI*LCREDP* are significant at the 95% level in all cases. These results strongly suggest that FDI enhances economic growth only if domestic financial markets are well-developed, thus supporting the main hypothesis investigated in this paper.

<INSERT TABLE 5>

What do the results of the analysis in this paper imply for the countries in the data set? Like we did before with respect to the hypothesised interactive relationship between human capital and FDI (Borensztein, De Gregorio and Lee, 1998), we calculate the first-order condition of the growth equation with respect to *LFDI* and set this equation equal to zero. This allows us to determine the threshold value of *LCREDP* above which *LFDI* starts to have a positive effect on growth. Our results suggest that FDI has a positive effect on per capita growth if *LCREDP* exceeds 2.50 (when *LINVGDP* is excluded from the basic model) and 2.53 (when *LINVGDP* is included). Since all variables have been transformed in a logarithmic form, these results imply that *CREDP*, *i.e.* the private sector credit to GDP ratio should be larger than 12 per cent in order for FDI to have a positive effect on growth. In our data set 37 out 67 countries (or 55 per cent) satisfy this threshold value for *CREDP*. Table 6 presents the countries for which the domestic financial system has reached a sufficient level of development, *i.e.* for these countries FDI contributes positively to economic growth. The table shows that for most Sub-Saharan African countries it appears to be the case that the level of development of their domestic financial system is insufficient, so that FDI probably will not have a positive impact on their economic growth.

<INSERT TABLE 6>

5. CONCLUSIONS

FDI may help to raise economic growth in recipient countries. Yet, the contribution FDI can make may strongly depend on the circumstances in the recipient countries. Few empirical studies have investigated the relationship between FDI and economic growth and the role played by the circumstances FDI is confronted with whenever it enters a recipient country. These studies focused on the role of human capital available in and the export-orientedness of the recipient country. The original contribution this paper makes is that it argues that the development of the financial system of the recipient country is an important precondition for FDI to have a positive impact on economic growth. A more developed financial system positively contributes to the process of technological diffusion associated with FDI.

The paper empirically investigates the role the development of the financial system plays in enhancing the positive relationship between FDI and economic growth. The empirical investigation presented in the paper strongly suggest that this is the case. Of the 67 countries in data set, 37 have a sufficiently developed financial system in order to let FDI contribute positively to economic growth. Most of these countries are in Latin America and Asia. Almost all other countries are in Sub-Saharan Africa. These countries have very weak financial systems and consequently FDI does not contribute positively to growth.

The results of the empirical investigation in this paper provide a number of policy-relevant conclusions. First, the results contradict the widely accepted view that an increase in FDI may important to enhance economic growth in Sub-Saharan Africa. This is only true after these countries have improved their domestic financial systems. Second, the analysis in this paper may contribute to the discussion on the order of economic liberalisation in LDCs. The outcomes of the empirical investigation suggest that these countries should first reform their domestic financial system before liberalising the capital account.

The investigation in this paper is a first step into the analysis of the role the domestic financial system plays in making FDI contribute to economic growth in LDCs. Of course, we would like to determine more precisely how

financial system development influences the relationship between FDI and growth. One obvious way to proceed is to extend the empirical research, which may focus on using alternative indicators, representing different functions of the domestic financial system in LDCs.

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APPENDIX I: LIST OF VARIABLES USED IN THE ANALYSIS (sections 3 and 4)

AIDGDP = development aid as a percentage of GDP
BANKL = bank and trade related lending as a percentage of GDP
BMP = black market premium, calculated as (black market rate/official rate)-1.
CIVLIB = index of civil liberties
CREDITPR = credit to the private sector as a percentage of GDP
DEBTGDP = the external debt to GDP ratio
DEBTS = total external debt service as a percentage of GDP
EINFL = uncertainty with respect to inflation
EGOVC = uncertainty with respect to government expenditures
EXPGDP = exports of goods and services as a percentage of GDP
FDI = foreign direct investment as a percentage of GDP
GDPPC = GDP per capita in 1970
GOVCGDP = government consumption as a percentage of GDP
INFL = the annual inflation rate
INVGDP = average investment to GDP ratio over 1970-1995 period
MGDP = average money and quasi money to GDP ratio over the 1970-1995 period
PCGROWTH = average real per capita growth rate over 1970-1995 period.
PRIGHTS = index of political rights
SECENR = secondary school enrolment rate in 1970
STDINFL = the standard deviation of the annual inflation rate, calculated from the inflation figures
TRADE = exports plus imports to GDP; measure of the degree of openness

The source for all variables is World Bank (1997), which is available on CD-ROM, except for *BMP, CIVLIB* and *PRIGHTS*. These variables are obtained from the data set created by Barro and Lee (1994). Moreover, *EINFL* and *EXPGDP* have been calculated by the authors (see below). The variables from

Barro and Lee (1994) refer to averages for the 1970-1990 period. Unless otherwise stated, all other variables refer to averages over 1970-1995 period. For all variables logarithmic transformations are used.

We need to explanation how the uncertainty variables *EINFL* and *EGOVC* have been constructed. Both variables are constructed by using the standard deviation of the unpredictable part of *INFL* and *GOVC*; see Bo (1999) for a survey of different methods to measure uncertainty. We first specify and estimate a forecasting equation to determine the expected part of *INFL* and *GOVC*. The standard deviation of the unexpected part of *INFL* and *GOVC* (*i.e.* the residuals from the forecasting equation) is used as a measure of uncertainty. We have used a second-order autoregressive process, extended with a time trend, as the forecasting equation:

$$P_t = a_1 + a_2 T + a_3 FDI_{t-1} + a_4 FDI_{t-2} + e_t,$$

where P_t is the variable under consideration, T is a time trend, a_1 is an intercept, a_3 and a_4 are the autoregressive parameters and e_t is an error term. We estimate the above equation for all countries in the data set. By calculating the standard deviation of the residuals for the entire sample period for each individual country, we obtain the variables *EINFL* and *EGOVC*.

APPENDIX II: COUNTRIES IN THE DATA SET

Africa:
Algeria, Benin; Burkina Faso; Burundi; Cameroon; Cape Verde; Central African Rep.; Chad; Egypt; Gabon; Gambia; Ghana; Guinea-Bissau; Cote d'Ivoire; Kenya; Lesotho; Madagascar; Mali; Mauritania; Morocco; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; Somalia; Sudan; Swaziland; Togo; Tunisia; Zambia; Zimbabwe

South America:
Barbados; Costa Rica; Dominican Rep.; El Salvador; Guatemala; Haiti; Honduras; Jamaica; Mexico; Nicaragua; Panama; Trinidad and Tobago; Argentina; Bolivia; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela

Asia and others
Bangladesh; China; India; Malaysia; Nepal; Pakistan; Philippines; Sri Lanka; Syria; Thailand; Hungary; Malta; Fiji; and Papua New Guinea

Table 1: Descriptive statistics for per capita growth and FDI

	PCGROWTH	*FDI*
Mean	0.938	0.998
Median	0.529	0.693
Maximum	6.832	4.698
Minimum	-3.134	0.003
Standard Deviation	1.923	0.989
Skewness	0.719	1.824
Kurtosis	4.120	6.686

Table 2: Correlation matrix

	PCGROWTH	*LFDI*	*LSECENR*	*LINVGDP*	*LCREDP*	*LGDPPC*
PCGROWTH	1					
LFDI	0.21	1				
LSECENR	0.43	0.30	1			
LINVGDP	0.58	0.29	0.27	1		
LCREDP	0.48	0.38	0.53	0.52	1	
LGDPPC	-0.10	0.37	0.52	0.18	0.45	1

Table 3: Direct investment and economic growth

	1	2	3	4	5
LGDPPC	-1.182 (-5.15)	-1.238 (-5.29)	-1.318 (-5.39)	-1.180 (-5.20)	-1.247 (-4.98)
LSECENR	0.891 (4.47)	0.882 (4.45)	1.176 (5.20)	0.740 (3.75)	0.964 (4.09)
LCREDP	1.562 (4.12)	1.471 (3.97)	1.313 (3.47)	1.827 (4.59)	1.620 (4.02)
LFDI		0.156 (1.11)	-0.701 (-2.14)	-1.587 (-2.60)	-1.574 (-2.68)
*LFDI*LSECENR*			0.351 (2.89)		0.215 (1.69)
*LFDI*LCREDP*				0.621 (2.85)	0.429 (1.86)
C	1.376 (1.01)	2.127 (1.47)	2.253 (1.58)	0.943 (0.60)	1.386 (0.85)
R^2	0.46	0.46	0.50	0.51	0.51
F	19.94	15.32	14.26	14.53	12.46

Dependent variable: *PCGROWTH.* Amount of observations in all regressions: 67.

Table 4: FDI and economic growth: effects via efficiency

	1	2	3	4	5
LGDPPC	-1.117 (-6.83)	-1.148 (-6.33)	-1.220 (-6.90)	-1.081 (-7.14)	-1.113 (-6.86)
LSECENR	0.868 (5.40)	0.863 (5.43)	1.106 (5.61)	0.706 (4.64)	0.805 (4.03)
LINVGDP	2.539 (5.56)	2.488 (5.55)	2.352 (4.82)	2.594 (5.60)	2.536 (5.25)
LCREDP	0.843 (2.46)	0.807 (2.40)	0.713 (1.99)	1.171 (3.23)	1.095 (2.86)
LFDI		0.085 (0.65)	-0.617 (-1.84)	-1.839 (-3.23)	-1.828 (-3.28)
*LFDI*LSECENR*			0.289 (2.29)		0.095 (0.807)
*LFDI*LCREDP*				0.685 (3.45)	0.599 (2.91)
C	-4.437 (-3.07)	-3.910 (-2.48)	-3.477 (-2.27)	-5.473 (-3.44)	-5.125 (-3.04)
R^2	0.59	0.58	0.61	0.64	0.63
F	24.43	19.47	18.00	20.40	17.36

Dependent variable: *PCGROWTH.* Amount of observations in all regressions: 67.

Table 5: Stability test

	NUMBER	R^2	*COEF*	*STERR*	*CDF*	*PERC*
Without *LINVGDP* in the base model						
LFDI	364	0.57	-1.348	0.544	0.993	1.000
*LFDI*LCREDP*	364	0.57	0.534	0.194	0.997	0.997
LFDI	1,001	0.58	-1.310	0.535	0.993	0.921
*LFDI*LCREDP*	1,001	0.58	0.519	0.192	0.997	0.983
With *LINVGDP* in the base model						
LFDI	364	0.72	-1.620	0.505	1.000	1.000
*LFDI*LCREDP*	364	0.72	0.615	0.173	1.000	1.000
LFDI	1,001	0.73	-1.528	0.500	1.000	1.000
*LFDI*LCREDP*	1,001	0.73	0.603	0.172	1.000	1.000

NUMBER denotes the number of equations tested.

Table 6: Relationship between FDI and growth and the role of the level of development of the domestic financial system

No positive effect of *LCREDP* on relationship between *LFDI* and *PCGROWTH*
AFRICA: Algeria; Benin; Burkina Faso; Burundi; Cameroon; Cape Verde; Central African Rep.; Chad; Gabon; Gambia;; Guinea-Bissau; Cote d'Ivoire; Kenya; Lesotho; Madagascar; Mali; Mauritania; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; Somalia; Sudan; Togo; Zimbabwe
LATIN AMERICA: Guatemala; Haiti
ASIA AND OTHER COUNTRIES: Nepal; Papua New Guinea
Positive effect of *LCREDP* on relationship between *LFDI* and *PCGROWTH*
AFRICA: Egypt; Ghana; Morocco; Swaziland; Tunisia; Zambia
LATIN AMERICA: Barbados; Costa Rica; Dominican Rep.; El Salvador; Honduras; Jamaica; Mexico; Nicaragua; Panama; Trinidad and Tobago; Argentina; Bolivia; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela
ASIA AND OTHER COUNTRIES: Bangladesh; China; India; Malaysia; Pakistan; Philippines; Sri Lanka; Syria; Thailand; Hungary; Malta; Fiji