



Determinants of Foreign Direct Investment in Developing Countries: A Panel Data Analysis

Abstract

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The aim of this paper is to explore, by estimating a panel data econometric model, the determining factors of foreign direct investment (FDI) inflows in developing countries over the period of 1990-2007. The study is based on a sample of panel data on 25 developing countries. In the model, dependent variable is FDI inflows. Independent variables are FDI outflows, GDP, BOP, population, openness of the economy, mobile, internet, technology, ODA and labor. According to the econometric results, in the main model, openness of the economy, market size, availability of labour force, ODA, mobile, technology and internet have positive effects on FDI inflows in developing countries.

Introduction

The marked rise of FDI inflows to developing countries since the early 1990s has prompted substantial empirical research into the underlying factors, for at least two reasons. First, FDI has become an important part of the domestic economy. Second, foreign investments played and still play a crucial role in the recipients' transition from centrally planned economies to market economies, providing substantial financial capital, technological know-how and managerial expertise. Yet the patterns of absolute and relative FDI inflows have been quite erratic, with respect to developing countries.

Therefore, an in-depth analysis of the factors determining FDI inflows is needed not only to understand these aspects but also to predict future patterns of FDI relating to these countries and provide policy makers with guidelines on how to improve FDI inflows. In addition it would be useful to evaluate FDI behavior in selected developing countries in relation to important determinants of FDI, which have been highlighted in previous studies.

Theoretical Background

There are many theories which attempt to explain the determinants of FDI. These theories are significant steps towards the development of a systematic framework for the emergence of FDI. However, the capacity of each to serve as a self contained general theory, which could explain all types of FDI (*i.e.*, outward as well as inward FDI at the firm, industry, and country level), has been questioned in the works of various scholars. Agarwal (1980), Parry (1985), Itaki (1991) can be given as examples. Dunning is one of the most referenced one by authors working on FDI. Dunning (1993) describes three main types of FDI based on the motive behind the investment from the perspective of the investing firm. The first type of FDI is called *market-seeking* FDI, whose aim is to serve local and regional markets. It is also called horizontal FDI, as it involves replication of production facilities in the host country. Tariff-jumping or export-substituting FDI is a variant of this type of FDI. Because the reason for horizontal FDI is to better serve a local market by local production, market size and market growth of the host economy play important roles. Obstacles to accessing local markets, such as tariffs and transport costs, also

encourage this type of FDI. A second type of FDI is called *resource-seeking*: when firms invest abroad to obtain resources not available in the home country, such as natural resources, raw materials, or low-cost labour. Particularly in the manufacturing sector, when multinationals directly invest in order to export, factor-cost considerations become important. In contrast to horizontal FDI, vertical or export-oriented FDI involves relocating parts of the production chain to the host country. Availability of low-cost labour is a prime driver for export-oriented FDI. Naturally, FDI in the resource sector, such as oil and natural gas, is attracted to countries with plentiful natural endowments. The third type of FDI, called *efficiency-seeking*, takes place when the firm can gain from the common governance of geographically dispersed activities in the presence of economies of scale and scope. In 1998, the World Investment Report, UNCTAD (1998) has analysed the determinants of FDI and host country determinants have been classified into the three groups. These are politic factors, business facilitation and economic factors. The absence of a generally accepted theoretical framework has led researchers to rely on empirical evidence for explaining the emergence of FDI.

Empirical Evidence

The literature examines a large number of variables that have been set forth to explain FDI. Some of these variables are included in formal hypotheses or theories of FDI, whereas others are suggested because they make sense instinctively. Most of the variables used in empirical studies appear in the UNCTAD's (1998) classification of the determinants of inward FDI. Regardless of the underlying hypothesis or the classification of these variables, existing empirical studies have considered different combinations of these variables with mixed results, not only with respect to the importance or otherwise of these variables (statistical significance) but in terms of the direction of the effect. In the literature, there are many determinants often cited in the econometric studies. In the following paragraphs, some of the determinants and their relations to FDI will be explained in the light of earlier studies.

Model and Estimation Methodology

The empirical analysis in this article is based on a sample of panel data on 25 developing countries. The relationship between FDI flows and its determinants is estimated by regressing the following equation.

$$fdi = \alpha_0 + \beta_1 outflows + \beta_2 gdp + \beta_3 bop + \beta_4 exim + \beta_5 pop + \beta_6 mob + \beta_7 net + \beta_8 ht + \beta_9 lab + \beta_{10} oda + \beta_{11} inflation$$

where *fdi* denotes FDI inflows; *outflows* denotes outflows of FDI; *gdp* stands for GDP per capita, which is a proxy for market size; *bop* denotes the Balance of Payment; *exim* denotes the openness of the economy, which is measured by Export and Import divided by GDP; *pop* shows the Population of the Country; *mob* indicates the number of mobile telephone, which measures mobile telephones per 1000 people and *net* denotes the number of internet users which is measured by the number of internet users per 1000 people are used as a proxy for the quality of infrastructure in the country; *lab* which is a proxy for available work force in a country, denotes labors in all sectors and finally *oda* stands for Official Development Aid (ODA).

Infrastructure covers many dimensions, ranging from physical assets such as roads, sea ports, railways, and telecommunications, to institutional development, such as accounting and legal services. In order to present an attractive setting for the operations of a multinational company (MNC), it is important that the country's infrastructure be sufficiently developed to support various activities to be carried out by the company. An indispensable condition for global competition among MNCs is the ability to link affiliates through adequate infrastructure facilities. A country may have low cost labor, but if it does not have the necessary supporting services or infrastructure MNCs will not locate in that country. Moreover, foreign investors also point to the potential for attracting significant FDI if host governments permit more substantial foreign participation in the infrastructure sector. Jordaan (2004) claims that good quality and well-developed infrastructure increases the productivity potential of investments in a country and therefore stimulates FDI flows towards the country. According to Asiedu (2002) and Ancharaz (2003), the number of telephones *per* 1,000 inhabitants is a standard measurement in the literature for infrastructure development. However, according to Asiedu, this measure falls short, because it only captures the availability and not the reliability of the infrastructure. Furthermore, it only includes fixed-line infrastructure and not cellular (mobile) telephones. There are varieties of factors which can determine infrastructure in a country but because of lack of data only three variables called **internet, mobile and technology** have been selected. The number of mobile telephone, which measures mobile telephones per 1000 people, and the number of

internet users which is measured by the number of internet users per 1000 people are used as a proxy for the quality of infrastructure in the country. Countries with good telecommunications infrastructure tend to have similar quality in other facilities such as rail, roads, and the internet. Furthermore, high technology exports which is measured as a percentage of manufactured exports has been considered in order to show the application of technology in infrastructure.

A higher **GDP per capita** of residents of a country indicates a higher effective demand for the kinds of goods and services produced by MNCs. Thus, it is expected that the inflow of FDI per capita will be positively related to the purchasing power of local consumers. The FDI literature suggests that a host country's economic health, namely, its economic size and growth rate is important in determining a country's FDI inflows (Tsai, 1994).

The literature indicates that the key locational factors determining FDI are country's market size, input costs — notably of natural resources and labor — and openness of an economy (see e.g. Singh and Jun (1995); Culem (1988)). Market size, typically measured by host country **Gross Domestic Product (GDP)** captures potential economies of large-scale production. In the transition context, survey evidence suggests that most firms invested in search of new market opportunities (Lankes and Venables (1996)), which can also be related to absolute market size. The annual real GDP growth rate is used as an indicator of future market potential. A positive relationship between GDP Growth and FDI is expected in this study. It is also hypothesized that foreign investors look beyond the current market size and take into account the future growth potential of the market.

Higher **FDI outflow** may also enhance the capability of the home country in undertaking FDI inflow (Banga, 2007) with a lag, by enhancing the flow of non-debt private capital and technological and managerial skill, creating domestic employment through backward linkage effects and also by building up the foreign exchange reserves of the country. Thus, **FDI inflows** and outflows could be complementary. On the other hand, it may be a plausible theoretical proposition to argue that entry of foreign firms represented by FDI inflows increases competition in the domestic market, which in turn

forces domestic firms to seek additional markets through exporting and FDI outflow. It is therefore topical to get an insight into the effect of FDI outflows into corresponding inflows.

It is also widely argued that FDI and **openness of the economy** will be positively related (see Caves (1996); Singh and Jun (1995)). This in part proxies the liberality of the trade regime in the country and in part the higher propensity for multinational firms to export and import. Therefore the degree of openness of the country can be measured by its Export and Import both divided by GDP. While, determinates of **BOP** can be the country's exports and imports of goods, then we can conclude that BOP can be correlated to FDI too.

Expected profitability will also be higher if inputs costs, most notably labor, energy and raw materials costs, are lower than in the donor economy. For most of the transition economies, the key resource is **labor**, which is regarded as having relatively high levels of skills and training (in comparison for example to regions with comparable per capita income levels in South East Asia or Latin America) and a strong scientific base (see EBRD (1999)). This aspect indicates the inclusion of labor in the present analysis of FDI determinants.

Using **ODA** funds is very crucial to improve the domestic investment climate in developing countries, specifically by targeting ODA to ensure the development of the social sectors, economic infrastructure, and by accelerating regional integration and liberalisation. In addition, ODA funds would be essential to assist the development of a Global Investment Exchange. This would identify and accredit intermediary organisations, which can screen FDI projects for sustainability and commercial viability.

Population: All else equal, greater labor availability should attract FDI, notably, export-oriented FDI. In the case of developing countries, abundance of unskilled workers should result in labor-seeking multinationals investing in these countries. Consequently, we should observe a positive relationship between population and FDI.

To understand the expected sign of each variables and their sources the table 1 has been made

Table 1: Variable Names, Definitions and Data Sources

Variable name	Definition	Source	Expected Sign
Inflows	Total FDI inflows, US \$ at current prices in millions	1	Positive
Outflows	Total FDI outflows, US \$ at current prices in millions	1	Positive
BOP	Balance of Payment in Billion of US \$	1	Positive
GDP per capita	GDP is expressed in current U.S. dollars per person. Data are derived by first converting GDP in national currency to U.S. dollars and then dividing it by total population.	1	Positive
Openness of the Economy	Export plus Import divided by Gross Domestic Product, Current Price in US Billion \$	1	Positive
Population	The number of people who were living at that country in that year	1	Positive
Labour	Total labour force, both sexes	1	Positive
Mobile	Mobile cellular subscriptions (per 100 people)	3	Positive
Internet	Internet users (per 100 people)	3	Positive
Technology	High-technology exports (% of manufactured exports)	3	Positive
ODA	Total Official Development Aid net, US \$ at current prices in millions	2	Positive
Inflation	Inflation at average consumer prices	1	Negative

1. IMF data bank online

2. OECD.org

3. World Bank database online

In an attempt to determine the determinants of FDI, in this study the panel data techniques has been employed. The use of panel data techniques allows us to determine the temporal evolution of groups of countries rather than analyzing the temporal behaviour of each of them. This technique takes into account the individual heterogeneity, allows a larger number of data points and improves the efficiency of the estimates.

Before the analyzing our panel data check for unit root is necessary to ascertain the stationary data series. A variety of procedures for the analysis of unit roots in a panel context have been developed¹. Here we make use of IPS test developed by Im, Pesaran and Shin (2003). IPS using the likelihood framework, suggested a new more flexible and computationally simple unit root testing procedure for panels (which is referred as t-bar statistic), that allows for simultaneous stationary and non stationary series (Barbieri, Laura 2006). The results of IPS method have been showed in tables 2.

¹ There are number of panel unit root test. One of the first unit root test to be developed for panel data is that of Levin, Lin, and Chu (2002) and the second one is that of Hadri (2000). Both test assume that the autoregressive parameters are common across section unites, while Levin, Lin and chu (2002) uses a null hypothesis of unit root and Hadri (2000) uses a null of no unit root. Unlike Levin, Lin and Chu test, Hadri test is applicable to small-T, large-N panels. A third test is referred to as the IPS test developed by IM, Pesaran and Shin (2003). In this test the null hypothesis is that of a unit root, where this test is applicable to sufficiently large T and N.

Table 2. Results of Panel Unit Root Test for Developing Countries (Im, Pesaran and Shin)

Variables	Level		1 st differences	
	Statistic	Probability	Statistic	Probability
Inflows	5.3612	1.0000	-3.7895	0.0001
Outflows	8.4448	1.0000	-2.9085	0.0018
BOP	2.8094	0.9975	-5.600	0.0000
GDP	8.3129	1.0000	-1.3516	0.0883
EXIM/GDP	1.6609	0.9518	-2.3513	0.0094
Inflation	0.5744	0.7172	-7.9893	0.0000
Mobile	14.4643	1.0000	-4.6361	0.0387
High Tech	5.3991	0.9912	-4.3419	0.0671
Internet	13.1453	1.0000	-3.4935	0.0202
High Technology	1.6801	0.9535	-10.4868	0.0000
Population	4.3571	1.0000	-26.6574	0.0000
ODA	3.4371	0.9768	-3.2372	0.0467

After making all the series stationary then the panel data has been used. Panel data may have group effects, time effects, or both. These effects are either fixed effect or random effect. A fixed effect model assumes differences in intercepts across groups or time periods, whereas a random effect model explores differences in error variances. The Hausman specification test² compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). If correlated (H0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; so a fixed effect model is preferred. Hausman's essential result is that the covariance of an efficient estimator with its difference from an inefficient estimator is zero (Greene 2003). When we performed the Hausman test specification for different classification (Inflows for Developing Countries), the test recommended the use of fixed effects model.

² The Hausman specification test is the classical test of whether the fixed or random effects model should be used. The research question is whether there is significant correlation between the unobserved person-specific random effects and the regressors. If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation, the random effects model would be inconsistently estimated and the fixed effects model would be the model of choice.

Table 3. Estimation Results of Panel Method of FDI Inflows for Developing Countries Using Fixed Effect Models.

Dependent Variable = Inflow		
Developing Countries		
	Coefficient	P Value
Intercept	-21055.7 (2013.6)	0.000
Outflows	0.334 (0.100)	0.738
BOP	-8.714 (14.548)	0.550
EXIM	3.762 (2.095)	0.074*
POP	-74.514 (30.93)	0.000***
GDP Per Capita	1.047 (0.192)	0.000***
Mobile	70.107 (25.329)	0.006***
High Tech	61.769 (2.873)	0.032*
Internet	38.153 (64.210)	0.032**
Labour	0.8221 (0.646)	0.000***
Inflation	-56.875 (20.123)	0.567
ODA	1.217 (0.224)	0.000***
Overall R ²		0.6237
Obser.		331

Note: *, ** and *** indicate 10%, 5% and 1% level of significant respectively.

Results

The result shows that openness of the economy, market size, availability of labour force and also ODA have positive effects on FDI inflows in developing countries. In addition, mobile, technology and internet as a proxy of infrastructure turned out to be positive; therefore, this result shows that investors are attracted to a country with better infrastructure. However, high population rate come out to have negative effect on FDI inflows in these countries.

Conclusion

As it has been observed openness of the economy has the positive relation with FDI inflows in developing countries. It is quite obvious that open economies will smooth the path for export and as well as import and since FDI inflows is flowing to those countries

because of lesser barrier, therefore, openness of the economy can be considered as an important determinants of FDI in developing countries. High rate of population can be an obstacle for development in developing countries because of its cost which imposes on government especially while the qualities of these populations in developing countries are low. As a result of that it affects the economic phenomena such as FDI. Nowadays, some developing countries appear to have the biggest markets in the world (China and India) which can captures potential economies of large-scale production. Bigger market induces higher effective demand for the kinds of goods and services produced by MNCs. Therefore, **market size** too is an important element in determining both FDI inflows for developing economies as the results proved this fact. The positive sign of infrastructure in developing countries

indicates that good quality and well-developed infrastructure increases the productivity potential of investments in a country and therefore stimulates FDI inflows towards the country.

Positive sign of labor for developing countries FDI inflows proves that for most of the developing economies, the key resource is **labor**, which is regarded as having relatively high levels of skills and training and a strong scientific base thus the positive sign of labour lays behind of this logic.

And finally the effect of **ODA** on FDI inflows in developing countries is significant and positive. This result shows that ODA funds is very crucial to improve the domestic investment climate in developing countries, specifically by targeting ODA to ensure the development of the social sectors, economic infrastructure, and by accelerating regional integration and liberalisation. In addition, ODA funds would be essential to assist the development of a Global Investment Exchange. This would identify and accredit intermediary organisations, which can screen FDI projects for sustainability and commercial viability.

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