Push Factors of Outward FDI—A Cross-Country Analysis of Developed and Developing Countries

Indrajit Roy and K. Narayanan

1 Introduction

Numerous theories attempted to explain the determinants of outward foreign direct investment (OFDI). MNEs spread out their activities in overseas locations for multiple reasons such as the exploitation of economies of scale/scope; the use of firm-specific advantages (Hymer 1960) often due to a life-cycle pattern of their products (Vernon 1966) to avoid contracting problems and associated transactions costs (Coase 1937; Teece 1986). Companies prefer internal transaction rather than arm's length market transactions, i.e. internalisation advantages (Dunning 1981) for these reasons. Literature also suggests various institutional factors such as macroeconomic economic factors of a country or push factors that cause OFDI. The main motives behind FDI decision of enterprise (Behrman 1972; Dunning and Lundan 2008) are market-seeking, resource-seeking, efficiency-seeking and strategic asset-seeking.

Several empirical studies (Barry et al. 2003; Kimino et al. 2007; Kumar 2007; Kyrkilis and Pantelidis 2003; Tolentino 2008) have examined push factors of OFDI in a panel data set-up using ordinary least square (OLS) method of regression. These factors may influence OFDI of varied magnitude depending on whether reference country is developed or developing countries. Also, there are issues when effects are estimated based on OLS model. OLS-based model focuses on the average/mean as a measure of location of the distribution; therefore, information about the tails and other parts of the distribution are ignored. Additionally, OLS is sensitive to extreme values (outliers), which can at times significantly distort the results. As a result, sometimes macroeconomic variables, based on OLS regression which is considered

I. Roy (✉)
Reserve Bank of India, Mumbai, India
e-mail: iroy@rbi.org.in

K. Narayanan
Department of Humanities and Social Sciences, Indian Institute of Technology Bombay, Mumbai, India
e-mail: knn.iitb@gmail.com

having significant (positive/negative) influence on OFDI, may not necessarily be true as the effects may be insignificant or very different (intensity and direction) for some segments (e.g. higher/lower strata) of FDI distribution. Quantile regression technique on the other hand attempts to explain the complete description of the conditional distribution (rather than only conditional mean analysis as in OLS), i.e. how the median, or may be 25th or 75th percentile of the dependent variable, are affected by explanatory variables.

This paper examines the association of select macroeconomic variables with the aggregate outward FDI of a country (i.e. 'home country'[1] determinants or 'push factors'[2] for OFDI) based on country-level panel data comprising a set of 'developed economies'[3] (G7[4] and other developed countries[5]) and 'emerging market economies' or developing economies[6] (BRICS[7] and other EME[8]s) using quantile regression. Specifically, the study aims to analyse the set of determinants for inter-country differences in OFDI. This study uses time series data of annual frequency for 36 developed and developing countries (which account for around 85% of total OFDI and 75% of total IFDI) for the period 1996–2013. The data are drawn from IMF, World Bank and UNCTAD databases.

Brief literature survey on FDI and push factors are discussed in Sect. 2. Methodology and empirical model specifications are discussed in Sect. 3. Empirical results are presented in Sect. 4, and finally a summary of findings is presented in Sect. 5.

2   Survey of Literature

Hymer (1960) observed that many enterprises invest as well as borrow from abroad and there are substantial cross movements of resources internationally within few selected industries. Also, capital was mostly transferred from developed countries to

---

[1] 'Home country' refers to parent or originating country of a company who have initiated outward FDI, whereas 'host country' refers to country of destination.

[2] 'Push factors' refers to domestic factors or determinants from Home country's perspective.

[3] 'Developed economies' refers to set of countries with high GDP, low inflation, high per capita income, higher life expectancy, high level of literacy and skilled manpower.

[4] G7 refers to front runners among the developed economies, viz. Canada, France, Germany, Italy. Japan, UK and USA.

[5] Other_Dev is set of developed countries (excluding G7 countries), viz. Australia, Austria, Belgium, Denmark, Finland, Ireland, New Zealand, Norway, Spain, Sweden and Switzerland).

[6] 'Emerging market economies' (EMEs) refer to set of countries with roughly 80% world population and constitute 20% world economies and which are progressing towards becoming advanced with faster GDP growth, low or middle per capita income, with lower level of literacy as well as skilled manpower. EMEs are in between of developed economies and frontier or least developed economies.

[7] BRICS refers to Brazil, Russia, India, China and South Africa which are front runner among the EMEs.

[8] Other_EMEs: Mexico, Thailand, Bangladesh, Bulgaria, Colombia, Ghana, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Turkey and Uruguay.

developed countries and not to less developed countries—these phenomena could not be explained by capital arbitrage theory. Hymer (1960) argues that firms engaging in international operations must possess ownership advantages (such as lower-cost factors; know-how skills; distributional and marketing advantages; expertise in product differentiation, etc.), which is sufficient to offset the disadvantages (i.e. 'liability of foreignness' due to information costs; exchange rate risks; and government restriction on type of activities and discrimination against foreigners including risk of expropriation of assets) they faced in competing with local firms in the host country. Hymer's hypothesis forms the basis of other explanations for determinants of FDI such as transactions costs and internalisation theories.

Johanson and Vahline (1977) followed behavioural theory and introduced Uppsala model which focuses on gradual internationalisation of firms through different stages. The model explains how firms gradually increase their activities in foreign markets which begin with occasional exports orders that are followed by regular exports and subsequently by foreign production. The model focuses on the gradual acquisition of knowledge about foreign markets and operations, and thereby gradually increases their commitments to foreign markets. By way of incremental learning, firms gain experience and expand their business into markets with greater 'psychic distance' (idiosyncratic differences), including geographical distance (Hashai and Almor 2004). Therefore, the internationalisation progresses are stepwise process and at a relatively slow pace because of local market regulations and organisational learning. At the same time, the level of commitment to foreign market may also decrease or even end, if the performance and prospect are not sufficiently met. While the Uppsala model posits that the internationalisation process of a firm is based on incremental learning, recent studies have shown that new firms especially from the emerging markets with little experience on foreign markets quickly penetrate and integrate with other foreign markets (these firms are termed as 'Born global' into the literature (Hashai and Almor 2004).

The eclectic paradigm, also known as OLI paradigm, was developed by Dunning (1988, 2001). OLI paradigm is a combination of three factors, i.e. ownership (O) advantage (industrial organisation theory), location (L) advantages (international immobility of some factors of production) and internalisation (I) advantage (transaction cost economics) which explain different types of FDI. A firm should possess some sort of comparative advantage over other firms in the host country, and the firm believes that it would gain immensely by internalisation of these assets. This implies that an internal expansion is preferred instead of depending on market (e.g. license agreement with another firm). The ownership advantage of the firm can be better exploited when it is combined with the favourable factor inputs located in the host country. OLI theory postulates FDI as a means for companies to leverage ownership, in attractive locations, by way of internalizing assets to gain competitive advantage which would imply that firms to invest abroad at the same or lower level of development to reap the benefit (i.e. AE to AE, AE to DE, DE to DE). Therefore, OLI theory has been criticised as it is based on the MNEs from developed countries and fails to explain the new wave of OFDI especially the cases when EM MNEs, which do not have those 'O' advantages are not waiting to gain experience or assets

but undertake OFDI activities to the developed markets and taking aggressive steps (such as M&As) to gain those advantages (Rugman and Li 2007).

Dunning (1981, 1988) and Dunning and Narula (1996) developed investment development path (IDP) hypothesis which argues that a country's net outward direct investment position is systematically related to its level of economic development. According to IDP model, countries evolve through five stages of investment development. Stage-1 of IDP is related to pre-industrialisation period and characterised by insufficient location advantages or attractiveness for foreign capitals (small domestic markets, inadequate infrastructure, scarcity of skilled labour force and underdeveloped legal frameworks). Domestic companies are not competent enough to internationalise their activities. In this phase of development, inward and outward FDI flows to the country are almost non-existent. In stage-2 of IDP, government policies facilitate the development of certain location-specific advantages, which in turn attract inward foreign direct investment. But as domestic firms lack ownership advantages, very little outward investment may be possible at this stage of development. As a result, net investment position will become increasingly negative. Domestic companies will take time to accumulate the firm-specific assets which will eventually enable them for OFDI (Caves 1971; Dunning 1988). In stage-3 of IDP, inward FDI diminishes, however, over the time, 'learning-by-doing' will help in improving competitiveness of domestic companies and outward FDI will emerge. As a result, net FDI stock position will start improving, although continue to be in the negative region. Stronger domestic companies will be more competitive in the home market and may engage in market/strategic asset-seeking investment in developed countries, whereas resource-seeking OFDI will be destined to the developing countries. In stage-4 of IDP, OFDI increases further and eventually turn countries into net outward investors. In stage-5 (added subsequently, Dunning and Narula 1996), the net investment position of such countries will revolve around zero depending on the short-term evolution of exchange rates and economic cycles. IDP curve may vary widely across individual countries due to specific economic structures (market size, availability of natural resources), the type of FDI undertaken and government policies.

3   Push Factors of OFDI

Various determinants examined in this study and associated hypotheses are described below:

3.1   *Home Country—Market Conditions*

Market size of a country is reflected in its gross domestic products (GDP). Incidentally, at times, even country with smaller GDP may enjoy advantage of a larger market because of their membership to customs union like EU. Generally, a high

level of GDP is indicative of large market size and companies by way of serving to a large market (economies of scale) develop certain competence (ownership advantage) which they can use to their advantage for overseas expansion. Therefore, a company with large home market is likely to undertake investment at overseas locations. Therefore, a positive relationship between GDP and outward FDI is expected. Market demand or buying capacity of the consumer is reflected in per capita GDP of a country. In home country with low market demand condition, companies may not reap benefits of economies of scale and may initiate OFDI (Dunning 1981; Taylor 2002; Kyrkilis and Pantelidis 2003; Deng 2004; Buckley et al. 2007). Therefore, a negative relationship is expected between per capita GDP and OFDI. Share of services and manufacturing sector in overall GDP is also indicative of level of economic development of home country. Therefore, share of non-agriculture GDP (i.e. services GDP and manufacturing GDP combined) in overall GDP influences the quantum of OFDI.

3.2 Policy Variables

FDI openness of the home country is expected to have positive influence on OFDI. A more liberal and open FDI policy would induce domestic companies to shift investment abroad and thereby lead to a greater outward FDI (Dunning 1981; Buckley et al. 2007). Inward FDI (IFDI) stock of a country is also indicative of liberal policy as well as technology advancement (direct and spill over) of a country and may influence OFDI. Therefore, a positive relationship is expected between IFDI and OFDI. Trade openness of home country is generally measured as trade (exports + import) to GDP ratio. Empirical studies suggest that expansion of trade activities enables domestic firms to acquire knowledge about foreign markets and therefore develop certain expertise for foreign operations and marketing of their products and thereby facilitate them to establish operations abroad (Johanson and Vahlne 1977; Buckley et al. 2007; Goh and Wong 2011; Kyrkilis and Pantelidis 2003). Therefore, positive relationship is expected between trade openness of home country and its OFDI.

3.3 Economic Variables

Interest rate in home country is also assumed to influence OFDI. Low interest rate implies abundance of capital, and therefore, opportunity cost of capital reduces. As a result, firms with abundant capital may look for more profitable avenues in foreign countries, especially in capital-intensive sector (Krykilis and Pantelidis 2003). Therefore, negative relationship is expected between interest rate of home country and its OFDI. Exchange rate of home country if it appreciates (strengthen), foreign currency denominated assets at host becomes cheaper for firms' from home country's

perspective. Therefore, appreciation of exchange rate of home country with respect to host country lowers the capital requirements (in domestic currency) of MNEs for foreign investment therefore encourage OFDI (Blonigen 1997; Buckley et al. 2007). Moreover, an appreciation in exchange rate makes exported goods more expensive to foreign buyers, therefore makes exports less competitive. As a result, appreciation in exchange rate makes OFDI a relatively cheaper option to domestic companies for servicing foreign market.

3.4   Production Factors

Technological capability of a company provides ownership advantages, and the company can capitalise it by investing to other countries (Lall 1980; Clegg 1987; Grubaugh 1987; Pearce 1989; Kogut and Chang 1991; Dunning 1993). Therefore, efforts and policy towards capacity building of technology absorption/diffusion is important, and also certain technology obtained from developed countries may not be suitable in the emerging economies and thereby necessitate indigenous innovations (Lall 2001; Girma 2005; Li 2011; The World Bank 2008; Fu et al. 2011). This suggests that developing countries that put greater efforts in indigenous technological innovation are more likely to benefit out of international technological diffusion thus facilitate a greater level of internationalisation through OFDI. Research and development expenditure (% of GDP) is considered as a proxy for the technology capability of the home country, and a positive relationship is expected with OFDI.

3.5   Governance, Corruption and Outward FDI

In general, MNEs are corruption averse and the least corrupt countries may attract more FDI because they provide a more favourable climate for investors. Castro and Nunes (2013) investigate the impact of corruption on FDI inflows in 73 countries, over the period 1998–2008, and observed that countries where corruption is lower, the FDI inflows are greater. Hence, perception of heightened corruption and various other weak governance indicators at home also drive investment out of home country, especially in developing economies.

Based on the worldwide survey on governance, where respondents are public, private, and NGO sector experts, Worldwide Governance Indicators (WGI) project presents cross-country measure of the Control of Corruption index (captures perceptions of corruption including both petty and grand forms of corruption), political stability and absence of violence (measures perceptions of likelihood of social unrest, terrorism, violent demonstrations and security risk rating, etc.), the Government Effectiveness index (captures the quality of bureaucracy, the competency of civil servants and government's commitment to policies), the rule of law index (captures enforceability of contracts and the effectiveness of judiciary), the regulatory

Table 1 WGI Governance—correlation coefficients among sub-indicators

Correlation (2016)	Voice and accountability	Political stability and absence of violence	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Voice and accountability	1.00	0.69	0.69	0.93	0.92	0.95
Political stability and absence of violence		1.00	0.69	0.65	0.76	0.74
Government effectiveness			1.00	0.93	0.94	0.91
Regulatory quality				1.00	0.95	0.87
Rule of law					1.00	0.95
Control of corruption						1.00

quality index (measures price controls, inadequate bank supervision and perceptions of burdens imposed by excessive regulations such as foreign trade, business development, etc.) and voice and accountability (captures different aspects of political process, civil liberties and independence of the media.). The units of aggregate governance indicators follow standard normal distribution with zero mean and unit standard deviation, ranging from −2.5 (weak) to 2.5(strong). These six indicators are highly related (Table 1).

3.6 Ease of Doing Business

World Bank's ease of doing business ranks countries according to the costs that firms face when operating in a country. A high ease of doing business ranking indicates the regulatory environment is more favourable to the starting and operation of a local firm. Ease of doing business is based on composed index of ten topics, viz. Starting a Business, Dealing with Construction Permits, Getting Electricity, Registering Property, Getting Credit, Protecting Minority Investors, Paying Taxes, Trading across Borders, Enforcing Contracts and Resolving Insolvency. These indicators are closely related (Table 2).

Table 2 Ease of doing business—subcomponents: correlation coefficients

Correlations	Starting a business	Dealing with construction permits	Getting electricity	Registering property	Getting credit	Protecting minority investors	Paying taxes	Trading across borders	Enforcing contracts	Resolving insolvency
Starting a business	1.00	0.54	0.47	0.53	0.39	0.56	0.52	0.47	0.51	0.56
Dealing with construction permits		1.00	0.55	0.52	0.31	0.43	0.55	0.49	0.50	0.40
Getting electricity			1.00	0.58	0.41	0.52	0.55	0.59	0.59	0.58
Registering property				1.00	0.49	0.54	0.62	0.60	0.61	0.54
Getting credit					1.00	0.56	0.35	0.40	0.35	0.50
Protecting minority investors						1.00	0.49	0.45	0.52	0.63
Paying taxes							1.00	0.57	0.57	0.51
Trading across borders								1.00	0.54	0.62
Enforcing contracts									1.00	0.48
Resolving insolvency										1.00

4 Methodology

4.1 Empirical Model Specification and Data Description

This study uses time series data of annual frequency of 36 developed and developing countries (which account for around 85% of total OFDI and 75% of IFDI) for the period 1996–2013. The data are drawn from IMF, World Bank and UNCTAD databases.

Hypothesis 1 Outward FDI of a country is positively associated with its market size.

Hypothesis 2 Outward FDI is negatively associated with the market demand as measured by per capita GDP of home country.

Hypothesis 3 Outward FDI is positively associated with economic development of home country.

Hypothesis 4 Outward FDI is positively associated with degree of trade openness of home country.

Hypothesis 5 Outward FDI of a country is positively associated with its inward FDI.

Hypothesis 6 Outward FDI is negatively associated with real interest rate of home country.

Hypothesis 7 Outward FDI is positively associated with real effective exchange rate of home country.

Hypothesis 8 Outward FDI is positively associated with home country's technological efforts (share of R&D expenditure in GDP)

Hypothesis 9 Outward FDI is positively associated with share of ores and metals import in overall imports.

Hypothesis 10 Outward FDI is positively associated with ICT goods imports (% total goods imports).

4.2 The Basic Panel Regression Model

$$Y_{it} = \sum_{j=1}^{k} b_j Z_{it}^j + a_i + e_{it} \tag{1}$$

where Y_{it} represents OFDI of ith country for the 't'th year; $Z_{it}^j (j = 1 \ldots k)$ is the selected (jth) macroeconomic determinants pertaining to 'i'th country for 't'th year; a_i is the unobserved effects due to country heterogeneity; b_i is unknown coefficient; and e_{it}'s are independently (over time 't' as well as across country indexed on 'i') and identically normally distributed error process with mean zero and variance σ_e^2.

A special case of model (1) would be obtained if group heterogeneity was zero or negligible. In such case, a_i's, (for all i) are equal and the model would be estimated by pooled regression as

$$Y_{it} = \sum_{j=1}^{k} b_j Z_{it}^j + a + e_{it} \qquad (2)$$

Generally, model (1) would give a better fit over model (2), which can be tested by the usual F-statistics on exclusion principle. Least square dummy variables (LSDV) technique is used to estimate group heterogeneity in model (1).

The LSDV model with k countries can be estimated as

$$Y_{it} = \sum_{j=1}^{k} b_j Z_{it}^j + \eta + \eta_2 D_{2t} + \eta_3 D_{3t} + \cdots + \eta_k D_{kt} + e_{it} \qquad (3)$$

where D_{it} assumes a value 1 for all observations pertaining to ith country and assumes a value 0 for all other country, $i = 2, 3,\ldots, n$.

Model (3) is the re-expression of model (1) by assuming $a_1 = \eta$ and $a_i = (a_1 + \eta_i)$, $i = 2,3, \ldots , n$. Thus, model (3) considers first country as the base country with effect $a_1 = \eta$ on Y_{it}, and η_i represents the incremental effect of ith country over the base country, $i = 2, 3,\ldots, n$. In the absence of any country-level heterogeneity, $\eta_2 = \eta_3 = \cdots = \eta_n = 0$. This hypothesis can be tested in model (3) using F-statistics based on exclusion principle/restrictions.

We investigate determinants of OFDI using quantile regression model (similar to LSDV model). Further, it is unlikely that the drivers of outward FDI are the same across all developing countries—the panel estimation helps us to overcome this limitation as it accommodates for country and time effects separately. Here, instead of using all individual countries as dummies, we group the countries based on level of economic development and use these groups as dummies, viz. seven highly industrialised countries (G7); other advanced countries (other_developed); among developing economies five countries which are progressing at relatively faster pace, i.e. BRICS countries—Brazil (BRA), Russia (RUS), India (IND), China (CHN) and South Africa (ZAF); and other developing counties (eme_others). Also, we use time trend dummies (Trend). We test statistical significance of ten OFDI determinants for 36 countries during 1996–2013. Data for certain variables are missing for some country/year combination, and as a result, if all variables are included in the same regression equation, number of observations become less than half as compared to the average number of observations available when we test the significance of an

individual determinant. Further, as determinants are correlated of various degrees, multicollinearity poses a problem. Therefore, we first test the significance of each determinant individually and thereafter test the effect of all determinants together on OFDI.

$$
\begin{aligned}
\text{LOFDI}_{it} = {}& \alpha + \beta_1 * \text{Trend}_{it} + \beta_2 * \text{BRA} + \beta_3 * \text{RUS} + \beta_4 * \text{IND} \\
& + \beta_5 * \text{CHN} + \beta_6 * \text{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \text{Other\_developed}_{it} \\
& + \beta_9 * \text{Factor}_{it}^k
\end{aligned}
\tag{4}
$$

$$
\begin{aligned}
\text{LOFDI}_{it} = {}& \alpha + \beta_1 * \text{Trend}_{it} + \beta_2 * \text{BRICS} + \beta_3 * \text{DEV}_t + \beta_4 * \text{LGDP} \\
& + \beta_5 * \text{LGDP\_PC} + \beta_6 * \text{LNAGDP} + \beta_7 * \text{LIFDI} \\
& + \beta_8 * \text{LRDG} + \beta_9 * \text{LOMI} + \beta_{10} * \text{Lint\_rate}
\end{aligned}
\tag{5}
$$

where 'i' denotes country, and 't' denotes year. The dependent variable LOFDI_{it} is log of Outward FDI (USD, million, current prices) of 'i'th country in 't'th year. Selected factors (all are log transformed). α: intercept; Trend: time trend (year); BRA: dummy variable for Brazil (i.e. 1 for record pertaining to Brazil and 0 for others). RUS, CHN, IND, ZAF, G7, BRICS, Dev and Other_Dev are also dummy variables pertaining to Russia, China, India, South Africa, G7 group of countries, BRICS countries, developed countries and other developed countries. LGDP: Log of nominal GDP; LGDPPC: Log of GDP per capita; LTrade: Log of Trade; LREER: Log of REER; LRDG: Log of R&D growth; LICI: Log of ICI; LOMI: Log of OMI; LIFDI: Log of Inward FDI; LNAGDP: Log of non-agriculture GDP of the country corresponding to log of OFDI stock (as dependent variable) of country concern (Table 3).

Table 3 Push factors (determinants) of outward foreign direct investment

Push factors/determinants	Symbol
Nominal GDP (USD, million)	LGDP
GDP per capita, PPP (constant 2011 international $)	LGDP_PC
Inward FDI (USD, million, current prices)	LIFDI
Non-agriculture GDP (share of services and manufacturing GDP)	LNAGDP
Real effective exchange rate	LREER
Trade (% of GDP)	LTRADE
Nominal interest rate (%)	LINT_rate
ICT goods imports (% total goods imports)	LICT
Research and development expenditure (% of GDP)	LRDG
Ores and metals imports (% of merchandise imports)	LOMI

Model (4) is to test the individual determinants without taking into consideration of other determinants. Model (5) takes into consideration of all identified determinants together.

Model 1 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{Nominal\ GDP})_{it}$

Model 2 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{GDP\ per\ capita})_{it}$

Model 3 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{Trade})_{it}$

Model 4 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{REER})_{it}$

Model 5 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{Intrate})_{it}$

Model 6 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{RDG})_{it}$

Model 7 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{ICI})_{it}$

Model 8 : $\mathrm{LOFDI}_{it} = \alpha + \beta_1 * \mathrm{Trend}_{it} + \beta_2 * \mathrm{BRA} + \beta_3 * \mathrm{RUS} + \beta_4 * \mathrm{IND}$
$+ \beta_5 * \mathrm{CHN} + \beta_6 * \mathrm{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \mathrm{Other\_developed}_{it}$
$+ \beta_9 * \log(\mathrm{OMI})_{it}$

Model 9 : $\text{LOFDI}_{it} = \alpha + \beta_1 * \text{Trend}_{it} + \beta_2 * \text{BRA} + \beta_3 * \text{RUS} + \beta_4 * \text{IND}$
$\quad + \beta_5 * \text{CHN} + \beta_6 * \text{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \text{Other\_developed}_{it}$
$\quad + \beta_9 * \log(\text{IFDI})_{it}$

Model 10 : $\text{LOFDI}_{it} = \alpha + \beta_1 * \text{Trend}_{it} + \beta_2 * \text{BRA} + \beta_3 * \text{RUS} + \beta_4 * \text{IND}$
$\quad + \beta_5 * \text{CHN} + \beta_6 * \text{ZAF}_t + \beta_7 * G_{it}^7 + \beta_8 * \text{Other\_developed}_{it}$
$\quad + \beta_9 * \log(\text{NAGDP})_{it}$

Model 11 : $\text{LOFDI}_{it} = \alpha + \beta_1 * \text{Trend}_{it} + \beta_2 * \text{BRICS} + \beta_3 * \text{DEV}_t + \beta_4 * \text{LGDP}$
$\quad + \beta_5 * \text{LGDP\_PC} + \beta_6 * \text{LNAGDP} + \beta_7 * \text{LIFDI} + \beta_8 * \text{LRDG}$
$\quad + \beta_9 * \text{LOMI} + \beta_{10} * \text{Lint\_rate}$

4.3 Quantile Regression

Quantile τ (ranging from 0 to 1) refers to a specified proportion of an ordered sample of a population, e.g. $\tau(0.5)$ is the median value. Distribution function $F_Y(y)$ of Y can determine the probability (τ) of occurrence of $Y = y$, whereas quantiles define exactly the opposite; i.e., for a given probability τ, it provides the corresponding value $y_\tau = F_Y^{-1}(\tau)$ of the sample data/distribution. The entire conditional distribution of the dependent variable Y can be characterised through different values of τ. For a given $X_i = x_i$, if the cumulative density function (CDF) for a conditional dependent variable Y is $F_{x_i}(y)$, then apart from mean $\mu_{x_i}(y)$, different quantiles $F_{x_i}^{-1}(\tau)$ of y can also be computed. OLS regression basically connects $\mu_{x_i}(y)$ across different values of X_i, whereas quantile regression for a given τ connects $F_{x_i}^{-1}(\tau)$, across different values of X_i, thereby it focuses on the interrelationship between the explanatory variable X_i and the dependent variable Y for different quantiles (Koenker 2005).

In OLS by focusing on the mean as a measure of location of the distribution, information about the tails and other parts of a distribution are ignored. Moreover, OLS is sensitive to extreme values (outliers) that can distort the results significantly. Sometimes, OLS estimates can even be misleading about the correct association between an explanatory and a dependent variable as it may be very different for different subsections (quantile) of the sample. Quantile regression explains complete description of the conditional distribution (rather than only conditional mean analysis as in OLS), e.g. how the median, or perhaps the 25th or 75th percentile of the dependent variable, are affected by the explanatory variables. There may be instances when a macroeconomic variable considered having positive influence on OFDI based on OLS-based regression; may not be the true for some segments (higher/lower strata) of OFDI distribution which may have, on the contrary, insignificant or even opposite effect.

5   Empirical Findings and Discussion

The correlation matrix of the variables used in this study is given in Table 4. Scatter plot is given in appendix. The regression results are given in Tables 5, 6, 7 and 8.

5.1   Examining Push Factors in a Univariate Setup

As discussed above, due to data issue (missing data for some determinants on some country/year and for other determinants data are missing for different set of country/year combination), and also to avoid multicollinearity issue, individual determinants are first tested for their significance using both OLS method and quantile regression technique with country/regions dummies (Eq. 4), and thereafter, all determinates are tested together (Eq. 5). Accordingly, using Eq. (4), ten determinants are tested (named as Model 1 to Model 10) and results are presented in Tables 5, 6, 7 and 8.

Model 1 regresses log of OFDI to country/region dummies and log of nominal **GDP**, and OLS estimates suggest that GDP is positively related to OFDI. Individual country-/region-specific differences are found to be significant. Intercept for base-level region (i.e. other EMEs except BRICS) is negative. Intercept for other countries/regions are also negative (intercept for base group added to individual country/region coefficient), and for India, intercept is lowest. Negative intercept in log–log model implies very small positive number. Therefore, Model 1 also reveals that in general for all countries under study, OFDI to GDP shares of all of the economies were low in the initial period and increased over time (as trend coefficient is positive) and initial value of OFDI to GDP (intercept term) is lowest for India followed by China. Quantile estimates also reveal similar relationship across different quantiles. The result supports Hypothesis 1 indicating that OFDI of a country is positively associated with its GDP.

Model 2 regresses log of OFDI to country/region dummies and log of 'GDP per capita'. OLS estimates suggest that 'GDP per capita' is positively related to OFDI. Individual country/region dummies are also found to be significant and higher for the emerging economies as compared to developed economies. Quantile regressions also indicate positive and significant relationship. However, for lower quartile (first quartile or 25th percentile), we observe estimated coefficient for log of per capita GDP (i.e. LGDPPC) is 3.48 which is lower than the coefficient observed for median (5.0) and third quartile (5.44). This implies that effect of per capita GDP on OFDI is not uniform, but it increases with OFDI volume. The result indicates that OFDI is positively associated with the market demand as measured by per capita GDP of home country and defies Hypothesis 2.

Model 3 investigates the relationship between OFDI with **trade openness**, and OLS estimate is positive and significant. Also, individual country-/region-specific dummies are positive and significant. Intercept for India is found to be lower than

Table 4 Correlation coefficient OFDI and determinants

	LOFDISTO	LNGDP	LGDPPC	LNAGDP	LTRADI	LIFDI	LINT_RATE	LREER	LRDG	LOMI	LICI
LOFDISTO	1										
LNGDP	0.83	1									
LGDPPC	0.65	0.30	1								
LNAGDP	0.51	0.36	0.53	1							
LTRADE	−0.14	−0.49	0.06	−0.10	1						
LIFDI	0.89	0.79	0.44	0.38	−0.07	1					
LINT_RATE	−0.57	−0.52	−0.45	−0.40	0.07	−0.40	1				
LREER	0.44	0.46	0.31	0.28	−0.15	0.43	−0.34	1			
LRDG	0.75	0.56	0.70	0.54	−0.06	0.53	−0.60	0.31	1		
LOMI	0.30	0.39	0.01	−0.07	0.02	0.12	−0.44	0.19	0.35	1	0.115701
LICI	−0.04	0.09	−0.24	−0.12	0.14	−0.02	−0.18	0.04	−0.09	0.12	1

Table 5 Results of LSDV Eq. (4) for 10 determinants: OLS regression for mean: coefficient (t-statistics)

Mean Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
C	−8.69*** (−18.03)	−11.98*** (−12.03)	3.58*** (6.54)	−11.4*** (−4.79)	8.54*** (19.62)	7.11*** (28.92)	2.35*** (6.77)	5.54*** (30.07)	−4.33*** (−17.13)	24.28*** (−7.33)
TREND	0.05*** (6.02)	0.1*** (10.92)	0.14*** (12.21)	0.11*** (8.85)	0.1*** (7.01)	0.15*** (11.54)	0.2*** (13.58)	0.14*** (12.34)	−0.02*** (−2.66)	0.14*** (12.88)
BRA	1.02*** (4.17)	3.18*** (10.89)	4.66*** (12.41)		5.19*** (12.5)	2.82*** (6.87)	3.83*** (10.8)	3.87*** (11.2)	1.11*** (5.77)	3.03*** (8.77)
RUS	1.44*** (6.1)	2.39*** (7.95)	4.02*** (11.41)		4.2*** (11.54)	2.74*** (7.49)	4.73*** (13.27)	4.12*** (11.8)	1.76*** (9.46)	4.12*** (10.21)
IND	−0.81*** (−3.39)	3.72*** (12.19)	2.25*** (6.25)		1.82*** (5.03)	0.78*** (2.22)	2.77*** (7.78)	1.39*** (3.91)	0.69*** (3.82)	2.41*** (7.07)
CHN	−0.31 (−1.18)	4.65*** (15.96)	4.03*** (11.41)		3.29*** (8.82)	2.67*** (7.25)	2.69*** (7.32)	3.17*** (8.65)	0.48*** (2.46)	3.84*** (11.52)
ZAF	2.31*** (10.29)	2.53*** (8.69)	3.28*** (9.3)		3.2*** (8.86)	2.07*** (4.81)	2.95*** (8.3)	3.4*** (9.72)	1.64*** (8.99)	2.2*** (6.39)
G7	1.83*** (10.64)	2.97*** (13.62)	6.32*** (38.11)		5.18*** (22.19)	4.71*** (15.23)	5.92*** (36.73)	5.94*** (37.07)	2.28*** (18.68)	4.7*** (21.5)
OTHER_DEV	2.95*** (29.63)	0.99*** (4.59)	4.16*** (28.85)		3.61*** (17.33)	2.85*** (9.59)	4.37*** (30.64)	4.18*** (29.85)	1.94*** (21.36)	3.09*** (17.36)
BRICS				3.65*** (15.38)						
DEV				4.56*** (29.89)						
LNOM_GDP	1.35*** (31.12)									

(continued)

Table 5 (continued)

Mean Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LGDPPC		4.72*** (18.22)								
LTRADE			0.61*** (4.65)							
LREER				3.96*** (7.48)						
Lint_Rate					−0.84*** (−6.32)					
LRDG						0.5*** (3.56)				
LICI							1.4*** (12.85)			
LOMI								0.62*** (5.22)		
LIFDI									1.21*** (42.89)	
LNAGDP										7.08*** (9.22)
Adj R-squared	0.90	0.83	0.75	0.69	0.74	0.77	0.79	0.75	0.94	0.77
F-statistics	622.51	344.86	209.59	289.48	160.03	169.10	209.35	208.11	1002.52	210.13

Note C: intercept; Trend: time trend (year); BRA: dummy variable for Brazil (i.e. 1 for record pertaining to Brazil and 0 for others), RUS, CHN, IND, ZAF, G7, BRICS, DEV and Other_Dev are also dummy variables pertaining to Russia, China, India, South Africa, G7 group of countries, BRICS countries, developed countries and other developed countries. Other_EME is dummy variable for other EME countries used as base line and not included in the models; LGDP: Log of nominal GDP; LGDPPC: Log of GDP per capita; LTrade: Log of Trade; LREER: Log of REER; LRDG: Log of R&D growth; LICI: Log of ICI; LOMI: Log of OMI; LIFDI: Log of Inward FDI; LNAGDP: Log of non-agriculture GDP of the country corresponding to log of OFDI stock (as dependent variable) of country concern. T-statistics is given in parenthesis ()
***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Table 6 Results of LSDV Eq. (4) for 10 determinants: quantile regression for median coefficient (t-statistics)

Median Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
C	−7.15*** (−12.45)	−12.3*** (−12.35)	4.39*** (5.65)	−6.03 (−1.67)	7.72*** (11.21)	7.7*** (31.04)	1.68*** (3.37)	5.97*** (12.85)	−3.67*** (−12.75)	33.31*** (−3.62)
TREND	0.06*** (6.61)	0.09*** (8.44)	0.13*** (8.53)	0.13*** (7.53)	0.13*** (6.19)	0.16*** (11.96)	0.2*** (14.81)	0.15*** (10.64)	−0.01 (−0.89)	0.13*** (10.31)
BRA	1.32*** (6.76)	2.45*** (16.85)	4.51*** (12.66)		4.65*** (13.86)	2.09*** (8.8)	3.73*** (16.46)	3.7*** (9.77)	1.26*** (8.6)	2.5*** (10.44)
RUS	1.9*** (7.83)	1.9*** (9.1)	4.32*** (11.21)		4.18*** (11.7)	2.39*** (8.53)	4.79*** (20.22)	4.06*** (9.4)	1.84*** (15)	3.95*** (16.76)
IND	−0.69 (−1.96)	3.03*** (6.84)	1.87*** (3.27)		1.44*** (2.29)	−0.06 (−0.13)	3.24*** (8.43)	1.26 (1.9)	0.7*** (2.69)	1.89*** (3.92)
CHN	0.1 (0.46)	3.79*** (21.75)	3.81*** (11.06)		3.3*** (7.93)	1.97*** (7.83)	2.45*** (7.61)	3.31*** (7.28)	0.34 (1.86)	3.63*** (15.07)
ZAF	2.26*** (13.41)	1.78*** (11.22)	3.26*** (9.71)		2.95*** (8.63)	1.22*** (5.18)	2.97*** (13.19)	2.98*** (7.45)	1.61*** (11.3)	1.66*** (6.73)
G7	2.27*** (10.06)	2.16*** (9.68)	6.18*** (19.49)		5.06*** (11.27)	3.96*** (12.42)	5.9*** (28.58)	5.76*** (15.28)	2.32*** (14.75)	3.94*** (11.28)
OTHER_DEV	3.1*** (23.51)	0.03 (0.1)	4.25*** (12.67)		4.04*** (10.41)	2.11*** (6.84)	4.3*** (21.18)	4.17*** (11.16)	2.16*** (17.5)	2.46*** (6.52)
BRICS				3.42*** (7.87)						
DEV				4.91*** (11.42)						
LNOM_GDP	1.21*** (23.58)									

(continued)

Table 6 (continued)

Median Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LGDPPC		5*** (19.01)								
Ltrade			0.42*** (2.13)							
REER				2.74*** (3.32)						
LIntRate					−0.59*** (−3.47)					
LRDG						0.42*** (2.8)				
LICI							1.68*** (10.14)			
LOMI								0.25 (0.95)		
LIFDI									1.14*** (33.32)	
LNAGDP										9.29*** (4.37)
Pseudo R-squared	0.70	0.62	0.52	0.43	0.50	0.55	0.56	0.52	0.77	0.55
Adjusted R-squared	0.70	0.62	0.52	0.42	0.49	0.54	0.55	0.51	0.77	0.55

Note C: intercept; Trend: time trend (Year); BRA: dummy variable for Brazil (i.e. 1 for record pertaining to Brazil and 0 for others). RUS, CHN, IND, ZAF, G7, BRICS, DEV and Other_Dev are also dummy variables pertaining to Russia, China, India, South Africa, G7 group of countries, BRICS countries, developed countries and other developed countries. Other_EME is dummy variable for other EME countries used as base line and not included in the models; LGDP: Log of nominal GDP; LGDPPC: Log of GDP per capita; LTrade: Log of Trade; LREER: Log of REER; LRDG: Log of R&D growth; LICI: Log of ICI; LOMI: Log of OMI; LIFDI: Log of Inward FDI; LNAGDP: Log of non-agriculture GDP of the country corresponding to log of OFDI stock (as dependent variable) of country concern. T-statistics is given in parenthesis ()

***p < 0.01, **p < 0.05, *p < 0.10

Table 7 Results of LSDV Eq. (4) for 10 determinants: quantile regression for 1st quartile coefficient (t-statistics)

First quartile: Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
C	−7.99*** (−15.97)	−9.05*** (−4.64)	2.87*** (3.61)	11.63*** (−3.12)	4.93*** (9.35)	5.44*** (12.79)	1.73*** (5.56)	3.76*** (21.32)	−4.51*** (−8.59)	23.87*** (−3.03)
TREND	0.04*** (4.74)	0.12*** (10.92)	0.15*** (13.48)	0.13*** (9.72)	0.12*** (7.03)	0.14*** (9.16)	0.18*** (12.59)	0.14*** (12.21)	−0.02 (−1.14)	0.14*** (11.34)
BRA	1.82*** (8.39)	4.97*** (17.76)	6.33*** (27.6)		6.59*** (25.03)	4.5*** (12.29)	5.25*** (23.13)	5.92*** (24.43)	1.76*** (5.9)	4.95*** (8.49)
RUS	2.08*** (6.54)	4.03*** (7.03)	5.37*** (7)		5.57*** (10.84)	3.76*** (4.59)	6.06*** (30.05)	5.14*** (8.17)	2.42*** (9.45)	5.94*** (13.15)
IND	−0.78 (−1.84)	4.16*** (9.87)	3.25*** (7.19)		2.9*** (6.31)	1.57*** (2.96)	3.25*** (10.48)	2.67*** (5.19)	0.81*** (2.87)	3.44*** (10.68)
CHN	0.65*** (2.74)	5.89*** (28.52)	5.78*** (28.8)		5.41*** (18.46)	4.12*** (10.47)	4.01*** (11.92)	5.37*** (16.58)	0.71*** (2.02)	5.44*** (14.39)
ZAF	2.96*** (19.53)	4.15*** (15.12)	5.13*** (26.12)		5.15*** (23.75)	3.6*** (9.97)	4.33*** (19.38)	5.04*** (23.46)	2.01*** (7.86)	3.97*** (6.69)
G7	2.46*** (9)	4.93*** (10.03)	7.78*** (47.58)		7.07*** (22.69)	5.78*** (13.42)	6.89*** (34.3)	7.43*** (28.82)	2.72*** (7.59)	6.18*** (8.65)
OTHER_DEV	3.29*** (20.27)	2.93*** (5.43)	5.92*** (30.82)		5.67*** (19.04)	4.08*** (8.53)	5.28*** (24.42)	5.71*** (21.09)	2.42*** (7.47)	4.52*** (6.52)
BRICS				4.67*** (23.62)						
DEV				5.14*** (26.56)						
LNOM_GDP	1.23*** (24.64)									

(continued)

Table 7 (continued)

First quartile: Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LGDPPC		3.48*** (6.52)								
Ltrate			0.22 (1.13)							
REER				3.65*** (4.43)						
LINT_Rate					−0.36*** (−2.38)					
LRDG						0.43* (1.94)				
LICI							1.07*** (7.9)			
LOMI								0.25 (1.74)		
LIFDI									1.16*** (16.15)	
LNAGDP										6.53*** (3.45)
Pseudo-R-squared	0.74	0.64	0.60	0.53	0.59	0.61	0.64	0.59	0.79	0.60
Adjusted R-squared	0.74	0.63	0.59	0.52	0.58	0.60	0.63	0.59	0.79	0.60

Note C: intercept; Trend: time trend (year); BRA: dummy variable for Brazil (i.e. 1 for record pertaining to Brazil and 0 for others). RUS, CHN, IND, ZAF, G7, BRICS, DEV and Other_Dev are also dummy variables pertaining to Russia, China, India, South Africa, G7 group of countries, BRICS countries, developed countries and other developed countries. Other_EME is dummy variable for other EME countries used as base line and not included in the models; LGDP: Log of nominal GDP; LGDPPC: Log of GDP per capita; LTrade: Log of Trade; LREER: Log of REER; LRDG: Log of R&D growth; LICI: Log of ICI; LOMI: Log of OMI; LIFDI: Log of Inward FDI; LNAGDP: Log of non-agriculture GDP of the country corresponding to log of OFDI stock (as dependent variable) of country concern. T-statistics is given in parenthesis ()

***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Table 8 Results of LSDV Eq. (4) for 10 determinants: quantile regression for third quartile

Third quartile: Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
C	−7.89*** (−8.18)	−13.48*** (−16.34)	6.02*** (12.86)	−7.48*** (−3.47)	9.61*** (10.46)	8.82*** (19.6)	5.49*** (6.85)	7.38*** (27.01)	−2.59*** (−4.24)	−14.4*** (−5.99)
TREND	0.04*** (3.81)	0.09*** (9.84)	0.15*** (12.97)	0.12*** (7.86)	0.13*** (7.02)	0.15*** (10.13)	0.19*** (11.14)	0.15*** (12.75)	0 (0.07)	0.16*** (16.88)
BRA	0.61*** (3.13)	1.91*** (15.58)	2.83*** (14.23)		3.27*** (6.19)	1.15*** (2.87)	2.31*** (10.71)	2.51*** (15.16)	0.78*** (6.28)	1.92*** (10.83)
RUS	1.2*** (6.54)	1.33*** (7.89)	2.78*** (13.26)		2.69*** (9.94)	1.55*** (3.64)	2.96*** (10.91)	3.04*** (10.46)	1.35*** (13.93)	2.8*** (13.93)
IND	−0.66*** (−3.04)	3.62*** (17.4)	1.45*** (5.44)		1.37*** (3.81)	0.25 (0.56)	1.71*** (4.94)	1.39*** (5.38)	0.69*** (5.3)	1.84*** (6.56)
CHN	−0.88*** (−3.84)	3.9*** (11.97)	2.69*** (10.34)		2.13*** (6)	1.19*** (2.78)	2*** (6.61)	2.44*** (9.46)	0.69*** (4.05)	2.69*** (12.53)
ZAF	1.84*** (9.73)	1.49*** (9.26)	1.84*** (7.44)		1.77*** (6.35)	0.4 (1.08)	1.38*** (6.26)	2.01*** (6.85)	1.08*** (8.05)	1.27*** (5.47)
G7	1.73*** (9.72)	1.84*** (8.7)	5.02*** (27.15)		4.46*** (13.68)	3.44*** (6.22)	4.84*** (22.98)	5.05*** (27.82)	2.01*** (13.41)	4.18*** (21.69)
OTHER_DEV	2.69*** (24.48)	0.04 (0.16)	3.3*** (21.8)		2.93*** (8.74)	1.85*** (3.85)	3.61*** (12.73)	3.5*** (20.89)	1.75*** (22.37)	2.78*** (17.26)
BRICS				2.31*** (7.34)						
DEV				3.71*** (16.81)						
LNOM_GDP	1.35*** (16.42)									

(continued)

Table 8 (continued)

Third quartile: Eqn.	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
LGDPPC		5.44*** (23.59)								
Ltrate			0.41*** (3.6)							
REER				3.47*** (7.34)						
LIntRate					−0.69*** (−2.17)					
LRDG						0.66*** (3.2)				
LICI							0.79*** (3.07)			
LOMI								0.19 (1.21)		
LIFDI									1.09*** (17.14)	
LNAGDP										5.1*** (9.38)
Pseudo R-squared	0.67	0.63	0.50	0.39	0.49	0.52	0.49	0.49	0.73	0.54
Adjusted R-squared	0.66	0.63	0.49	0.38	0.48	0.51	0.48	0.49	0.72	0.53

Note C: intercept; Trend: time trend (year); BRA: dummy variable for Brazil (i.e. 1 for record pertaining to Brazil and 0 for others). RUS, CHN, IND, ZAF, G7, BRICS, DEV and Other_Dev are also dummy variables pertaining to Russia, China, India, South Africa, G7 group of countries, BRICS countries, developed countries and other developed countries. Other_EME is dummy variable for other EME countries used as base line and not included in the models; LGDP: Log of nominal GDP; LGDPPC: Log of GDP per capita; LTrade: Log of Trade; LREER: Log of REER; LRDG: Log of R&D growth; LICI: Log of ICI; LOMI: Log of OMI; LIFDI: Log of Inward FDI; LNAGDP: Log of non-agriculture GDP of the country corresponding to log of OFDI stock (as dependent variable) of country concern. T-statistics is given in parenthesis ()

***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

other BRICS countries and also than the developed countries but higher than other emerging economies. However, quartile regression reveals positive and significant association of trade and OFDI for median and upper (third) quartile and insignificant for first quartile. Therefore, effect of trade openness is not felt in countries with small size of OFDI; however, significant relationship exist for all others.

Model 4: Hypothesis of positive relationship of **REER** with OFDI is tested in Model 4, and OLS estimate supports the hypothesis. Quantile regressions also indicate similar results with marginally lower effect for median class.

Model 5: Hypothesis of negative relationship of **Interest rate** with OFDI is tested by Model 5, and OLS estimate supports the hypothesis. Significant individual country/region differences are also observed. Intercept for India is found to be lower than other BRICS countries as well as developed countries, however higher than other emerging economies. Quantile regressions also indicate negative and significant relationship and support hypothesis 6. However, estimated coefficient for real interest rates for first quartile is $(-)$ 0.36 which is lower (intensity, ignoring the sign) than other two quartiles (-0.59 for median and -0.69 for third quartile) as well as OLS estimate of $(-)$ 0.84 suggesting that effect is weaker for lower quartile. This implies that negative effect of interest rate on OFDI is not uniform, but it increases with the OFDI volume.

Model 6: Hypothesis of positive relationship of **RDG** with OFDI is tested in Model 6, and OLS estimate supports the hypothesis. Significant individual country/region differences are also observed. Intercept for India is found to be lower than other BRICS countries, developed countries as well as other emerging economies. Quantile regressions also indicate positive and significant relationship for all three quartiles but highest for upper quartile.

Model 7: Hypothesis of positive relationship of **ICI** with OFDI is tested in Model 7, and OLS estimate supports the hypothesis. Quantile regressions also indicate similar results with higher effect for median class than the first quartile as well as third quartile.

Model 8: Although, **OMI** and OFDI are found to be positively associated in OLS regression (Hypothesis 8), no significant association observed for first, second and third quartile.

Model 9: OFDI is found to be strongly associated with **IFDI** (Hypothesis 5). Effect of IFDI on OFDI is by and large uniform across countries.

Model 10: Economic development may also get reflected in the share of non-agriculture GDP (**NAGDP**), i.e. share of services and manufacturing sector in overall GDP, and is found to be positively related with OFDI (Hypothesis 3). Effect of NAGDP on OFDI is strongest for the median (9.3) and weakest for the upper quartile (5.1); OLS estimate of coefficient is 7.1. All of these indicate positive but large inequality of influence of NAGDP on different segments of OFDI distribution.

5.2 Examining Push Factors in a Multivariate Setup

Seven determinants, out of ten determinants which were tested individually in 5.1, are found to be significant when all were tested together in Model 11 using Eq. (5) (Table 9).

Model 11 reveals that outward FDI rises with GDPPC, NAGDP, GDP, IFDI, RDG, OMI and OFDI falls with interest rate. Effect of GDP on OFDI is found to be significant across all quartiles, however, found to be relatively stronger for the lower quartile as compared to the upper quartile. Similarly, per capita GDP (LGDPPC) is also observed to be positively influence OFDI, and effect varies considerably across quartiles with strongest effect observed for the first quartile and weakest effect observed for the third quartile. Share of non-agriculture GDP in overall GDP may be considered as economic development was also found to be positively associated with OFDI. The effect of NAGDP varies considerably across quartiles with strongest effect observed for the first quartile and weakest effect observed for the third quartile. IFDI stock was also found to be positively associated with OFDI for all quartiles as well as for the mean. However, the effects are different across quartiles, and strongest effect is observed for the upper quartile. Effect of IFDI is most prominent for countries which have very high level of OFDI. RDG is also found to be a significant factor for OFDI, and effect is relatively stronger for lower quartile than that of mean, median class as well as upper quartile. Nominal interest rate is found to have negative effects on OFDI for the mean, median and upper quartile. However, no significant effects were observed for lower quartile. OMI has positive effects on OFDI only for the first quartile and mean. No significant effect was observed for the median and upper quartile.

Table 9 Determinants of OFDI: significant (at 5% and above level) coefficients for different quartiles

	Model 11			
	25%	Median	75%	Mean
C	−20.33	−18.15	−16.52	−16.91
TREND	–	–	−0.01	0.01
BRICS	0.45	0.68	–	0.48
DEV	−0.45	–	–	–
LGDP	0.41	0.34	0.33	0.37
LNAGDP	1.91	1.89	1.80	1.48
LGDPPC	2.63	2.20	1.83	2.18
LIFDI	0.52	0.59	0.70	0.62
LRDG	0.46	0.27	0.34	0.32
LINT_RATE	–	−0.15	−0.15	−0.13
LOMI	0.12	–	–	0.15

5.3 Governance, Control of Corruption and Ease of Doing Business

Perception of corruption is much less in developed countries than developing countries. Also, effectiveness of governance structures in existence in developed countries is also perceived to be superior than that of developing countries. For G7 countries, all six sub-indices pertaining to governance and control of corruption are many folds higher than BRICS countries. In 2016, average score for voice and accountability was 1.2 for G7 countries as compared to -0.3 for BRICS countries; average score for political stability and absence of violence was 0.6 for G7 countries vis a vis −0.6 for BRICS countries; similarly, average score on government effectiveness for G7 countries was 1.5, and for BRICS countries, it is 0.1; perception on regulatory quality, rule of law and control of corruption are identical at 1.4 in G7 countries, whereas the scores are −0.2, −0.2 and −0.4 for BRICS countries. Perception on political stability, control of corruption, regulatory quality, rule of law are negative (in a scale of −2.5 (weak) to 2.5(strong)) and much lower than G7 countries (Table 10).

Table 10 Perception on control of corruption and other governance parameters: G7 versus BRICS

	Voice accountability	Political stability	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
G7 countries (2016)						
Canada	1.4	1.2	1.8	1.7	1.8	2.0
Germany	1.3	0.8	1.7	1.8	1.6	1.8
France	1.1	−0.1	1.4	1.1	1.4	1.4
United Kingdom	1.2	0.4	1.6	1.8	1.6	1.9
Italy	1.0	0.4	0.5	0.7	0.3	0.0
Japan	1.0	1.0	1.8	1.4	1.4	1.5
United States	1.1	0.4	1.5	1.5	1.7	1.3
G7-average:2016	1.2	0.6	1.5	1.4	1.4	1.4
BRICS countries (2016)						
Brazil	0.5	-0.4	−0.2	−0.2	−0.1	−0.4
China	−1.6	−0.5	0.4	−0.3	−0.2	−0.3
India	0.4	−1.0	0.1	−0.3	−0.1	−0.3
Russian Federation	−1.2	−0.9	−0.2	−0.4	−0.8	−0.9
South Africa	0.6	−0.1	0.3	0.2	0.1	0.0
BRICS-Average:2016	−0.3	−0.6	0.1	−0.2	−0.2	−0.4

*value range −2.5 (weak) to 2.5 (strong); *Data Source* The World Bank

5.4 Ease of Doing Business

Average rank for ease of doing business in G7 countries is much favourable at 23 out of 192 countries, whereas average rank for BRICS countries is 84. In particular, India is at 100th position in terms of ease of doing business ranking. On some of the sub-components which constitute ease of doing business composite index, situation in India is exceedingly better than G7 countries. India ranked fourth on 'Protecting Minority Investors' parameter (average rank is 40 for G7 countries), ranked 29th on 'Getting Electricity' (average rank is 34 for G7 countries) and also ranked 29th on 'Getting Credit' parameter (average rank is 51 for G7 countries). However, India ranked worst at 181st in terms of 'Dealing with Construction Permits', 164th on 'Enforcing Contracts', 156th on 'Starting a Business', 154th on 'Registering Property', 146th on 'Trading across borders', 119th on 'Paying Taxes' and 103rd on 'Resolving Insolvency' (Table 11).

6 Summary and Conclusions

Literature identifies many macroeconomic push factors of OFDI. However, whether these push factors vary across countries and whether association of push factors with OFDI is of nonlinear in nature are studied here in a cross-country framework. We observed that the degree of economic development, level of global integration, technological development of 'home country' have a positive influence on outward FDI, whereas interest rate is found to be negatively associated with the OFDI. Also, the effects of these determinants are of varying magnitude across different segments (lower, median and upper strata) of the distribution of OFDI.

Previous studies (Al-Sadig 2013; Banga 2007; Bhasin and Jain 2013) also found that most of these macroeconomic variables are be important determinants of OFDI. However, they did not analyse the varying role of these determinants on the magnitude of effects across different segments of OFDI. In a cross-country setup this study empirically verified ten different macroeconomic push factors of OFDI, viz. (a) whether OFDI of a country is positively associated with its market size, (b) whether outward FDI is negatively associated with the market demand as measured by per capita GDP of home country, (c) whether OFDI is positively associated with economic development of home country, (d) whether OFDI is positively associated with degree of trade openness of home country, (e) whether OFDI of a country is positively associated with its Inward FDI, (f) whether OFDI is negatively associated with real interest rate of home country, (g) whether OFDI is positively associated with real effective exchange rate of home country, (h) whether OFDI is positively associated with home country's technological efforts (share of R&D expenditure in GDP), (i) whether OFDI is positively associated with share of ores and metals import in overall imports and (j) whether OFDI is positively associated with ICT goods imports (% total goods imports).

Table 11 Perception on ease of doing business: G7 versus BRICS

	Ease of doing business rank	Starting a business	Dealing with construction permits	Getting electricity	Registering property	Getting Credit	Protecting minority investors	Paying taxes	Trading across borders	Enforcing contracts	Resolving insolvency
G7 countries (2017)											
United States	6	49	36	49	37	2	42	36	36	16	3
United Kingdom	7	14	14	9	47	29	10	23	28	31	14
Canada	18	2	54	105	33	12	8	16	46	114	11
Germany	20	113	24	5	77	42	62	41	39	22	4
France	31	25	18	26	100	90	33	54	1	15	28
Japan	34	106	50	17	52	77	62	68	51	51	1
Italy	46	66	96	28	23	105	62	112	1	108	24
Average: G7	23	54	42	34	53	51	40	50	29	51	12
BRICS countries (2017)											
Russian Federation	35	28	115	10	12	29	51	52	100	18	54
China	78	93	172	98	41	68	119	130	97	5	56
South Africa	82	136	94	112	107	68	24	46	147	115	55
India	100	156	181	29	154	29	4	119	146	164	103

(continued)

Table 11 (continued)

	Ease of doing business rank	Starting a business	Dealing with construction permits	Getting electricity	Registering property	Getting Credit	Protecting minority investors	Paying taxes	Trading across borders	Enforcing contracts	Resolving insolvency
Brazil	125	176	170	45	131	105	43	184	139	47	80
Average: BRICS	84	118	146	59	89	60	48	106	126	70	70

Data Source The World Bank

Based on a quantile panel regression, it is observed that the level of nominal GDP, GDP per capita, shares of services and manufacturing sector in overall GDP, inward FDI stock, share of R&D expenditure in GDP and interest rate of a country, are significantly associated (push factors or home country factors) with outward FDI. In particular, OFDI rises with all those parameters. However, the magnitude of effects of these determinants varies across quartiles; i.e., effects are asymmetric. Countries with high level of OFDI have a different level of association with these determinants, compared to countries with lower level of OFDI. Stronger effects of per capita GDP, nominal GDP, R&D and interest rate are observed for the higher quartile of OFDI distribution (i.e. large OFDI countries). No significant association between trade openness and OFDI was observed in countries with relatively small OFDI.

Weak perceptions about India on political stability, control of corruption, regulatory quality, rule of law as well as perceptions on various impediments in doing business such as dealing with construction permits, enforcing contracts, starting a business, registering property, trading across borders, paying taxes and resolving insolvency, etc., might also act as the push factors of OFDI from developing countries in general and India in particular.

To sum up, this study observes that macroeconomic factors which are associated with country-level OFDI are similar in nature across advanced countries and developing countries. However, intensity of these macroeconomic push factors varies considerably across different groups of countries, when they are grouped in terms of size of OFDI. Moreover, apart from various macroeconomic indicators for which hard data are available, perception-based indicators on control of corruption, governance aspects and climate of ease of doing business which are much weaker in developing economies than that of advanced economies also act as push factors of OFDI from developing countries.

Appendix

Scatter plots of OFDI and determinants (push factors) of selected home countries (Related to Chapter "Patent Policy and Relationship Between Innovation and Monopoly Power: Evidence from Indian High and Medium Technology Industries"**)**
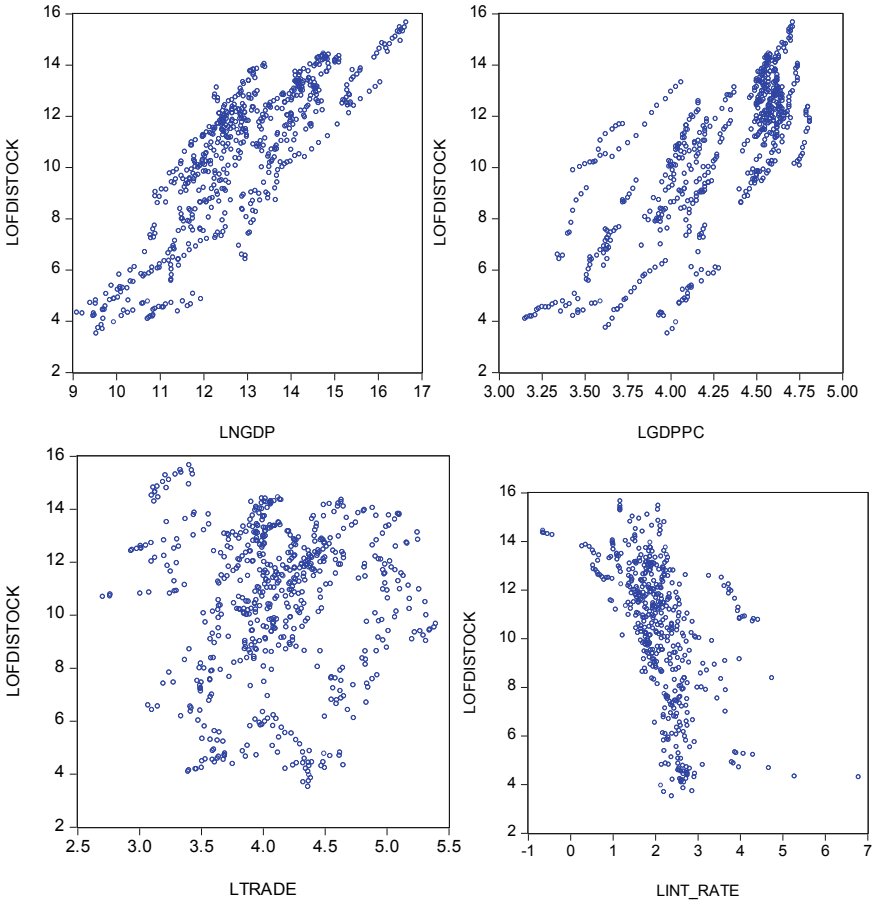
LOFDISTOCK: Logarithm of OFDI stock of a country; **LGDPPC**: logarithm of GDP per capita of a country; **LTRADE**: Log of Trade; **LINT_Rate**: Log of Interest rate.
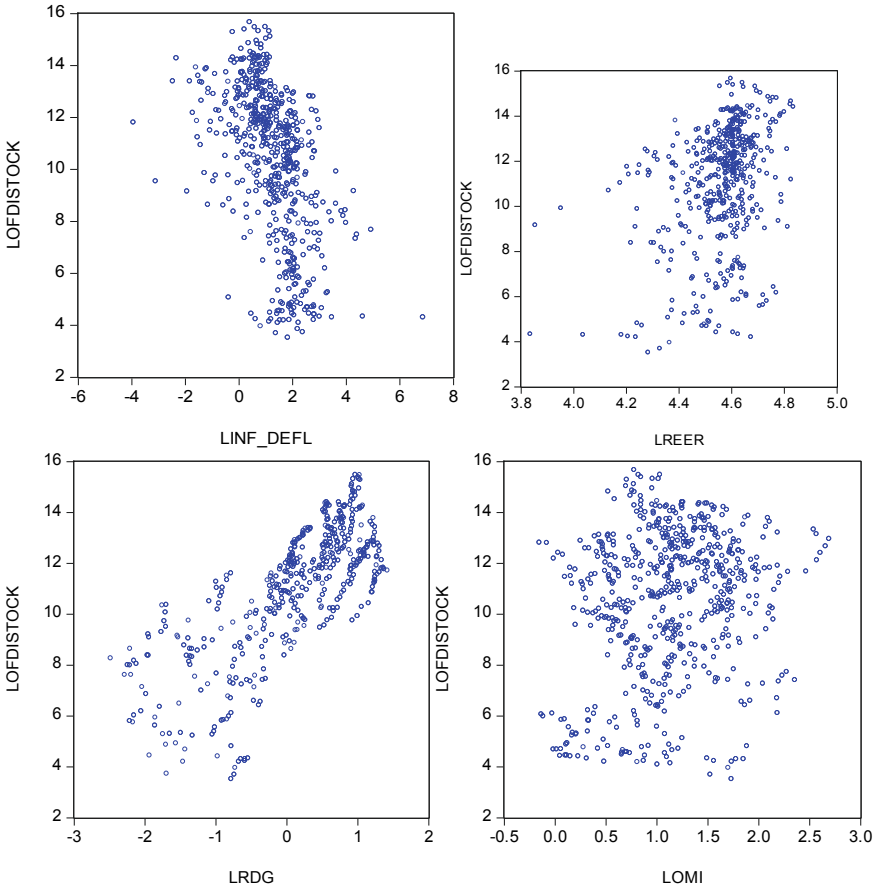
LOFDISTOCK: Logarithm of OFDI stock of a country; **LOMI**: Logarithm of Ores and Minerals import of a country; **LREER**: Logarithm of real effective exchange rate; **LINFL_Defl**: Logarithm of Inflation (GDP deflator); **LRDG**: Logarithm of investment in R&D.
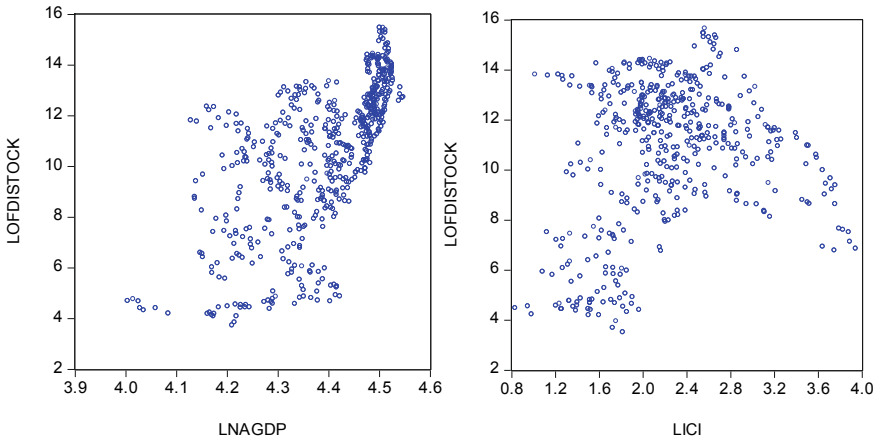
Data Source: IMF, World Economic Outlook

LOFDISTOCK: Logarithm of OFDI stock of a country; **LNAGDP**: Log of non-agriculture GDP of a country; **LICI**: Logarithm of ICT goods imports (% of total goods imports).

References

Al-Sadig, A. J. (2013). *Outward foreign direct investment and domestic investment: the case of developing countries*. IMF working paper, WP/13/52, Washington DC.

Barry, F., GÖrg, H., & Mcdowell, A. (2003). Outward FDI and the investment development path of a late-industrializing economy: Evidence from Ireland. *Taylor & Francis, Regional Studies, 37*(4), 341–349.

Banga, R. (2007). Drivers of outward foreign direct investment from Asian developing economies. ResearchGate. https://www.researchgate.net/publication/228903280.

Behrman, J. N. (1972). *The role of international companies in Latin America: Autos and petrochemicals*. Lexington, MA: Lexington Books.

Bhasin, N., & Jain, V. (2013). Home country determinants of outward FDI: A study of select asian economies. *SSRN*.

Blonigen, B. A. (1997). Firm-specific assets and the link between exchange rates and foreign direct investment. *American Economic Review, 87*(3), 447–466.

Buckley, P. J., Clegg, J. C., Cross, A. R., Liu, X., Voss, H., & Zheng, P. (2007). The determinants of chinese outward foreign direct investment. *Journal of International Business Studies, 38*(4), 99–518.

Castro, C., & Nunes, P. (2013). Does corruption inhibit foreign direct investment? *Politica/ Revista de Ciencia Politica*, *51*(1), 61–83.

Caves, R. (1971). International corporations: The industrial economics of foreign investment. *Economica*, *38*, 1–27.

Clegg, J. (1987). *Multinational enterprises and world competition: A comparative study of the USA, Japan, the UK, Sweden and West Germany*. New York: St Martin's Press.

Coase, R. H. (1937). The nature of the firm. *Economica, New Series, 4*(16), 386–405.

Deng, P. (2004). Outward investment by Chinese MNCs: Motivations and implications. *Business Horizons, Elsevier, 47*(3), 8–16.

Dunning, J. H. (1981). Explaining outward direct investment of developing countries: In K. Kumar & M. G. McLeod (Eds.), *Support of the eclectic theory of international production*, *Multinationals from developing countries*. Lexington Books: Lexington, Massachusetts.

Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies, 19,* 1–31.

Dunning, J. H. (2001). The eclectic (OLI) paradigm of international production: Past, present and future. *International Journal of the Economics of Business*.

Dunning, J. H. (1993). *Multinational enterprises and the global economy*. Addison- Wesley: Wokingham.

Dunning, J. H., & Lundan, S. M. (2008). *Multinational enterprises and the global economy* (2nd ed.). Cheltenham, UK: Edward Elgar.

Dunning, J. H., & Narula, R. (1996). The investment development path revisited: Some emerging issues. In J. Dunning & R. Narula (Eds.), *Foreign direct investment and government, catalysts for Economic Restructuring*. London: Routledge.

Fu, X., Pietrobelli, C., & Soete, L. (2011). The role of foreign technology and indigenous innovation in emerging economies: Technological change and catching up. *World Development, 39*(7), 1204–1212.

Girma, S. (2005). Absorptive capacity and productivity spillovers from FDI: A threshold regression analysis. *Oxford Bulletin of Economics and Statistics, 67*(3), 281–306.

Goh, S. K., & Wong, K. N. (2011). Malaysia's outward FDI: The effect of market size and government policy. *Journal of Policy Modeling, 33*(3), 497–510.

Grubaugh, S. G. (1987). Determinants of direct foreign investment. *Review of Economics and Statistics, 69,* 149–152.

Hashai, N., & Almor, T. (2004). Gradually internationalizing 'born global' firms: An oxymoron? *International Business Review, 13*(4), 465–483.

Hymer, S. H. (1960). *The international operations of national firms: A study of direct investment*. (Ph.D. Thesis). Massachusetts Institute of Technology, Cambridge, MA. Published in 1976 by MIT Press, Cambridge, MA.

Johanson, J., & Vahlne, J. (1977). The Internationalization process of the Firm- a model of knowledge development and increasing foreign market commitments. *Palgrave Macmillan Journals*.

Kimino, S., Saal, D. S., & Driffield, N. (2007). Macro determinants of FDI inflows to Japan: An analysis of source country characteristics. *The World Economy, 30*(3), 446–469.

Koenker, R. (2005). *Quantile regression*. Cambridge University Press, Econometric Society Monographs No. 38.

Kogut, B., & Chang, S. J. (1991). Technological capabilities and Japanese foreign direct investment in the United States. *Review of Economics and Statistics, 73,* 401–413.

Kumar, N. (2007). Emerging TNCs: trends, patterns and determinants of outward FDI by Indian enterprises. *Transnational Corporations, 16*(1), 1–26.

Kyrkilis, D., & Pantelidis, P. (2003). Macroeconomic determinants of outward foreign direct investment. *International Journal of Social Economics, 30*(7), 827–836.

Lall, S. (1980). Monopolistic advantages and foreign involvement by U.S. manufacturing industry. *Oxford Economic Papers*, *32*, 102–22.

Lall, S. (2001). Competitiveness. Technology and skills, Cheltenham. Edward Elgar.

Li, X. (2011). Sources of external technology, absorptive capacity, and innovation capacity in Chinese state-owned high-tech enterprises. *World Development, 39*(7), 1240–1248.

Pearce, R. D. (1989). *The internationalisation of sales by leading enterprises: Some firm, industry and country determinants*. Discussion papers in international investment and business studies, Series B, No. 135 Reading, UK: University of Reading.

Rugman, A. M., & Li, J. (2007). Will China's multinationals succeed globally or regionally? *European Management Journal, 25*(5), 333–343.

Taylor, R. (2002). Globalization strategies of Chinese companies: Current developments and future prospects. *Asian Business & Management, 1,* 209–225.

Teece, D. J. (1986). Transactions cost economics and the multinational enterprise: An assessment. *Journal of Economic Behaviour and Organization*, 21–45 (North Holland).

The World Bank. (2008). *Global economic prospects: Technological diffusion in the developing world*. Washington DC: The World Bank.

Tolentino, P. E. (2008). *The determinants of the outward foreign direct investment of China and India: Whither the home country?* UNU-MERIT working paper series 049, United Nations University, Maastricht Economic and social Research and training centre on Innovation and Technology.

Vernon, R. (1966). International investment and international trade in the product cycle. *The Quarterly Journal of Economics, 80,* 190–207.