Working Paper Series

#2008-049

The determinants of the outward foreign direct investment of China and India: Whither the home country?

Dr Paz Estrella Tolentino

United Nations University - Maastricht Economic and social Research and training centre on Innovation and Technology
Keizer Karelplein 19, 6211 TC Maastricht, The Netherlands
Tel: (31) (43) 388 4400, Fax: (31) (43) 388 4499, e-mail: info@merit.unu.edu, URL: http://www.merit.unu.edu

The determinants of the outward foreign direct investment of China and India: Whither the home country?

Dr Paz Estrella Tolentino

School of Management and Organizational Psychology
Birkbeck, University of London
Malet Street, London WC1E 7HX
United Kingdom
Tel. No. + 44 20 7631 6762
Fax No. + 44 20 7631 6769
p.tolentino@bbk.ac.uk

Abstract
The current study examines the relationships between several home country-specific macroeconomic factors and the level of the outward FDI of China and India using multiple time-series data from 1982 to 2006 and from 1980 to 2006, respectively. With the use of a vector autoregressive model assessing the causal relationships of the endogenous variables, the empirical research proves that Chinese national characteristics associated with income per capita, openness of the economy to international trade, interest rate, human capital, technological capability, exchange rate and exchange rate volatility do not Granger cause the level of outward FDI of China. By contrast, the national technological capability of India Granger causes their level of outward FDI. The level of outward FDI of China does not Granger cause any of the home country-specific macroeconomic factors considered, while the level of outward FDI of India Granger causes their national interest rate.

Key words: outward FDI; home country; FDI determinants; Chinese MNCs, Indian MNCs, VAR model
JEL codes: F23, C32, C51

UNU-MERIT Working Papers
ISSN 1871-9872

Maastricht Economic and social Research and training centre on Innovation and Technology, UNU-MERIT

1. Introduction

With at least 18,521 parent companies, multinational companies (MNCs) based in the developing economies accounted for some 24 per cent of all parent companies of MNCs in the whole world, and their stock of outward foreign direct investment (FDI) at around $ 1.6 trillion represented almost 13 per cent of the worldwide stock as of 2006.[1] East and South-East Asia and Latin America have maintained their historical positions as the two most dominant home regions for FDI in the developing world, accounting for respectively 76 per cent and 15 per cent of the stock of outward FDI from developing economies excluding those of tax-haven economies, and around 9 per cent and 2 per cent of the worldwide stock of outward FDI in 2006. Despite their relatively low significance on a worldwide scale and geographical concentration, there are several remarkable features that draw attention to the high degree of multinationality of some developing economies and the importance of some of the largest MNCs based in developing economies in global competition: the substantial increase in the transnationality index of the top 50 non-financial MNCs from developing economies over the past decade; the sustained role of the four leading newly industrialized East Asian economies — Hong Kong (China), Republic of Korea, Singapore and Taiwan — as the most dynamic foreign investors in South-East Asia; the steady increase in the number of firms from developing economies in the list of the world's top 100 non-financial MNCs from five in 2004 to seven in 2005; and the operation of the top 100 non-financial MNCs from developing economies in a broad range of manufacturing and service industries of varying degrees of R & D intensity or human capital intensity.

Notwithstanding the relatively small size of the outward FDI of China and India, the rapid expansion in recent years along with the distinguishing features and unique

strengths of Chinese and Indian MNCs have intrigued the international business community. China increased the size of its outward FDI stock in absolute and relative terms since 1990. At $4,455 million, Chinese outward FDI accounted for just over 3 per cent of the total outward FDI stock of developing economies in 1990, but it grew to 3.2 per cent share in 2000 and almost 5 cent by 2006 when the size of Chinese outward FDI reached $73,330 million (UNCTAD, 2007). The role of inward and outward internationalization in facilitating competitive catch-up by developing country MNCs, with evidence relating to Chinese MNCs has been examined by Young, Huang and McDermott (1996). The growth of Chinese MNCs is doubtless contributing to the rising economic power of China. More than a few research articles have attempted to explore the emergence and development of Chinese outward FDI, including their evolving characteristics, motivations as well as future prospects (see, for example, Cai, 1999; Fung, Liu and Kao, 2007). Morck, Yeung and Zhoa (2008) assert that China's outward FDI at the infant stage concentrated on tax havens and Southeast Asian countries and were dominated by state-controlled enterprises with government sanctioned monopoly status. Wu and Yeo (2002) stated that the evolution of Chinese outward FDI from trade-related and resource-extraction activities in the early 1990s to increasingly more complex manufacturing in more recent years is associated with the restructuring of the Chinese economy, increased government promotion and the emergence of more outward-looking Chinese companies. Their participation in low-technology and labour intensive manufacturing industries in neighbouring developing countries as well as resource-based industries in resource-rich countries have grown alongside their asset-seeking FDI in more advanced economies in their quest for strategic resources and capabilities (Deng, 2004).

On a much smaller scale than China, India similarly increased the size of its outward FDI stock in absolute and relative terms since 1990. At a mere $124 million, Indian outward FDI accounted for 0.1 per cent of the total outward FDI stock of developing economies in 1990, and although it grew almost fifteen-fold to $1,859 million by 2000 its relative share in the total outward FDI stock of developing economies only climbed meagrely to 0.2 per cent. However, the seven times increase in the size of its outward FDI stock to $12,964 million by 2006 translated to a quadrupling of its relative share to 0.8 per cent (UNCTAD, 2007). Pradhan (2008) and Ramachandran *et al* (2004) have explored the evolution in Indian outward FDI, referring to a shift in the pattern of overseas expansion and basis of competitiveness of Indian companies. Full or majority ownership, along with expansion into new manufacturing industries as well as the service sector have now become commonplace for Indian MNCs, along with the emergence of developed countries as important host countries for their crosssborder activity, particularly in the form of acquisitions (Nayyar, 2008). The competitive advantages of Indian MNCs are now being increasingly defined by technological and skill intensity. Chittoor and Ray (2007) examined the different pathways of internationalization of Indian pharmaceutical firms using strategic group analysis. Their in-depth analysis of firms from each strategic group resulted in two significant findings: first, the different groups had similar levels of performance in terms of return on assets despite their different value creation potential; and second, it enabled a conceptual model of internationalization for emerging economy firms to be formulated which combined exploitation and exploration strategies along the dimensions of products and markets. Other studies that have focused on the impact of international expansion of

Indian firms on their performance include Contractor, Kumar and Kundu (2007) and Garg and Delios (2007).

The varying impact of country-, industry-, and firm-specific considerations on ownership and internalization characteristics of firms and location characteristics of countries has been extensively analysed in the international business literature (see Dunning, 1982; Gray, 1982). Although internal influences associated with a firm's internal assets and competencies are central to their competitive advantages and predominately explain variations in their performance (Hawawini, Subramanian and Verdin, 2004), external or environmental factors associated with a firm's country of origin provide a critical, albeit partial, role in the development of a firm's competitive advantages by providing the context in which firm choices are made.[2] The current research article has one broad objective. It aims to examine the relationships between several home country-specific national macroeconomic factors and the level of the outward FDI of China and India using multiple time-series data from 1982 to 2006 and 1980 to 2006, respectively. Specifically, it adopts a vector autoregressive (VAR) model to assess the causal relationships of the endogenous variables consisting of the size of outward FDI and a broad range of national macroeconomic characteristics of the home country to include income per capita, openness of the economy to international trade, interest rate, human capital, technological capability, exchange rate and exchange rate volatility. Collectively, these characteristics provide a broad measure of macroeconomic soundness (income per capita), science, education & innovation (human capital, technological capability), finance (interest rate, exchange rate, exchange rate volatility) and internationalisation (openness of the economy to international trade) that are argued to comprise some of the home country-specific national-level determinants of the

competitiveness of all MNCs based in a nation.[3] The review in Section 2 provides the context in which to situate the current study in the broader academic literature, and draws out the theoretical basis for selecting the variables to be included in the VAR model to be estimated. Section 3 contains the specification of the empirical model, data description and results of the integration tests on the variables, followed by the empirical results in Section 4. The discussion and conclusions of the research are covered in Section 5.

2. The academic literature review

By comparison to the richness and depth of the academic literature examining the emergence and growth of inward FDI in China, the literature remains rather sparse in the area of Chinese and Indian outward FDI and in need of further development. Some published research articles have examined the determinants of Chinese or Indian direct investments abroad, and a few have attempted to advance or reformulate existing conventional theories as well as newer emerging perspectives to explain Chinese or Indian MNCs or Chinese or Indian outward FDI. This review surveys the relevant academic literature as a way in which to reflect on the current stage of its development and to provide a proper context in which to situate the current study within that body of knowledge.

Among case studies on Chinese MNCs (Liu and Li, 2002; Warner, Hong and Xu, 2004) is a limited academic literature on the determinants of outward FDI in China which have attributed varying importance on the role of home country-specific, host country-specific and firm-specific factors in explaining the emergence and growth of Chinese MNCs, with most studies lending emphasis on a combination of factors. Hong and Sun (2006) traced the emergence and growth of Chinese overseas investment to corporate entrepreneurship responding to the challenges and

opportunities presented by globalization, favourable home government policy and the deepening reforms in China. Morck, Yeung and Zhoa (2008) argue of the economic rationality of China's outward FDI in light of national factors associated with China's savings rate, corporate ownership structures, and bank-dominated capital allocation, particularly by the most active firms able to overcome capital constraints and avail of value-creating opportunities afforded by outward FDI. The continuing spate of cross-border M&As by Chinese firms since around 2001 is regarded to be primarily motivated by the need to develop markets, promote diversification, obtain foreign advanced technology and other resources, and create value (Boateng, Qian and Tianle, 2008). Studies that have accorded a more theoretical perspective have directed their attention to explaining either Chinese MNCs (Low and Hongbin, 2006; Li, 2007 and Rui and Yip, 2008), or Chinese outward FDI (Yang, 2005; Buckley *et al,* 2007). Low and Hongbin (2006) analysed ownership, locational and internalization advantages of Chinese construction MNCs in the context of Dunning's eclectic paradigm. On the other hand, Li (2007), on the basis of evidence gathered from three longitudinal cases from China, integrated the eclectic paradigm with a linkage–leverage–learning model of MNC formation in a content-process framework in an attempt to explain all types of MNC from both developed and developing countries. Rui and Yip (2008) view Chinese firms through the lens of a strategic intent perspective and regard their foreign acquisitions as means to acquire strategic capabilities to offset competitive disadvantages and to leverage unique ownership advantages in the face of institutional incentives and constraints. Turning to those studies that theoretically explained Chinese FDI, Yang (2005) developed a network model through the application of network research in business organizations to the economic analysis of Chinese outward FDI. On the

other hand, Buckley *et al* (2007) nested three special explanations (capital market imperfections, special ownership advantages and institutional factors) within the general theory of the MNC as a means to explain the geographical destination of Chinese outward FDI.

In a similar fashion, apart from case studies on Indian MNCs (see, for example, Bowonder and Mastakar; 2005; and Seshadri and Tripathy. 2006), there is a limited academic literature on the determinants of outward FDI in India which have attributed varying importance on the role of home country-specific, host country-specific and firm-specific factors in explaining the emergence and growth of Indian MNCs. In analysing the determinants of Indian FDI in the manufacturing sector, Pradhan (2004) concluded that firm-specific characteristics such as age, size, R&D intensity, skill intensity and export orientation provide critical explanatory factors. Nayyar (2008), on the other hand, had a broader perspective of the underlying factors driving the process of expansion of Indian FDI as a whole, which differed across industries and firms. In his viewpoint, the rapid growth in overseas investment and acquisitions by Indian firms were partly attributable to factors implicit in the liberalization of the policy regime and the greater access to financial markets; and partly in the long-term emergence and evolution of capacities and abilities of Indian companies to compete in the world market. Other studies provided conceptual or theoretical perspectives in explaining the changing stylized facts about Indian FDI. The contributions of Sanjaya Lall and Rajiv Lall in the 1980s in explaining Indian MNCs have given way to newer perspectives. The explanation of Ferrantino (1992) of the previously observed pattern of South-South direct investments by firms based in Argentina and India due to high transaction costs in high-income markets has a dated feel. Much more relevant are studies that analyse the factors that enable

Indian firms to currently succeed in their quest for international expansion in all markets. Lacking ownership-specific advantages, Elango and Pattnaik (2007) draw attention to the goal of Indian firms to build capabilities through international expansion by drawing on the international experience of their parent and foreign networks. This dovetails with the springboard perspective of Luo and Tung (2007) in which international expansion by firms based in emerging markets is regarded as a platform to acquire strategic resources while overcoming domestic institutional and market constraints.

Given that some of a firm's ownership-specific advantages are likely to reflect at least in part external or environmental factors associated with a firm's country of origin (see, for example, Kumar and Kim, 1984 and Hawawini and Schill, 1982), the current study aims to provide a useful contribution to the academic literature on the determinants of Chinese or Indian outward FDI by examining the relationships between several national macroeconomic factors specific to China and India and the propensities of their firms to engage in outward FDI. This study provides an analogy to the previous study of Franko (1976) by way of testing the proposition that Chinese and Indian MNCs are different from each other and from those of their counterparts in other countries mainly because of the uniqueness of the national economic characteristics of their countries of origin. These home country-specific factors include income per capita, openness of the home economy to international trade, interest rate, human capital, technological capability, exchange rate and exchange rate volatility. These factors are specific to India or China in their origin and use, but because they are available to all firms based in a particular location, these location-specific characteristics could potentially accord firms of one nationality an ownership advantage over that of another. Reference is therefore made in the current literature

review to some of these previous — and often controversial — studies that identified and examined the key determinants of outward FDI to provide a theoretical and empirical justification for selecting variables to be included in the VAR model to be estimated in this study. “The lack of a consensus over the conclusions reached by the wide range of empirical studies as to the relative importance and the direction of impact of the potential determinants of FDI can be explained, to some extent, in terms of the wide differences in perspectives, methodologies, sample-selection and analytical tools.” (Chakrabarti, 2001, pp. 89-90) The literature survey will be focused on, but not limited to, studies that analyse the relationships of these home country-specific factors to outward FDI.

2.1 National income/ national income per capita

A number of academic studies have established the theoretical and/or empirical causal relationships between outward FDI and national income or economic growth.

The concept of an investment development cycle/ path in international production advanced by Dunning (1981) — which established that there is a relationship between net outward investment (NOI) and a country’s relative stage of development as measured by gross national product (GNP) per capita — provides an important theoretical rationale for a model that proposes that higher income levels of a country are associated with higher levels of outward FDI. Although subsequently extended by Narula (1996) and Dunning and Narula (1997), Dunning suggested that the plotted data of the NOI and GNP of different countries, both variables normalised by the size of the population, show the presence of a J-shaped investment development curve with countries classified as belonging to four or five main groups corresponding to four or five stages of development. However, an earlier study by

this author published in Tolentino (1993) showed how the general trend towards internationalisation of business associated with the rapid emergence and growth in the levels of outward FDI from newer home countries, including developing countries, exerted profound implications for Dunning's concept of an investment development cycle/path in international production. At the core of such analysis is the structural change in the relationship between NOI and GNP per capita that has occurred since the mid-1970s, as a result of the general rise of newer MNCs based in countries at intermediate stages of development, including the richer developing countries, that have acquired the capacity and incentive to engage in outward FDI at a much earlier stage in their development when compared to the MNCs based in Europe and the United States. As a consequence of the increased significance of outward FDI from the newer home countries resulting from the general trend towards internationalisation of business, a country's overall NOI can no longer be determined or predicted solely by its relative stage of development.

The empirical research of Tallman (1988) showed how the level of home country economic development in 14 industrialised countries, as measured by GDP per capita, is a major positive determinant of their levels of outward FDI in the manufacturing sector in the United States. By contrast, the size of the home economy, as measured by GDP, is not always significant in determining the level of such FDI. This contrasts with the results of Kyrkilis and Pantelidis (2003) who showed that real gross national product is the most important determinant of the outward FDI of five European Union countries and four non-European Union countries. Although there are ambiguous results for gross national product or gross domestic product as a determinant of FDI, there is a strong unequivocal positive support for the explanatory power of market size of a host country, as measured by

per capita GDP, in inward FDI. Chakrabarti (2001) confirmed the robustness of this correlation by extreme bound analysis.

Other studies have analysed the impact of outward FDI on national income of the home country. The theoretical research of Bellak (1992) investigated the impact of outward FDI on a home country's balance of payments, unemployment, national income, structure, distribution, business cycle as well as dynamic competitiveness. He indicated that the effect of FDI on a home country's economy cannot be generalized but must be examined on a case-by-case basis. The empirical research of Wu, Toh and Ho (2003) showed the importance of outward FDI to Singapore's gross national income and to domestic demand through income remittances.

2.2 Openness of the economy to international trade

The influence of the trade liberalisation of a country's economy on FDI is another subject in the international business empirical literature, given the concentration of most FDI in the tradable sector. The significance of openness of the home or host economy in determining inward or outward FDI in empirical studies is mixed. A strong positive effect of openness on FDI (Kravis and Lipsey, 1982; Culem, 1988; Edwards, 1990; and Pantelidis and Kyrkilis, 2005) is balanced by the more cautious weak positive link found by Schmitz and Bieri (1972). Wheeler and Mody (1992) provided a more qualified position. While they found a strong positive effect of openness on FDI in the manufacturing sector, a weak negative link is found in the electronics industry. In assessing the controversial relation between FDI and openness (as measured mostly by the ratio of exports plus imports to GDP) using extreme bound analysis, Chakrabarti (2001) established that the variable is highly sensitive to small alterations in the conditioning information set. However, a country's

openness to trade is more likely to be correlated with FDI than any other potential explanatory variable. This confirms a recent empirical study by Chiou Wei and Zhu (2007) that exchange rate and openness are not significant determinants of outward FDI.

Just as the causality from trade openness to FDI is ambiguous, so is the reverse causality. On the one hand, Ghosh (1997) argued that openness is positively correlated with FDI liabilities with or without country fixed effects, and with the direction of causality running from FDI to trade openness, rather than the reverse. This differs from the results of the decomposition analysis of Aizenman and Noy (2006) who reported that most of the linear feedback between trade and FDI can be accounted for by Granger-causality from gross FDI flows to trade openness (50 per cent) and from trade to FDI (31 per cent).

2.3 Interest rate

The level of interest rate is a proxy for the capital abundance or scarcity of a country, with an inverse correlation between the interest rate and outward FDI since relatively low interest rates associated with a home country's capital abundance decreases the opportunity cost of capital and enhances the profitability of investments abroad. Thus the ability to raise capital at preferential rates is another frequently hypothesised asset ownership advantage of MNCs or potential MNCs. The empirical literature has in the main focused on assessing the capital intensity of FDI in various countries with mixed and often conflicting results. In the case of the United States, Pugel (1981) found that the financial capital requirements required to operate at minimum efficient scale of production, controlled for the effect of scale economies, is positively and significantly related in a cross-sectional industry study of American FDI. Similarly,

Clegg (1987) reported that capital intensity was a statistically significant positive determinant of American FDI. However, Lall (1980) and Grubaugh (1987) had conflicting results when assessing the propensity of American FDI to undertake FDI. Lall (1980) discovered no significant relationship between a measure of capital intensity and the propensity of American firms to undertake FDI. Furthermore, Grubaugh (1987) using a sample of 300 American firms found no significant relationship between a measure of labour intensity (used as the inverse of capital intensity) and the likelihood of an American firm to become an MNC. Capital intensity was also significantly and positively related to British FDI, significantly and negatively related to Japanese FDI, and insignificantly related to Swedish and German FDI (Clegg, 1987).

2.4 Human capital

The role of human capital in the propensity of countries to engage in international production is also a theme in the international business literature. Empirical studies for a few countries have shown that either human capital intensity or skill intensity were significantly and positively related with the activities of MNCs based in West Germany (Juhl, 1979; Clegg, 1987), the United Kingdom and Japan (Clegg 1987). By contrast, the findings on FDI by American and Swedish firms were rather different. Lall (1980) and Pugel (1978, 1981) showed that the level of human competence or skills level was significantly positively related with either the foreign production of American firms or the propensity of American firms to engage in foreign production. Clegg (1987), however, had an adversarial view. He found that the skill intensity of managerial manpower is a statistically insignificant determinant of the ownership advantages of American MNCs. Similar conflicting findings were

noted in the case of Swedish MNCs. While Swedenborg (1979) found human competence to be positively and significantly related to the foreign production of Swedish firms, Clegg (1987) found that the skill intensity of managerial manpower was an insignificant determinant of their ownership advantages.

2.5 Technological capability

The product cycle model of Raymond Vernon provides the theoretical foundation for the ideas that the propensity of countries to engage in trade and international production depended notably on their technological capability; and the competitive or ownership advantages of firms based in one country – particularly their capacity to innovate new products and processes – reflected in part, at least, the characteristics of their countries of origin. In the product cycle model, Vernon (1966) explained the foreign activities of American MNCs in the period after the Second World War and since then a number of well known empirical studies have driven home the point that technological intensity or research intensity plays a statistically significant positive role in explaining US FDI (Dunning and Buckley, 1977; Wolf, 1977; Pugel, 1978, 1981; Bergsten, Horst and Moran, 1978; Lall, 1980; Clegg, 1987; Grubaugh, 1987; Pearce, 1989). Similar findings apply to Swedish FDI (Swedenborg, 1979; Clegg, 1987), German FDI (Cantwell, 1987; Clegg, 1987), and Continental European FDI (Pearce, 1989). The findings on FDI by British and Japanese firms were rather different. Clegg (1987) found that R & D expenditures played a statistically insignificant negative role as a determinant of UK outward FDI. Similarly, Pearce (1989) proved that research intensity was not a significant influence on the FDI of British firms, consistent with the higher share of its outbound investments in natural resource-intensive industries. The results for Japanese FDI were rather uneven.

Based on pooled cross section sets of data for 1965, 1970 and 1975, Clegg (1987) demonstrated that R & D expenditures was a statistically significant negative determinant of outward FDI of Japanese MNCs. On the other hand, the study of Cantwell (1987) returned a statistically significant positive relationship between the comparative patenting advantages of Japanese firms in a selection of 12 manufacturing industries and their share of the total production in those industries. Pearce (1989) provided a more qualified position. He claimed that although the propensity of Japanese firms to engage in overseas production was positively correlated to the average research intensity of industries, less R & D-intensive Japanese firms tended to record a higher overseas production ratio within industries. The role of technological capability in Japanese FDI was confirmed by Kogut and Chang (1991). In their analysis of Japanese FDI in the United States they established the key point that the determinants of these investments stemmed both from the exploitation of existing technological advantages and the acquisition of foreign technology.

The role of technological capability in explaining FDI from developing countries have been explored by various theoretical perspectives to include the product cycle model (Wells, 1983), and the concepts of localised technological change (Lall, 1983) and technological accumulation (Cantwell and Tolentino, 1990; Tolentino, 1993). With the recognition that technology creation is broader than the sphere of research and patenting activity, these theories showed that technological capability is a useful means of analysing the international growth of manufacturing firms from quite different national environments, and at different stages of development and capacity.

2.6 Exchange rate and exchange rate volatility

A number of academic studies have emphasized the theoretical and/or empirical relationships between the level and volatility of a home country's exchange rates on outward FDI. The evidence on such relationship is ambiguous at least in terms of inward FDI, with a heterogeneous impact of exchange rates on inward FDI observed across countries, types of investment and time (Pain and van Welsum, 2003).

At the theoretical or conceptual level, the currency area hypothesis of Aliber (1970) focused on the importance of country-specific ownership advantages that accrue to firms located in a particular currency area. Aliber argued that financial factors such as capital market relationships, exchange risks and the preferences of the market for holding assets denominated in selected currencies fundamentally explain the pattern of FDI. By lowering the capital requirements of outward FDI in domestic currency units and reducing the nominal competitiveness of exports, the appreciation of the home country currency encourages outward FDI. A more complex model based on capital market imperfections had been offered by Froot and Stein (1989). In their model, currency movements alter the relative wealth positions of countries. They showed how the depreciation of the dollar increases the propensity of foreign firms to invest in the United States by lowering their capital costs for FDI, which allows for more aggressive bidding of dollar-denominated foreign assets. Conversely, Klein and Rosengren (1991) proved in a macro-oriented empirical analysis that relative wealth provided one of the fundamental determinants of American FDI in six developed countries in the period between 1979 and 1988. Baek and Kwok (2002) similarly analysed the effects of foreign exchange rate and volatility on the corporate choice of foreign entry mode and shareholder wealth. They found that a stronger home currency is related to a higher propensity to select a

subsidiary and observed greater changes in shareholder wealth around subsidiary announcements in the presence of a stronger home currency for non-US parent companies. A theoretical examination of the relationship between exchange rate risks and two-way FDI had been advanced by Qin (2000). Assuming that producers wish to maximize the utility function based on rates of return and real exchange rates, Qin argued in a one-sector, two-country model that higher exchange rate volatility leads to a larger ratio of FDI to exports. The reduction of producers' exchange rate risk then becomes a driving force for two-way FDI under certain conditions. In analysing the endogeneity of the exchange rate as a determinant of FDI, Russ (2007) showed that an MNC's response to exchange rate volatility will differ depending on whether the volatility arises from shocks in the firm's home or host country.

Empirically based studies looking at the causal relationships between the level and/or volatility of a home country's exchange rates on outward FDI of several countries had been provided by Gopinath, Pick and Vasavada (1998) and Bolling, Shane and Roe (2007) for the United States, Georgopoulos (2008) for Canada, Blonigen (1997) and Guo and Trivedi (2002) for Japan, and Choi and Jeon (2007) and Kyrkilis and Pantelidis (2003) for various developed and developing countries. All these studies found a positive correlation between the home country exchange rate and/or exchange rate volatility and outward FDI. These studies differ from earlier studies of Froot and Stein (1989), Blonigen (1995) and Blonigen and Feenstra (1996) that noted a strong negative correlation between a country's exchange rate and FDI, and from Tuman and Emmert (1999) that detected an insignificant exchange rate effect on FDI in a share regression and a significantly negative effect on a per capita regression. In assessing the controversial relation between FDI and

exchange rate using extreme bound analysis, Chakrabarti (2001) ascertained that the variable is highly sensitive to small alterations in the conditioning information set. Moreover, a country's exchange rate is least likely to be correlated with FDI than any other potential explanatory variable.

3. The empirical model specification and data description

The data used in the current study consists of a multiple time series for the period 1982 to 2006 for China and 1980 to 2006 for India, with the choice of time period determined by the availability of data to construct consistent measures of the selected variables over time. The data are drawn from numerous international sources, and in the case of GDP presented a problem of converting to the United States dollar. All nominal data series, except those on technology, were converted to real data series by using the relevant price indices. The Data Appendix provides detailed descriptions of the variables and information on data sources.

Given the presence of multiple variables, the choice of model is between the following multiple equation models: a simultaneous, or structural, equation model or a vector autoregressive (VAR) model. The use of simultaneous, or structural, equation models involve the treatment of some variables as endogenous and some as exogenous or predetermined. The exclusion or inclusion of certain predetermined variables plays a crucial role in the identification of the model prior to estimation. These decisions are often subjective and therefore lead to the problem of simultaneity. Sims (1980) argued that there should be no *a priori* distinction between endogenous and exogenous variables in the presence of true simultaneity among a set of variables. This criticism of simultaneous, or structural, equation modelling became the fundamental basis of Sims' development of the VAR model.

A VAR model is an extension of an autoregressive model to the case in which there is more than one variable under study. Such model has more than one dependent variable and, thus, has more than one equation. Each equation in the multiple equation model uses as its explanatory variables lags of all the variables under study (and possibly a deterministic trend). The term autoregressive is due to the inclusion of the lagged value of the dependent variable on the right-hand side of the equation, and the term vector is due to the existence of a vector of two (or more) variables.

Since the current research involves eight variables, there will be eight equations to be estimated in an unrestricted VAR model. The eight equations below thus constitute an unrestricted VAR model with eight variables. All equations depend on p = 1 lag of the dependent variable and on q = 1 lag of each of the seven other variables. Therefore the lag length is set such that $p = q$, with the exact lag length of p and q determined appropriately on the basis of the number of observations in the multiple time series. The resulting model to be estimated is known as a VAR (1) model.

$$LFDI_t = \alpha_1 + \delta_1 t + \phi_{11} LFDI_{t-1} + \beta_{11} LYPC_{t-1} + \beta_{12} LO_{t-1} + \beta_{13} LI_{t-1} + \beta_{14} LHC_{t-1} + \beta_{15} LTE_{t-1} + \beta_{16} LER_{t-1} + \beta_{17} LERV_{t-1} + e_{1t}$$

$$LYPC_t = \alpha_2 + \delta_2 t + \phi_{21} LFDI_{t-1} + \beta_{21} LYPC_{t-1} + \beta_{22} LO_{t-1} + \beta_{23} LI_{t-1} + \beta_{24} LHC_{t-1} + \beta_{25} LTE_{t-1} + \beta_{26} LER_{t-1} + \beta_{27} LERV_{t-1} + e_{2t}$$

$$LO_t = \alpha_3 + \delta_3 t + \phi_{31} LFDI_{t-1} + \beta_{31} LYPC_{t-1} + \beta_{32} LO_{t-1} + \beta_{33} LI_{t-1} + \beta_{34} LHC_{t-1} + \beta_{35} LTE_{t-1} + \beta_{36} LER_{t-1} + \beta_{37} LERV_{t-1} + e_{3t}$$

$$LI_t = \alpha_4 + \delta_4 t + \phi_{41} LFDI_{t-1} + \beta_{41} LYPC_{t-1} + \beta_{42} LO_{t-1} + \beta_{43} LI_{t-1} + \beta_{44} LHC_{t-1} + \beta_{45} LTE_{t-1} + \beta_{46} LER_{t-1} + \beta_{47} LERV_{t-1} + e_{4t}$$

$$LHC_t = \alpha_5 + \delta_5 t + \phi_{51} LFDI_{t-1} + \beta_{51} LYPC_{t-1} + \beta_{52} LO_{t-1} + \beta_{53} LI_{t-1} + \beta_{54} LHC_{t-1} + \beta_{55} LTE_{t-1} + \beta_{56} LER_{t-1} + \beta_{57} LERV_{t-1} + e_{5t}$$

$$LTE_t = \alpha_6 + \delta_6 t + \phi_{61} LFDI_{t-1} + \beta_{61} LYPC_{t-1} + \beta_{62} LO_{t-1} + \beta_{63} LI_{t-1} + \beta_{64} LHC_{t-1} +$$

$\beta_{65}LTE_{t-1} + \beta_{66}LER_{t-1} + \beta_{67}LERV_{t-1} + e_{6t}$

$LER_t = \alpha_7 + \delta_7 t + \phi_{71}LFDI_{t-1} + \beta_{71}LYPC_{t-1} + \beta_{72}LO_{t-1} + \beta_{73}LI_{t-1} + \beta_{74}LHC_{t-1} + \beta_{75}LTE_{t-1} + \beta_{76}LER_{t-1} + \beta_{77}LERV_{t-1} + e_{7t}$

$LERV_t = \alpha_8 + \delta_8 t + \phi_{81}LFDI_{t-1} + \beta_{81}LYPC_{t-1} + \beta_{82}LO_{t-1} + \beta_{83}LI_{t-1} + \beta_{84}LHC_{t-1} + \beta_{85}LTE_{t-1} + \beta_{86}LER_{t-1} + \beta_{87}LERV_{t-1} + e_{8t}$

where:

α = constant or intercept

t = deterministic trend

LFDI = Natural logarithm of real FDI outflows from China or India, US $ million (2000=100), 1982 to 2006 in the case of China and 1980 to 2006 in the case of India

LYPC = Natural logarithm of real GDP per capita of China or India, US $ million (2000=100), 1982 to 2006 in the case of China and 1980 to 2006 in the case of India

LO = Openness of the Chinese or Indian economy to trade as measured by the natural logarithm of the annual sum of real exports and imports of China or India, US $ million (2000=100), 1982 to 2006 in the case of China and 1980 to 2006 in the case of India

LI = Home country interest rate as measured by the natural logarithm of the annual real lending rate of China, (2000=100), % per annum, 1982 to 2006 or the real prime commercial lending rate of India, (2000=100), % per annum, 1980 to 2006

LHC = Human capital variable as proxied by the natural logarithm of the annual real GDP per person employed in China or India, a measure of productivity per worker, US $ million (2000=100), 1982 to 2006 in the case of China and 1980 to 2006 in the case of India

LTE = Technology capability variable as proxied by the natural logarithm of the annual number of applications for registration of a trademark with a national or

regional trademark office by residents of China or India, 1982 to 2006 in the case of China and 1980 to 2006 in the case of India

LER = Home country exchange rate as measured by the natural logarithm of the annual real effective exchange rate index of China based on relative consumer prices (2000=100), 1982 to 2006 or the annual real effective exchange rate index of India based on 36 currencies (2000=100), 1980 to 2006

LERV = Home country exchange rate volatility as measured by the natural logarithm of the annual standard deviation of the log of the monthly changes in the real effective exchange rate index in China based on relative consumer prices (2000=100), 1982 to 2006 or the natural logarithm of the annual standard deviation of the log of the monthly changes in the real effective exchange rate of the Indian national currency to the United States dollar (2000=100), 1980 to 2006

e = the stochastic error term, called impulse or innovation or shock in the VAR.

VAR models provide a framework for testing for Granger causality between each set of variables. At a more fundamental level, Granger causality within the framework of a VAR can shed light on the causality between each set of variables where theory and common sense do not provide clarity on the exact direction of causality. This is because all the variables used to explain the current value of the dependent variable in a VAR occurred in the past. It therefore assumes that the past might influence the present, but it is not possible for the present to influence the past (Gujarati, 2003). Problems of interpretation that arise with the regression of FDI_t on YPC_t , O_t , I_t , HC_t, TE_t , ER_t and ERV_t do not arise in the VAR case, i.e. the VAR does not suffer from the problem of simultaneity noted by Sims (1980).

There are other advantages in using a VAR model. VAR models do not draw heavily on existing conceptual models or theories, but the results of the VAR model can bear implications for existing conceptual models or theories. Thus, VAR models are often regarded as “atheoretical” (Koop, 2000) because it uses less prior information and is not tied to any one existing conceptual model or theory. The theory is limited to selecting the variables in the VAR model, as was undertaken in the previous section of the current study. The empirical VAR model used in the current study simply states as follows: The outward FDI of China or India and a number of factors specific to China or India as a home country — to include national income per capita, openness of the economy to trade, interest rates, human capital, technological capability, exchange rates and exchange rate volatility — are related. This relationship is modelled as implying only that each variable depends on lags of itself and all other variables.

“Strictly speaking, in an *m*-variable VAR model, all the *m* variables should be (jointly) stationary.” (Gujarati, 2003, p. 853). Tables 1 and 2 present the results of integration tests employing the use of correlograms of each of the eight variables used in the VAR modelling for China and India. The tables prove the stationary properties of all variables in the multiple time series used for VAR model estimation in the two countries. Since all variables in the VAR (1) are stationary, estimation and testing can be carried out in the standard way of Ordinary Least Squares Regression.

Table 1. Correlograms of the variables used in the VAR model for China (Period: 1982 to 2006)

1. LFDI				
Lag	AC	PAC	Q-Stat	Prob
1	0.1527232	0.152723	0.655998	0.417976
2	-0.27402	-0.30445	2.859631	0.239353
3	-0.129629	-0.03221	3.375195	0.337313
4	0.0952385	0.048626	3.666743	0.452981
5	0.0227161	-0.05775	3.684159	0.595723
6	-0.051254	-0.01221	3.777485	0.706759
7	-0.007061	0.010061	3.779355	0.804812
8	0.0019435	-0.03133	3.779505	0.876449
9	-0.032684	-0.032	3.824573	0.922575
2. LYPC				
Lag	AC	PAC	Q-Stat	Prob
1	0.8805589	0.880559	21.80767	3.01E-06
2	0.7650769	-0.04589	38.98621	3.42E-09
3	0.6555743	-0.0385	52.17257	2.75E-11
4	0.5485371	-0.05444	61.84413	1.19E-12
5	0.4294851	-0.12217	68.06957	2.58E-13
6	0.3138056	-0.06887	71.56798	1.95E-13
7	0.2188149	0.004553	73.36348	3.08E-13
8	0.1321614	-0.03928	74.05701	7.62E-13
9	0.0189541	-0.19313	74.07216	2.41E-12
3. LO				
Lag	AC	PAC	Q-Stat	Prob
1	0.8579737	0.857974	20.70335	5.36E-06
2	0.7120864	-0.09107	35.58466	1.87E-08
3	0.5722487	-0.06193	45.63199	6.79E-10
4	0.4581139	0.009037	52.37776	1.15E-10
5	0.3594242	-0.02298	56.73778	5.73E-11
6	0.270501	-0.03728	59.33727	6.14E-11
7	0.1860805	-0.04957	60.63574	1.13E-10
8	0.1151099	-0.01563	61.16186	2.76E-10
9	0.0400473	-0.08084	61.22952	7.76E-10
4. LI				
Lag	AC	PAC	Q-Stat	Prob
1	0.9212607	0.921261	23.87029	1.03E-06
2	0.8243733	-0.16095	43.81482	3.06E-10
3	0.7145977	-0.12774	59.48248	7.58E-13
4	0.5961665	-0.10827	70.90652	1.46E-14
5	0.4668493	-0.13668	78.26228	1.94E-15
6	0.3444554	-0.02398	82.47746	1.1E-15
7	0.2155994	-0.13781	84.22057	1.89E-15
8	0.0719228	-0.21002	84.42597	6.26E-15
9	-0.058542	-0.02291	84.57055	1.99E-14
5. LHC				
Lag	AC	PAC	Q-Stat	Prob
1	0.8537001	0.8537	20.49761	5.97E-06
2	0.7082884	-0.07565	35.22061	2.25E-08
3	0.5716595	-0.05254	45.24726	8.2E-10
4	0.4455418	-0.04785	51.62786	1.65E-10
5	0.3469576	0.015682	55.69067	9.41E-11
6	0.2662591	-0.00829	58.20927	1.04E-10
7	0.1996875	-0.01195	59.70458	1.73E-10

8	0.1364738	-0.04404	60.44411	3.81E-10
9	0.0472757	-0.14893	60.5384	1.06E-09
6. LTE				
Lag	AC	PAC	Q-Stat	Prob
1	0.8489215	0.848921	20.26878	6.73E-06
2	0.689861	-0.11029	34.23565	3.68E-08
3	0.542219	-0.05212	43.25615	2.17E-09
4	0.4356817	0.051496	49.35746	4.92E-10
5	0.3414538	-0.03967	53.29239	2.93E-10
6	0.2547938	-0.04225	55.59876	3.51E-10
7	0.1796192	-0.01558	56.80862	6.52E-10
8	0.110488	-0.04166	57.29334	1.58E-09
9	0.0413725	-0.06265	57.36555	4.3E-09
7. LER				
Lag	AC	PAC	Q-Stat	Prob
1	0.8212047	0.821205	18.96686	1.33E-05
2	0.589101	-0.26189	29.15173	4.68E-07
3	0.3467248	-0.1605	32.84024	3.48E-07
4	0.1478724	-0.02962	33.54308	9.25E-07
5	0.039546	0.097799	33.59586	2.87E-06
6	-0.045377	-0.12217	33.66901	7.79E-06
7	-0.100293	-0.0411	34.04621	1.69E-05
8	-0.210303	-0.28059	35.8023	1.91E-05
9	-0.273155	0.102476	38.95005	1.18E-05
8. LERV				
Lag	AC	PAC	Q-Stat	Prob
1	0.4587076	0.458708	5.917857	0.014988
2	0.3018682	0.115827	8.592161	0.013622
3	0.0912796	-0.10819	8.847801	0.031384
4	0.1418609	0.136534	9.494661	0.049857
5	0.2308736	0.190782	11.29362	0.045859
6	-0.10261	-0.42153	11.66767	0.069807
7	0.0532184	0.28403	11.77388	0.108244
8	-0.183094	-0.27844	13.10495	0.108289
9	-0.172021	-0.23082	14.35334	0.1103

Notes:
AC = autocorrelation, PAC = partial autocorrelation, Q-Stat = Q statistic, Prob = Probability

Table 2. Correlograms of the variables used in the VAR model for India (Period: 1980 to 2006)

1. LFDI				
Lag	AC	PAC	Q-Stat	Prob
1	0.7504871	0.750487	16.96191	3.81E-05
2	0.6491275	0.196664	30.15911	2.83E-07
3	0.4829429	-0.13339	37.76837	3.16E-08
4	0.4156507	0.077744	43.6499	7.58E-09
5	0.3426604	0.032763	47.82885	3.85E-09
6	0.2409842	-0.13515	49.99416	4.71E-09
7	0.1483869	-0.07131	50.85619	9.81E-09
8	0.0856265	0.024745	51.15834	2.45E-08
9	0.035099	-0.02522	51.21193	6.37E-08
2. LYPC				
Lag	AC	PAC	Q-Stat	Prob
1	0.8119752	0.811975	19.85519	8.35E-06
2	0.6373663	-0.06439	32.57849	8.43E-08
3	0.4758102	-0.06707	39.96464	1.08E-08
4	0.3616249	0.032599	44.41659	5.26E-09
5	0.2812708	0.019584	47.23231	5.09E-09
6	0.2043759	-0.05066	48.78971	8.21E-09
7	0.1455428	-0.00052	49.61901	1.72E-08
8	0.0900466	-0.02952	49.95317	4.17E-08
9	0.0411081	-0.02994	50.02668	1.06E-07
3. LO				
Lag	AC	PAC	Q-Stat	Prob
1	0.848639	0.848639	21.68874	3.21E-06
2	0.7086996	-0.04106	37.41937	7.49E-09
3	0.5856661	-0.0201	48.60991	1.58E-10
4	0.4804479	-0.01047	56.46817	1.6E-11
5	0.4013967	0.027927	62.20255	4.26E-12
6	0.3094416	-0.09521	65.77281	3E-12
7	0.2213113	-0.0482	67.69033	4.32E-12
8	0.1407278	-0.03968	68.50647	9.74E-12
9	0.0658125	-0.04676	68.69488	2.74E-11
4. LI				
Lag	AC	PAC	Q-Stat	Prob
1	0.9018135	0.901814	24.49187	7.46E-07
2	0.799568	-0.07336	44.51502	2.16E-10
3	0.6953401	-0.06709	60.28914	5.1E-13
4	0.5936486	-0.0474	72.2867	7.46E-15
5	0.4905874	-0.07164	80.85257	5.56E-16
6	0.3832013	-0.0927	86.32773	1.75E-16
7	0.274734	-0.08254	89.28272	1.74E-16
8	0.1665936	-0.08299	90.42646	3.81E-16
9	0.0652974	-0.05524	90.61193	1.23E-15
5. LHC				
Lag	AC	PAC	Q-Stat	Prob
1	0.8838478	0.883848	23.52575	1.23E-06
2	0.7733676	-0.03574	42.25816	6.66E-10
3	0.6648468	-0.05278	56.67911	3.01E-12
4	0.5667747	-0.01686	67.61501	7.23E-14
5	0.4732596	-0.03997	75.58648	7.02E-15
6	0.3728058	-0.09442	80.7686	2.48E-15
7	0.2712444	-0.07738	83.649	2.48E-15

8	0.1658872	-0.09622	84.78306	5.3E-15
9	0.0717546	-0.04008	85.00703	1.63E-14
6. LTE				
Lag	AC	PAC	Q-Stat	Prob
1	0.9028966	0.902897	24.55073	7.24E-07
2	0.8045337	-0.05785	44.82337	1.85E-10
3	0.7009211	-0.08298	60.85172	3.87E-13
4	0.5974884	-0.0597	73.00498	5.26E-15
5	0.4947498	-0.06027	81.71683	3.67E-16
6	0.3798439	-0.13583	87.09647	1.21E-16
7	0.2576291	-0.12486	89.69496	1.43E-16
8	0.1374002	-0.0846	90.47296	3.73E-16
9	0.0510066	0.088288	90.58614	1.24E-15
7. LER				
Lag	AC	PAC	Q-Stat	Prob
1	0.9150013	0.915001	25.21343	5.13E-07
2	0.8228841	-0.08812	46.42139	8.31E-11
3	0.7202895	-0.11374	63.3478	1.13E-13
4	0.5984252	-0.17626	75.5392	1.53E-15
5	0.4663003	-0.13519	83.27794	1.73E-16
6	0.323512	-0.15109	87.18026	1.17E-16
7	0.1944882	-0.00493	88.66114	2.33E-16
8	0.070401	-0.06224	88.86539	7.9E-16
9	-0.043626	-0.04011	88.94818	2.65E-15
8. LERV				
Lag	AC	PAC	Q-Stat	Prob
1	-0.06255	-0.06255	0.117828	0.731402
2	0.3471659	0.344602	3.892645	0.142798
3	-0.084502	-0.0555	4.125607	0.248216
4	-0.152867	-0.31657	4.921142	0.295485
5	0.1004714	0.170683	5.280415	0.382625
6	0.0268317	0.264706	5.307258	0.505051
7	-0.112554	-0.36552	5.803225	0.562905
8	-0.054693	-0.30696	5.9265	0.655465
9	-0.323628	-0.00423	10.48248	0.312854

Notes:
AC = autocorrelation, PAC = partial autocorrelation, Q-Stat = Q statistic, Prob = Probability

4. The empirical results

4.1 China

The results of the unrestricted VAR (1) model with 8 variables pertaining to China are presented in Table 3. Six of the eight equations that constitute the unrestricted VAR model are statistically significant on the basis of the standard *F* test at more than the 99 per cent confidence level. Moreover, the results for the six significant equations demonstrate some interesting patterns of Granger causality.

The observed F-statistic in the first equation, with LFDI as the dependent variable, is much too low to be statistically significant. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore accepted at the 95 per cent confidence level. This implies that none of the lagged explanatory variables are statistically significant in Granger causing the level of outward FDI flows of China, and this result is confirmed by the hypotheses tests for all individual regression coefficients other than LO(-1). Except for the statistically peculiar result on the coefficient of LO(-1), none of the other estimated partial coefficients of the regression equation are significantly different from zero at the 95 per cent confidence level.

The observed F-statistic in the second equation, with LYPC as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national income per capita of China. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LYPC(-1), LO(-1), LI(-1), LER(-1), LERV(-1) and Time at the 90 per cent confidence level at least. This means

that a number of home country-specific national factors Granger cause the GDP per capita of China: past values of GDP per capita of China, the openness of China to international trade, the national interest rate, the exchange rate and exchange rate volatility.

The observed F-statistic in the third equation, with LO as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the openness of the Chinese economy to international trade. However, none of the coefficients of the individual variables are significantly different from zero at the 90 per cent confidence level, other than Time. This result flags the possible problem of multicollinearity between the lagged variables in this equation.

The observed F-statistic in the fourth equation, with LI as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national interest rate of China. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LYPC(-1), LO(-1) and LI(-1) at the 90 per cent confidence level at least. This means that lagged values of national income per capita, the openness of China to international trade and the national interest rate Granger cause the national interest rate of China.

Table 3. The VAR (1) model for China using LFDI, LYPC, LO, LI, LHC, LTE, LER, LERV as dependent variables

	Dependent variable LFDI		Dependent variable LYPC		Dependent variable LO		Dependent variable LI		Dependent variable LHC		Dependent variable LTE		Dependent variable LER		Dependent variable LERV	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
LFDI(-1)	.037957	.878	.0096159	.348	-.011301	.430	-.0017529	.914	.0022642	.746	-.017951	.437	-.0044315	.741	.024482	.792
LYPC(-1)	-2.9372	.514	.42667	.031	-.42360	.113	-.60159	.056	-.16748	.197	-.69785	.106	.71271	.009	-3.8719	.034
LO(-1)	13.6382	.038	.50073	.057	.35925	.308	.73616	.080	.070552	.680	-.16815	.763	.28570	.388	.77785	.732
LI (-1)	-.28725	.948	-.73397	.001	.26692	.298	.59959	.053	-.18365	.154	.81953	.059	-.33916	.168	.85567	.606
LHC(-1)	-7.9819	.324	.51828	.125	.46649	.313	.074051	.887	.61408	.014	-.51706	.484	-.14447	.737	1.7683	.555
LTE(-1)	-4.2112	.218	.022507	.868	.061993	.745	-.28870	.200	.18873	.059	.51824	.107	.080568	.655	-1.6371	.516
LER(-1)	.19174	.947	-.49556	.001	.20705	.219	.14655	.441	.078140	.341	.83818	.006	.47655	.007	.70306	.516
LERV(-1)	.31593	.672	-.10644	.003	.0065585	.878	.058255	.246	-.011012	.602	.078290	.264	-.049721	.228	.28551	.315
Intercept	-18.3314	.584	-1.7563	.208	2.6187	.183	-2.0823	.349	1.7921	.072	7.0929	.034	-2.3451	.206	5.2546	.675
Time	-.34877	.743	-.12054	.013	.11815	.067	-.026231	.708	-.011689	.697	.28257	.011	-.14457	.022	.45784	.261
R-Squared	.38510		.99537		.99462		.98751		.99342		.98926		.95874		.55941	
R-Bar-Squared	-.010197		.99239		.99117		.97948		.98919		.98236		.93222		.27618	
S.E. of Regression	1.4500		058937		.082831		.095239		.040854		.13345		.078225		.54310	
F (9,14)	.97421[.499]		334.2975[.000]		287.7293[.000]		122.9701[.000]		234.7678[.000]		143.3358[.000]		36.1496[.000]		1.9751[.122]	
Akaike Info. Criterion	-46.5039		30.3645		22.1964		18.8463		39.1596		10.7499		23.5693		-22.9353	
Schwarz Bayesian Criterion	-52.3942		24.4742		16.3061		12.9561		33.2693		4.8596		17.6791		-28.8256	
DW-statistic	2.2714		1.9021		2.0722		1.9929		1.7353		1.9192		2.5292		2.3842	
System Log-likelihood	223.9638		223.9638		223.9638		223.9638		223.9638		223.9638		223.9638		223.9638	

The observed F-statistic in the fifth equation, with LHC as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national human capital of China. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LHC(-1), LTE(-1) and the Intercept at the 90 per cent confidence level at least. This means that lagged values of national human capital and technological capability Granger cause the national human capital of China.

The observed F-statistic in the sixth equation, with LTE as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national technological capability of China. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LI(-1), LER(-1), Intercept and Time at the 90 per cent confidence level at least. This means that lagged values of the national interest rate and exchange rate Granger cause the national technological capability of China.

The observed F-statistic in the seventh equation, with LER as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the

national level of the exchange rate of China. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LYPC(-1), LER(-1) and Time at the 95 per cent confidence level at least. This means that lagged values of the national income per capita and exchange rate Granger cause the national exchange rate of China.

The observed F-statistic in the eighth equation, with LERV as the dependent variable, is much too low to be statistically significant. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore accepted at the 95 per cent confidence level. This implies that none of the lagged explanatory variables are statistically significant in Granger causing the national exchange rate volatility of China, and this result is confirmed by the hypotheses tests for all individual regression coefficients other than LYPC(-1). Except for the statistically peculiar result on the coefficient of LYPC(-1), none of the other estimated partial coefficients of the regression equation are significantly different from zero at the 95 per cent confidence level.

4.2. India

The results of the unrestricted VAR (1) model with 8 variables pertaining to India are presented in Table 4. Seven of the eight equations that constitute the unrestricted VAR model are statistically significant on the basis of the standard *F* test at more than the 99 per cent confidence level. Moreover, the results for the seven significant equations demonstrate some interesting patterns of Granger causality.

Unlike that of China, the observed F-statistic in the first equation for India, with LFDI as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients

are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the outward FDI flows of India. The hypotheses tests for individual regression coefficients reveal a statistically significant coefficient for LTE at the 95 per cent confidence level at least. This means that national technological capability of India Granger causes the level of their outward FDI flows.

The observed F-statistic in the second equation, with LYPC as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national income per capita of India. The hypotheses tests for individual regression coefficients shows a statistically significant coefficient for LYPC(-1) at the 95 per cent confidence level at least. This means that the lagged value of the national income per capita Granger causes the current national income per capita of India.

The observed F-statistic in the third equation, with LO as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the openness of the Indian economy to international trade. However, as with China none of the variables are significantly different from zero at the 95 per cent confidence level. This result flags the possible problem of multicollinearity between the lagged variables in this equation.

Table 4. The VAR (1) model for India using LFDI, LYPC, LO, LI, LHC, LTE, LER, LERV as dependent variables

	Dependent variable LFDI		Dependent variable LYPC		Dependent variable LO		Dependent variable LI		Dependent variable LHC		Dependent variable LTE		Dependent variable LER		Dependent variable LERV	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
LFDI(-1)	0.57775	.853	.021821	.407	-.0071347	.851	-.038224	.029	.0073304	.245	-.0093434	.790	.0084837	.578	.013625	.952
LYPC(-1)	2.6083	.487	.80124	.019	.54203	.243	.12654	.516	.068833	.358	-.69905	.110	.13143	.473	-2.5324	.356
LO(-1)	-1.1674	.658	.15506	.484	.37687	.250	.025648	.851	.13488	.018	.23496	.433	-.13445	.303	.26292	.891
LI (-1)	1.8428	.640	-.28136	.397	.62440	.204	.93700	.000	-.10764	.180	-.70671	.125	-.4259E-3	.998	2.7148	.349
LHC(-1)	-3.8535	.787	-1.0125	.400	1.3644	.436	-.54626	.464	.11946	.673	1.2199	.451	.59269	.399	6.8346	.512
LTE(-1)	5.6896	.019	.023032	.901	.31251	.255	.17124	.148	-.0066117	.880	.25547	.313	.14461	.191	-1.3207	.415
LER(-1)	.023847	.995	.31868	.371	-.15393	.765	.25057	.262	-.10847	.206	.42586	.376	.73089	.002	-.31689	.918
LERV(-1)	.25949	.554	.056974	.132	-.0068549	.897	-.028800	.214	.0095342	.279	-.024735	.616	.020040	.352	-.43399	.183
Intercept	-28.7618	.795	7.2100	.439	-12.7882	.349	.93284	.871	6.5745	.008	-.65610	.958	-4.1281	.447	-44.7451	.579
Time	-.011980	.971	.012702	.650	.011519	.777	.0069012	.691	.0088086	.196	-.022321	.555	-.037701	.032	.17758	.468
R-Squared	.88199		.96831		.98283		.99808		.99818		.99083		.98119		.31647	
R-Bar-Squared	.81561		.95049		.97317		.99701		.99715		.98567		.97061		-.068018	
S.E. of Regression	.78743		.065821		.096006		.040887		.015632		.088831		.038404		.57261	
F (9,16)	13.2866(.000)		54.3259(.000)		101.7362(.000)		926.3809(.000)		973.1598(.000)		192.0815(.000)		92.7418(.000)		.82309(.604)	
Akaike Info. Criterion	-34.3672		30.1605		20.3463		42.5397		67.5382		22.3658		44.1683		-26.0846	
Schwarz Bayesian Criterion	-40.6577		23.8700		14.0558		36.2492		61.2478		16.0753		37.8779		-32.3751	
DW-statistic	2.1325		2.2420		1.9692		1.6481		1.6093		2.1498		2.5648		2.0786	
System Log-likelihood	313.4652		313.4652		313.4652		313.4652		313.4652		313.4652		313.4652		313.4652	

The observed F-statistic in the fourth equation, with LI as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national interest rate of India. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LFDI(-1) and LI(-1) at the 95 per cent confidence level at least. This means that lagged values of outward FDI flows and the national interest rate Granger cause the national interest rate of India.

The observed F-statistic in the fifth equation, with LHC as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national human capital of India. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LO(-1) and the Intercept at the 95 per cent confidence level at least. This means that the openness of India to international trade Granger causes the national human capital of India.

The observed F-statistic in the sixth equation, with LTE as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national technological capability of India. However, as with the third equation none of the variables are significantly different from zero at the 95 per cent confidence level.

This result flags the possible problem of multicollinearity between the lagged variables in this equation.

The observed F-statistic in the seventh equation, with LER as the dependent variable, is highly statistically significant at more than the 99 per cent confidence level. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore rejected, which implies that the lagged explanatory variables are collectively significant in determining the Granger causality of the national level of the exchange rate of India. The hypotheses tests for individual regression coefficients shows statistically significant coefficients for LER(-1) and Time at the 95 per cent confidence level at least. This means that the lagged value of the national exchange rate Granger causes the national exchange rate.

The observed F-statistic in the eighth equation, with LERV as the dependent variable, is much too low to be statistically significant. The null hypothesis that all of the regression coefficients are simultaneously equal to zero is therefore accepted at the 95 per cent confidence level. This implies that none of the lagged explanatory variables are statistically significant in Granger causing the national exchange rate volatility of India, and this result is confirmed by the hypotheses tests for all individual regression coefficients. None of the estimated partial coefficients of the regression equation are significantly different from zero at the 95 per cent confidence level.

5. Discussion and conclusions

An 8-equation unrestricted VAR model was used in the current study to test the relationships between the level of outward FDI flows of China or India and a number of factors specific to China or India as a home country to include national income per capita, openness of the economy to international trade, interest rate, human capital,

technological capability, exchange rate and exchange rate volatility. The most remarkable finding of the study is that the past values of all these home country-specific variables, either individually or collectively, do not explain the level of outward FDI flows of China.[4] Conversely, past values of the outward FDI flows of China do not explain national income per capita, the openness of China to international trade, the national interest rate, the national human capability, the national technological capability, the national exchange rate and the national exchange rate volatility. The results obtained on the basis of the data available to hand thus suggest that the home country-specific macroeconomic factors do not determine the level of outward FDI of China, and neither does the level of outward FDI of China determine these home country-specific macroeconomic factors.

By contrast, although past values of such India-specific national variables as income per capita, openness of the economy to international trade, interest rate, human capital, exchange rate and exchange rate volatility do not influence the level of outward FDI flows of India, the national technological capability of India as a home country clearly does. This result both confirms and complements the findings of Pradhan (2004) on the firm-level determinants of Indian outward FDI in which attention was drawn to the significance of R & D intensity of Indian MNCs in the manufacturing sector. The current study has provided evidence that some of the firm-specific ownership advantages of Indian MNCs reflect the national innovation system of their country of origin. The results also show that past values of the level of outward FDI flows of India Granger causes the national interest rate of India – a subject worthy of further investigation and research.

The results underscore the very early stage of development or prematurity of Indian and more so of Chinese MNCs. These are findings worthy of much interest,

and one that could well be peculiar to China or India alone, but could well change over time with a longer time series that would allow the estimation and testing of a more properly specified VAR model. Until such time comes the current study will have to conclude on the basis of currently available evidence.

The cases of China and India manifest the weakness of the macroeconomic theories of international production. A more nuanced perception may be required that extends beyond the currently accepted view that the increase in complexity of ownership advantages of MNCs and the growth in complexity of the determinants of these ownership advantages over time with increasing global integration diminish eventually the role of home country-specific national factors and the explanatory power of macroeconomic theories of international production. The current research has established that home country-specific national-level macroeconomic determinants could be irrelevant — or at best display varying degrees of importance — in explaining the variability in the levels of the annual outward FDI flows of countries. There are clear limits to the ability of macroeconomic theories, particularly those that assign sole importance to some national-level factors, to contribute to a universal understanding of the level and pattern of international production. The current study only serves to provide further proof of the dangers of pushing these theories — as well as policies based on these theories — beyond their limit.

The results of the current study imply strongly that there are other explanatory factors than the home country-specific national macroeconomic factors specified here that moderate the strength of the relationship. The estimated VAR model may be under-specified at two levels. On the one hand, the model is under-specified to the extent that it fails to determine comprehensively the full contribution of the home country in explaining variations in the level of the annual outward FDI flows of a

country. A more comprehensive model would assess the role of home country-specific national-level determinants as well as home country-specific industry-level determinants and home country-specific firm-level determinants that define the competitiveness of all firms based in a country. This study, along with other recent conceptual and empirical studies, clearly point to the importance of analysing the role of the home country environment more broadly.

The model suffers from under-specification at a more general level, which the analysis of the home country-specific national determinants of the annual outward FDI flows of China brings into sharp relief. In terms of providing directions for future research, there could presumably be several possible sources of variation in the level of annual outward FDI flows of a country to include: general home country factors, industry-specific effects (which capture the influence of structural characteristics of industries), firm-specific effects (which take account of the heterogeneity among firms in tangible and intangible assets), a year factor (which measures factors of broader economic significance, including the impact of a global factor) and various interactive factors such as home country-year factor (which captures the impact of business cycles on the country), industry-year factor (which captures the impact of economic cycles on the industry) and also the home country-industry (comparative advantage) factor. Porter (1990), Kojima (1973) and Tolentino (2000) have analysed some of these factors. The key focus of future research may be in specifying and testing a comprehensive empirical model which takes into account all these possible structural and cyclical factors in explaining the variance in the level of outward FDI flows of a country. Such an approach may have more mileage in explaining the so-called process of “accelerated internationalization” (Bonaglia, Goldstein and Mathews, 2007) of some MNCs based in developing

countries and the evolution of the more entrepreneurial companies from Brazil, Russia, India, Mexico and China as well as some smaller countries into global leaders in a variety of industries (van Agtmael, 2007), notwithstanding volatility and frequent crises as well as institutional constraints in their macroeconomic home environment (Khanna and Palepu, 2006). “Inter-firm and inter-industry variability in R and D quality, in entrepreneurs’ animal spirits, in synergistic relationships and the ability to exploit economies of agglomeration can all affect the identity of the efficient firms apparently without reference to national characteristics.” (Gray, 1982, p. 192) The current study certainly serves to fuel the conceptual debate concerning the extent to which country- and industry-specific factors embodied in the ‘location-bound’ approach predominate over firm-specific factors embodied in the ‘universalist’ approach in elucidating the distinctive nature of MNCs based in developing economies (see Tolentino, 2006; 2008).

The VAR models estimated in the current study bear far wider implications for the analysis of the relationships of macroeconomic variables and economic theory which fall outside the scope of the paper.

DATA APPENDIX

Measurement and Data Sources for China

Variables	*Measurement*	*Data Sources*
FDI	Real FDI outflows from China, US $ million (2000=100)	Calculated
	Nominal FDI outflows from China	IMF, Balance of Payments Statistics
	Chinese GDP deflator (2000=100)	IMF, International Financial Statistics
YPC	Real GDP per capita of China, US $ million (2000=100)	Calculated
	Nominal GDP of China	IMF, International Financial Statistics
	Chinese GDP deflator (2000=100)	IMF, International Financial Statistics
	Population of China	IMF, International Financial Statistics
O	Sum of real exports and imports of China, US $ million (2000=100)	Calculated
	Nominal sum of exports and imports of China	IMF, Direction of Trade Statistics
	USA GDP deflator (2000=100)	IMF, International Financial Statistics
I	Real lending rate of China, 2000=100 (% per annum)	Calculated
	Nominal lending rate of China	IMF, International Financial Statistics
	Inflation (CPI: 2000=100) of China	International Labour Office (ILO), LABORSTA
HC	Real GDP per person employed, a measure of productivity per worker, US $ million (2000=100)	Calculated
	Real GDP per person employed (1990=100)	Calculated
	Deflator GDP per person employed (1980=100)	ILO, Key Indicators of the Labour Market
TE	Number of applications for registration of a trademark with a national or regional trademark office by residents of China	World Bank, World Development Indicators
ER	Real effective exchange	IMF, International

	rate index based on relative consumer prices (2000=100)	Financial Statistics
ERV	The annual standard deviation of the log of the monthly changes in the real effective exchange rate index based on relative consumer prices (2000=100)	Calculated
	Monthly real effective exchange rate index based on relative consumer prices (2000=100)	IMF, International Financial Statistics

Measurement and Data Sources for India

Variables	*Measurement*	*Data Sources*
FDI	Real FDI outflows from India, US $ million (2000=100)	Calculated
	Nominal FDI outflows from India	IMF, Balance of Payments Statistics
	Indian GDP deflator (2000=100)	IMF, International Financial Statistics
YPC	Real GDP per capita of India, US $ million (2000=100)	Calculated
	Nominal GDP of India	IMF, International Financial Statistics
	Indian GDP deflator (2000=100)	IMF, International Financial Statistics
	Population of India	IMF, International Financial Statistics
O	Sum of real exports and imports of India, US $ million (2000=100)	Calculated
	Nominal sum of exports and imports of China	IMF, Direction of Trade Statistics
	USA GDP deflator (2000=100)	IMF, International Financial Statistics
I	Real prime commercial lending rate of India, 2000=100 (% per annum)	Calculated
	Prime commercial lending rate of India	IMF, International Financial Statistics
	Inflation (CPI: 2000=100)	International Labour

	of India	Office (ILO), LABORSTA
HC	Real GDP per person employed, a measure of productivity per worker, US $ million (2000=100)	Calculated
	Real GDP per person employed (1990=100)	Calculated
	Deflator GDP per person employed (1980=100)	ILO, Key Indicators of the Labour Market
TE	Number of applications for registration of a trademark with a national or regional trademark office by residents of India	World Bank, World Development Indicators
ER	Real Effective Exchange Rate index based on the 36-currency trade-based bilateral weights, annual average (2000=100)	Reserve Bank of India, Handbook of Statistics on Indian Economy*
ERV	The annual standard deviation of the log of the monthly changes in the real exchange rate of the Indian national currency against the US $ (2000=100)	Calculated
	Nominal monthly average exchange rate of the Indian national currency against the US $	IMF, International Financial Statistics
	Consumer price index of India (Industrial workers) (2000=100)	International Labour Office (ILO), LABORSTA

*****Calculated from Tables 152 and 153. Available at http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy

References

Aizenman, J. and I. Noy (2006), 'FDI and trade—Two-way linkages?,' *Quarterly Review of Economics & Finance,* **46**(3), 317-337.

Aliber, R. Z. (1970), 'A theory of foreign direct investment,' in C. P. Kindleberger (ed.), *The International Corporation: A Symposium*, MIT Press: Cambridge, Massachusetts.

Baek, H. Y. and C. C. Y. Kwok (2002), 'Foreign exchange rates and the corporate choice of foreign entry mode,' *International Review of Economics and Finance,* **11**(2), 207-227.

Bellak, C. (1992), *Effects of Foreign Direct Investment on the Home Country's Economy.* Ph.D. dissertation, Vienna University of Economics.

Bergsten, C., F. Horst and T. Moran (1978), *American Multinationals and American Interests.* The Brookings Institution: Washington, D.C.

Blonigen, B. A. (1995), *Explaining Japanese Foreign Direct Investment in the United States.* Ph.D. Dissertation, University of California, Davis.

Blonigen, B. A. (1997), 'Firm-specific assets and the link between exchange rates and foreign direct investment,' *American Economic Review,* **87**(3), 447-465.

Blonigen, B. A. and R. C. Feenstra (1996), Effects of U.S. trade protection and promotion policies. National Bureau of Economic Research, Working Paper No. 5285, Cambridge, MA.

Boateng, A., W. Qian and Y. Tianle (2008), 'Cross-border M&As by Chinese firms: an analysis of strategic motives and performance,' *Thunderbird International Business Review,* **50**(4), 259-270.

Bolling, C., M. Shane and T. Roe (2007), 'Exchange rates and U.S. foreign direct investment in the global processed food industry,' *Agricultural and Resource Economics Review,* **36**(2), 230-38.

Bonaglia, F., A. Goldstein and J. A. Mathews (2007), 'Accelerated internationalisation by emerging markets' multinationals: the case of the white goods sector,' *Journal of World Business,* **42**(4), 369-383.

Bowonder, B. and N. Mastakar (2005), 'Strategic business leadership through innovation and globalisation: a case study of Ranbaxy Limited,' *International Journal of Technology Management,* **32**(1/2), 176-198.

Buckley, P. J., L. J. Clegg, A. R. Cross, L. Xin, H. Voss and Z. Ping (2007), 'The determinants of Chinese outward foreign direct investment,' *Journal of International Business Studies,* **38**(4), 499-518.

Cai, K. G. (1999), 'Outward foreign direct investment: a novel dimension of China's integration into the regional and global economy,' *China Quarterly,* **160,** 856-80.

Cantwell, J. (1981), Technological advantage as a determinant of the international economic activity of firms. Discussion Papers in International Investment and Business Studies, No. 105, University of Reading: Reading, UK.

Cantwell, J. (1987), 'The reorganization of European Industries after integration: selected evidence on the role of multinational enterprise activities,' *Journal of Common Market Studies,* **26**(2), 127-151.

Cantwell, J. and P. E. E. Tolentino (2000), Technological accumulation and Third World multinationals. Discussion Papers in International Investment and Business Studies, Series B, No. 139, University of Reading: Reading, UK.

Chakrabarti, A. (2001), 'The determinants of foreign direct investment: sensitivity analyses of cross-country regressions,' *Kyklos,* **54**(1), 89-114.

Chiou Wei, S. Z. and Z. Zhu (2007), 'A revisit to the outward FDI determinants: further evidence from count panel data models with fixed effects,' *Applied Economics Letters,* **14**(10-12), 809-12.

Chittoor, R. and S. Ray (2007), 'Internationalization paths of Indian pharmaceutical firms — a strategic group analysis,' *Journal of International Management,* **13**(3), 338-355.

Choi, J. J. and B. N. Jeon (2007), 'Financial factors in foreign direct investments: a dynamic analysis of international data,' *Research in International Business and Finance,* ***2*1**(1), 1-18.

Clegg, J. (1987), *Multinational Enterprises and World Competition*: *A Comparative Study of the USA, Japan, the UK, Sweden and West Germany.* St Martin's Press: New York.

Contractor, F. J., V. Kumar and S. K. Kundu (2007), 'Nature of the relationship between international expansion and performance: the case of emerging market firms,' *Journal of World Business,* **42**(4), 401-417.

Culem, C. G. (1988), 'The locational determinants of direct investments among industrialized countries,' *European Economic Review,* **32**(4), 885-904.

Deng, P. (2004), 'Outward investment by Chinese MNCs: motivations and implications,' *Business Horizons,* **47**(3), 8-16.

Dunning, J. H. (1981), 'Explaining outward direct investment of developing countries: in support of the eclectic theory of international production,' in K.

Kumar and M. G. McLeod (eds), *Multinationals from Developing Countries.* Lexington Books: Lexington, Massachusetts.

Dunning, J.H. (1982), 'Explaining the international direct investment position of countries: towards a dynamic or developmental approach,' in J. Black and J. H. Dunning (eds), *International Capital Movements.* Macmillan: London.

Dunning, J. H. (1993), *Multinational Enterprises and the Global Economy.* Addison-Wesley: Wokingham.

Dunning, J. H. and P. J. Buckley (1977), 'International production and alternative models of trade,' *Manchester School of Economic and Social Studies,* **45**(4), 392-403.

Dunning, J. H. and R. Narula (1997), 'The investment development path revisited: some emerging issues,' in J. H. Dunning and R. Narula (eds), *Foreign Direct Investment and Governments Catalysts for Economic Restructuring.* Routledge: London.

Edwards, S. (1990), Capital flows, foreign direct investment, and debt-equity swaps in developing countries. National Bureau of Economic Research, Working Paper No. 3497, Cambridge, MA.

Elango, B. and C. Pattnaik (2007), 'Building capabilities for international operations through networks: a study of Indian firms,' *Journal of International Business Studies,* **38**(4), 541-555.

Ferrantino, M. J. (1992), 'Transaction costs and the expansion of Third-World multinationals,' *Economics Letters,* **38**(4), 451-456.

Franko, L. G. (1976), *The European Multinationals. A Renewed Challenge to American and British Big Business.* Harper and Row: London.

Froot, K. A. and J. C. Stein (1989), Exchange rates and foreign direct investment: an imperfect capital markets approach. National Bureau of Economic Research Working Paper No. 2914, Cambridge, MA.

Fung, H-G., Q. W. Liu and E. H. C. Kao (2007), 'China's outward direct and portfolio investments,' *China and World Economy,* **15**(6), 53-68.

Garg, M. and A. Delios (2007), 'Survival of the foreign subsidiaries of TMNCs: the influence of business group affiliation,' *Journal of International Management,* **13**(3), 278-295.

Georgopoulos, G. J. (2008), 'Cross-border mergers and acquisitions: does the exchange rate matter? some evidence for Canada,' *Canadian Journal of Economics,* **41**(2), 450-474.

Ghosh, I. (2007), 'The relations between trade and FDI in developing countries — a panel data approach', *Global Economy Journal,* **7**(3): 1-30.

Gopinath, M., D. Pick and U. Vasavada (1998), 'Exchange rate effects on the relationship between FDI and trade in the U.S. food processing industry,' *American Journal of Agricultural Economics,* **80**(5), 1073-79.

Gray, H.P. (1982), 'Macroeconomic theories of foreign direct investment: an assessment,' in A. M. Rugman (ed.), *New Theories of the Multinational Enterprise*. Croom Helm: London and Canberra, pp. 172-195.

Grubaugh, S. G. (1987), 'Determinants of direct foreign investment,' *Review of Economics & Statistics,* **69**(1), 149-152.

Gujarati, D. N. (2003), *Basic Econometrics,* International Edition. McGraw-Hill: London.

Guo, J. Q. and P. K. Trivedi (2002), 'Firm–specific assets and the link between exchange rates and Japanese foreign direct investment in the United States: a re-examination,' *Japanese Economic Review,* **53**(3), 337-349.

Hawawini, G., V. and M. Schill (1982), The Japanese presence in the European financial sector: historical perspective and future prospects. Paper presented to the conference on Japanese Direct Investment in a Unifying Europe, Fontainbleau, France, INSEAD, 26-27 June.

Hawawini, G., V. Subramanian and P. Verdin (2004), 'The Home Country in the Age of Globalization: How Much Does it Matter for Firm Performance?,' *Journal of World Business,* **39**(2), 121-135.

Hong, E. and L. Sun (2006), 'Dynamics of internationalization and outward investment: Chinese corporations' strategies,' *China Quarterly,* **187,** 610-34.

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.

Juhl, P. (1979), 'On the sectoral patterns of West German manufacturing investment in less developed countries: the impact of firm size, factor intensities and protection,' *Weltwirtschaftliches Archiv,* **115**(3), 508-21.

Khanna, T. and K. G. Palepu (2006), 'Emerging giants: building world-class companies in developing countries,' *Harvard Business Review,* **84**(10), 60–70.

Klein, M. W. and E. Rosengren (1994), 'The real exchange rate and foreign direct investment in the United States', *Journal of International Economics,* **36**(3/4), 373-389.

Kogut, B. and S. J. Chang (1991), 'Technological capabilities and Japanese foreign direct investment in the United States,' *Review of Economics & Statistics,* **73**(3), 401-413.

Kojima, K. (1973), 'A macroeconomic approach to foreign direct investment,' *Hitotsubashi Journal of Economics,* **14**(1), 1-21.

Koop, G. (2000), *Analysis of Economic Data.* John Wiley & Sons: Chichester.

Kravis, I. B. and Lipsey, R. E. (1982), 'The location of overseas production and production for export by U.S. multinational firms,' *Journal of International Economics,* **12**(3/4), 201-223.

Kumar, K. and Y. K. Kim (1984), 'The Korean manufacturing multinationals,' *Journal of International Business Studies,* **15**(1), 45-61.

Kyrkilis, D. and P. Pantelidis (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 US manufacturing industry,' *Oxford Economic Papers,* **32**(1), 102-22.

Lall, S. (1983). *The New Multinationals.* John Wiley: Chichester and New York.

Li, P. P. (2007), 'Toward an integrated theory of multinational evolution: the evidence of Chinese multinational enterprises as latecomers,' *Journal of International Management,* **13**(3), 296-318.

Liu, H. and K. Li (2002), 'Strategic implications of emerging Chinese multinationals: the Haier case study,' *European Management Journal,* **20**(6), 699-706.

Low, S. P. and J. Hongbin (2006), 'Analysing ownership, locational and internalization advantages of Chinese construction MNCs using rough sets analysis,' *Construction Management & Economics,* **24**(11), 1149-1165.

Luo, Y. and R. L. Tung (2007), 'International expansion of emerging market enterprises: a springboard perspective,' *Journal of International Business Studies,* **38**(4), 481-498.

Morck, R., B. Yeung and M. Zhoa (2008), 'Perspectives on China's outward foreign direct investment,' *Journal of International Business Studies,* **39**(3), 337-350.

Nachum, L. (2001), 'The impact of home countries on the competitiveness of advertising TNCs,' *Management International Review (MIR),* **41**(1), 77-98.

Nachum, L. and J. D. Rolle (1999), 'Home country and firm-specific ownership advantages: a study of US, UK and French advertising agencies,' *International Business Review,* **8**(5/6), 633-660.

Narula, R. (1996), *Multinational Investment and Economic Structure: Globalisation and Competitiveness.* Routledge: London.

Nayyar, D. (2008), 'The internationalization of firms from India: investment, mergers and acquisitions,' *Oxford Development Studies,* **36**(1), 111-131.

Pain, N. and D. van Welsum (2003), 'The multiple links between exchange rates and FDI,' *Journal of Common Market Studies,* **41**(5), 823-846.

Pantelidis, P. and D. Kyrkilis (2005), 'A cross country analysis of outward foreign direct investment patterns', *International Journal of Social Economics,* **32**(6), 510-519.

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, University of Reading: Reading, UK.

Porter, M. E. (1990), *Competitive Advantage of Nations.* The Free Press: Boston.

Pradhan, J. P. (2004), 'The determinants of outward foreign direct investment: a firm-level analysis of Indian manufacturing,' *Oxford Development Studies,* **32**(4), 619-39.

Pradhan, J. P. (2008), 'The evolution of Indian outward foreign direct Investment: changing trends and patterns,' *International Journal of Technology and Globalisation,* **4**(1), 70-86.

Pugel, T. A. (1981), *International Market Linkages and U.S. Manufacturing: Prices, Profits, and Patterns.* Ballinger: Cambridge, MA.

Pugel, T. A. (1981), 'The determinants of foreign direct investment: an analysis of US manufacturing industries,' *Managerial & Decision Economics,* **2**(4), 220-228.

Qin, J. (2000), 'Exchange rate risk and two-way foreign direct investment,' *International Journal of Finance and Economics,* **5**(3), 221-231.

Ramachandran, J. *et al* (2004), 'Indian companies in overseas markets: perspectives, patterns, and implications,' *Vikalpa: The Journal for Decision Makers,* **29**(4), 93-111.

Rui, H. and G. Yip (2008), 'Foreign acquisitions by Chinese firms: a strategic intent perspective,' *Journal of World Business,* **43**(2), 213-226.

Russ, K. N. (2007), 'The endogeneity of the exchange rate as a determinant of FDI: a model of entry and multinational firms,' *Journal of International Economics,* **71**(2), 344-372.

Schmitz, A. and J. Bieri (1972), 'EEC tariffs and U. S. direct investment,' *European Economic Review,* **3**(3), 259-270.

Seshadri, D. V. R. and A. Tripathy (2006), 'Reinventing a giant corporation: the case of Tata Steel,' *Vikalpa: The Journal for Decision Makers,* **31**(1), 133-146.

Shenkar, O. and Y. Luo (2004), *International Business.* John Wiley & Sons: Hoboken, New Jersey.

Sims, C. (1980), 'Macroeconomics and reality,' *Econometrica,* **48**(1), 1-48.

Swedenborg, B. (1979), *The Multinational Operations of Swedish Firms: An Analysis of Determinants and Effects.* Industriens Utredningsinstitut: Stockholm.

Tallman, S. B. (1988), 'Home country political risk and foreign direct investment in the United States,' *Journal of International Business Studies,* **19**(2), 219-234.

Tolentino, P.E. (1993), *Technological Innovation and Third World Multinationals.* Routledge: London and New York.

Tolentino, P.E. (2000), *Multinational Corporations: Emergence and Evolution,* Routledge Studies in International Business and the World Economy, Vol. 15. Routledge: London and New York.

Tolentino, P. E. (2006), 'Explaining multinational companies from the developing economies of East and Southeast Asia,' in H. W-C. Yeung (ed.), *Handbook of Research on Asian Business.* Edward Elgar: Cheltenham, UK and Northampton, MA.

Tolentino, P. E. (2008), 'Explaining the competitiveness of multinational companies from developing economies: a critical review of the academic literature,' *International Journal of Technology and Globalisation,* **4**(1), 23-38.

Tuman, J. P. and C. F. Emmert (1999), 'Explaining Japanese foreign direct investment in Latin America, 1979-1992,' *Social Science Quarterly,* **80**(3), 539-555.

UNCTAD (2007), *World Investment Report 2007: Transnational Corporations, Extractive Industries and Development.* United Nations: New York and Geneva.

van Agtmael, A. (2007), *The Emerging Markets Century: How a New Breed of World-Class Companies is Overtaking the World.* Free Press: New York.

Vernon, R. (1966), 'International investment and international trade in the product cycle,' *Quarterly Journal of Economics,* **80**(2), 190-207.

Warner, M., N. S. Hong and X. Xu (2004), 'Late development experience and the evolution of transnational firms in the People's Republic of China,' *Asia Pacific Business Review*, **10**(3/4), 324–345.

Wells, L. T. (1983), *Third World Multinationals: The Rise of Foreign Investment from Developing Countries.* MIT Press: Cambridge, MA.

Wheeler, D. and A. Mody (1992), 'International investment location decisions: the case of U.S. firms,' *Journal of International Economics,* **33**(1-2), 57-76.

Wolf, B. M. (1977), 'Industrial diversification and internationalization: some empirical evidence,' *Journal of Industrial Economics,* **26**(2), 177-191.

Wu, F., M. H. Toh and T. Ho (2003), 'Outward foreign direct investment and its impact on the home economy: the case of Singapore,' *Journal of Asian Business,* **19**(3), 27-48.

Wu, F. and H. S. Yeo (2002), 'China's rising investment in Southeast Asia: trends and outlook', *Journal of Asian Business,* **18**(2), 41-61.

Yang, D. (2005), *China's Offshore Investments: A Network Approach.* Edward Elgar: Cheltenham, U.K. and Northampton, MA.

Young, S., K. C-H. Huang and M. McDermott (1996), 'Internationalization and competitive catch-up processes: case study evidence on Chinese multinational enterprises,' *Management International Review (MIR),* **36**(4), 295-314.

The UNU-MERIT WORKING Paper Series

2008-01 *Science, Technology and Development: Emerging concepts and visions* by Luc Soete

2008-02 *Reframing technical change: Livestock Fodder Scarcity Revisited as Innovation Capacity Scarcity. Part 1. A Review of Historical and Recent Experiences* by Andy Hall, Rasheed Sulaiman V., Mona Dhamankar, Peter Bezkorowajnyj & Leela Prasad

2008-03 *Reframing technical change: Livestock Fodder Scarcity Revisited as Innovation Capacity Scarcity. Part 2. A Framework for Analysis* by Andy Hall, Rasheed Sulaiman, V. and Peter Bezkorowajnyj

2008-04 *Reframing technical change: Livestock Fodder Scarcity Revisited as Innovation Capacity Scarcity.Part 3. Tools for Diagnosis and Institutional Change in Innovation Systems* by Andy Hall, Rasheed Sulaiman and Peter Bezkorowajnyj

2008-05 *Is Inter-Firm Labor Mobility a Channel of Knowledge Spillovers? Evidence from a Linked Employer-Employee Panel* by Mika Maliranta, Pierre Mohnen & Petri Rouvinen

2008-06 *Financial Constraints and Other Obstacles:Are they a Threat to Innovation Activity?* By P. Mohnen, F.C. Palm, S. Schim van der Loeff and A. Tiwari

2008-07 *Knowledge-based productivity in 'low-tech' industries: evidence from firms in developing countries* by Micheline Goedhuys, Norbert Janz and Pierre Mohnen

2008-08 *The Voyage of the Beagle in Innovation Systems Land.Explorations on Sectors, Innovation, Heterogeneity and Selection* by Martin Srholec & Bart Verspagen

2008-09 *Crafting Firm Competencies to Improve Innovative Performance* by Boris Lokshin, Anita van Gils & Eva Bauer

2008-10 *The Economics and Psychology of Personality Traits* by Lex Borghans, Angela Lee Duckworth, James J. Heckman & Bas ter Weel

2008-11 *Embedding Research in Society: Development Assistance Options for Supporting Agricultural Innovation in a Global Knowledge Economy* by Andy Hall

2008-12 *Playing in Invisible Markets: Innovations in the Market for Toilets to Harness the Economic Power of the Poor* by Shyama V. Ramani

2008-13 *Explaining Success and Failure in Development* by Adam Szirmai

2008-14 *Running The Marathon* by William Cowan, Robin Cowan and Patrick Llerena

2008-15 *Productivity effects of innovation, stress and social relations* by Rifka Weehuizen, Bulat Sanditov and Robin Cowan

2008-16 *Entrepreneurship and Innovation Strategies in ICT SMEs in Enlarged Europe (EU25)* by Kaushalesh Lal and Theo Dunnewijk

2008-17 *Knowledge Transfers between Canadian Business Enterprises and Universities: Does Distance Matter?* By Julio M. Rosa & Pierre Mohnen

2008-18 *Multinationals are Multicultural Units: Some Indications from a Cross-Cultural Study* by Nantawan Noi Kwanjai & J. Friso den Hertog

2008-19 *The Innovativeness of Foreign Firms in China* by Branka Urem, Ludovico Alcorta and Tongliang An

2008-20 *Beyond the emission market: Kyoto and the international expansion of waste management firms* by Ionara Costa, Asel Doranova and Geert-Jan Eenhoorn

2008-21 *The 'making of' national giants: technology and governments shaping the international expansion of oil companies from Brazil and China* by Flavia Carvalho and Andrea Goldstein

2008-22 *If the Alliance Fits . . . : Innovation and Network Dynamics* by Robin Cowan & Nicolas Jonard

2008-23 *Facing the Trial of Internationalizing Clinical Trials to Developing Countries: With Some Evidence from Mexico* by Fernando Santiago-Rodriguez

2008-24 *Serving low-income markets: Rethinking Multinational Corporations' Strategies* by Shuan SadreGhazi and Geert Duysters

2008-25 *A percolation model of eco-innovation diffusion: the relationship between diffusion, learning economies and subsidies* by Simona Cantono and Gerald Silverberg

2008-26 *New Europe's Promise for Life Sciences* by Sergey Filippov and Kálmán Kalotay

2008-27 *A closer look at the relationship between life expectancy and economic growth* by Théophile T. Azomahou, Raouf Boucekkine, Bity Diene

2008-28 *Regional Capital Inputs in Chinese Industry and Manufacturing, 1978-2003* by Lili Wang & Adam Szirmai

2008-29 *Worker remittances and government behaviour in the receiving countries* by Thomas Ziesemer

2008-30 *Strategic motivations for Sino-Western alliances: a comparative analysis of Chinese and Western alliance formation drivers* by Tina Saebi & Qinqin Dong

2008-31 *Changing Configuration of Alternative Energy Systems* by Radhika Bhuyan and Lynn Mytelka

2008-32 *Promoting clean technologies: The energy market structure crucially matters* by Théophile T. Azomahou, Raouf Boucekkine, Phu Nguyen-Van

2008-33 *Local Knowledge Spillovers, Innovation and Economic Performance in Developing Countries: A discussion of alternative specifications* by Effie Kesidou and Adam Szirmai

2008-34 *Wage effects of R&D tax incentives: Evidence from the Netherlands* by Boris Lokshin and Pierre Mohnen

2008-35 *Cross-border Investment and Economic Integration: The Case of Guangdong Province and Hong Kong SAR* by Naubahar Shari and Can Huang

2008-36 *Radical versus non-radical inventions* by Wilfred Schoenmakers, Geert Duysters & Wim Vanhaverbeke

2008-37 *Localized Innovation, Localized Diffusion and the Environment: An Analysis of CO_2 Emission Reductions by Passenger Cars, 2000-2007* by Bart Los and Bart Verspagen

2008-38 *The economic impact of AIDS in sub-Saharan Africa* by Théophile T. Azomahou, Raouf Boucekkine, Bity Diene

2008-39 *Further results on bias in dynamic unbalanced panel data models with an application to firm R&D investment* by Boris Lokshin

2008-40 *A multilevel analysis of innovation in developing countries* by Martin Srholec

2008-41 *Experimentation with strategy and the evolution of dynamic capability in the Indian Pharmaceutical Sector* by Suma Athreye, Dinar Kale & Shyama V. Ramani

2008-42 *The Impact of Social Capital on Crime: Evidence from the Netherlands* by I.Semih Akcomak and Bas ter Weel

2008-43 *Portrait of an Odd-Eyed Cat: Cultural Crossing as a Trademark for a Dutch-Thai Strategic Alliance* by Nantawan Noi Kwanjai & J Friso den Hertog

2008-44 *The challenge of measuring innovation in emerging economies' firms: a proposal of a new set of indicators on innovation* by Luciana Manhães Marins

2008-45 *Intra-firm Technology Transfer and R&D in Foreign Affiliates: Substitutes or Complements? Evidence from Japanese Multinational Firms* by Rene Belderbos, Banri Ito, Ryuhei Wakasugi

2008-46 *To Be or Not to Be at the BOP: A One-North-Many-Souths Model with Subsistence and Luxury Goods* by Adriaan van Zon and Tobias Schmidt

2008-47 *Habit Formation, Information Exchange and the Social Geography of Demand* by Zakaria Babutsidze and Robin Cowan

2008-48 *Agenda Disputes and Strategic Venue Preferences: The Doha Crisis and Europe's Flight to Regionalism* by Francisco P. Toro

2008-49 *The determinants of the outward foreign direct investment of China and India: Whither the home country?* by Paz Estrella Tolentino

NOTES

[1] Excluding the Caribbean which is the home region of many tax-haven economies, the stock of outward FDI by developing economies stands at $ 1.4 trillion as of 2006. Data in this section is based on UNCTAD (2007). The current research adopts the classification used by UNCTAD for developing economies, which does not include South-East Europe and the Confederation of Independent States. The data on the stock of outward FDI from developing economies must be interpreted with caution. On the one hand, the data are over-stated for some economies on account of round tripping (in the case of Hong Kong, China); investment by foreign affiliates of mainly developed-country MNCs operating in developing economies (investment that is particularly large in economies such as Cyprus, Hong Kong (China), Mauritius, Singapore, Malaysia and a number of tax havens); and capital flight. On the other hand, other factors may lead to under-reporting of outward FDI. For example, firms from some developing economies have raised capital for outward FDI in host country markets or in international markets owing to the prohibitions on the transfer of funds from their home countries; in that case, the full extent of their international production activities is not reflected in FDI statistics.

[2] For an empirical analysis of the role of home country characteristics in the development of competitive advantages of companies, see Nachum and Rolle (1999) and Nachum (2001).

[3] Shenkar and Luo (2004) similarly consider economic soundness, science, technology & innovation, finance, and internationalisation as the four elements comprising the country-level determinants of the competitiveness of a nation.

[4] Except of course for LO(-1) whose coefficient is individually statistically significant within a regression model that is not statistically significant. This result makes intuitive sense. China's economic restructuring and transition to an open market economy and active promotion of the Chinese state has doubtless contributed to the emergence of Chinese outward FDI (Wu and Yeo, 2002; Hong and Sun, 2006). “To foster rapid growth and create jobs, China deliberately opened its domestic market to foreign competition relatively early in its economic development. But the *quid pro quo* implicit in this strategy was that the government would support, both diplomatically and

financially, Chinese companies overseas." (*The Economist,* 7/2/2005, Vol. 376 Issue 8433, pp. 54-56).