

# FDI, Investment and Growth in OECD Countries

**Keshab Bhattarai**

University of Hull, Business School, HU6 7 RX, UK

Phone: 441482463207; Fax: 441482463484; email: K.R.Bhattarai@hull.ac.uk

**Subrata Ghatak**

Kingston University, Surrey, KT1 2EE, UK

May 20, 2010

## **Abstract**

Multinational corporations [MNCs] usually engage in foreign direct investment [FDI] to take cost advantages of producing abroad to negate the need for licensing or subsidiary production. At the macro level, FDI accounts for significant proportions of MNCs total investment and has discernible impacts on economic growth. This is shown theoretically in the growth model where FDI complements domestic capital.

Our model predictions tested favourably against panel data analysis of FDI on growth for thirty OECD countries from 1990 to 2004. This paper also contributes to integrating micro and macro aspects of the impact of FDI on economic growth and provides empirical support to existing literature.

**Key Words:** FDI, Economic Growth, OECD

**JEL Classification:** F23, O40, O57

# FDI, Investment and Growth in OECD Countries

## 1 Introduction

Foreign direct investment [FDI] occurs when a multinational corporation [MNC], with specific advantages in technology, production process or management style, operates in a foreign country either by licensing arrangements or its subsidiary branch. FDI negates the need to export goods to those markets from home and is one of the major factors of globalisation benefiting both hosts and investors. Most MNCs operate in manufacturing and service industries that include automobile, energy, telecommunication, engineering, insurance and banks, pharmaceuticals and other private services sectors.

FDI has micro and macro dimensions. At micro level any FDI activity is driven by the profit maximising objective of an MNC. It occurs when it is profitable to produce in a foreign country to serve foreign markets - for this the producer has some market power based on its superior know-how or long time experience and customer relations. At macro level it complements domestic investment and helps host countries in the process of capital accumulation and faster growth - as is seen from the experience of South and East Asian countries and recently from the experience of BRICS countries. Imports of advanced technology management and marketing and production processes not only increase efficiency in production and distribution, but also raise the level of living standards and welfare in both host and foreign countries. The aim of this paper is to assess how FDI has contributed to the investment and growth process of OECD countries.

The following major stylized facts about FDI, investment and growth can be found from analysis of empirical facts (as reported in Tables A1 to A5 in the appendix).

1. The ratio of inflows to outflows varies by countries and over time. Study of ratios in Table A1 show significant upsurge in FDI inflows in Eastern European countries during this period, particularly in the Czech Republic, Hungary, Poland, Slovakia and Turkey. Among western European countries Ireland, Portugal and Spain have benefited by more inflows than outflows.

2. Output growth rates vary significantly across countries and over time. (Table A3).

3. The ratios of investment to GDP are more uniform over time in a particular country, but vary significantly across the countries between 8 to 30 percent (Table A2) though they are more uniform in comparison to inflows and outflows of FDI.

It is difficult to compare investment and GDP measured in different national currencies as the official exchange rate reflects the traded sector GDP, although a significant part of GDP is non-traded, particularly in larger economies. Despite this problem, the connection between inflows and outflows of FDI, investment

and rate of economic growth has engendered a lot of interest across the globe, particularly among OECD nations that have experienced a noticeable increase in mobility of capital across countries in recent years. The major contribution of this paper in this context lies in combining both micro aspects in a strategic model and macro aspects in an endogenous growth model and find empirical supports for conclusions of those models from the panel data of the OECD countries for 1990 to 2004. The micro economic theory of FDI is presented in the next section followed by a growth model with a link between FDI, investment and growth in section III. The empirical estimates emerging from the analysis of panel data on growth, investment, inflows and outflows of FDI among OECD are discussed in section IV. Section V concludes.

## 2 Microeconomic Theory of FDI

Hymer (1976) and Caves (1982) provide some early microeconomic studies about the effects of FDI which are further refined in Batra and Ramachandran (1980) and Batra (1986) with a comparative static exercise within a general equilibrium framework to analyse the impacts of subsidy or taxes relating to FDI. Strategic models of FDI are found in the works of Carledon - Rossel (1985), Hortmann and Markusen (1987) and Markusen (1995). These microeconomic models focus on the profit maximising motivations and strategic interactions of multinationals engaged in FDI with the underlying downward sloping demand functions and firm specific cost functions that are differentiated across countries. Licensing of copyrights or blueprints versus subsidiary based productions are based on microeconomic principles. These motives determine the nature of inflows and outflows or joint ventures between MNCs and firms serving in domestic markets.

- MNCs move to a foreign country for a number of reasons: cost advantages in producing there rather than exporting commodities;
- ownership (O) of firm specific capital;
- location (L) based advantages of production;
- licensing abroad for reasons of natural resources or customer bases;
- internalisation (I) of benefits of technical know how by firms doing R & D.

These OLI factors indicate why MNCs have cost advantages in going abroad because of ownership of firm specific factors such as R&D, scientific and technical workers, product novelty and complexity, and marketing expenditures. Also when they have more intangible assets such as management, engineering, marketing, financial services, patents and trademarks. Similarly, tariffs, quota, transportation cost, cheap production and customer base are also key location factors for FDI by a MNC. Internalisation refers to full exploitation of product and processes within the firm rather than by licensing or franchising to firms in other countries. The degree of economies of scale and the structure of market determine the amount of inflows and outflows and which one of its FDI activities are strategically stable in the long run.

### 3 A Microeconomic Model of FDI

A simple way to analyse the underlying microeconomic theory of FDI activity is to think of a MNC as a monopolist facing two different demand functions at home and abroad. A monopolist has firm specific capital, but the two markets differ on the structure of demand and cost conditions. The profit from domestic and foreign operations can be represented as:

$$\Pi_1 = P_1 q_1 - C_1 \quad (1)$$

$$\Pi_2 = P_2 q_2 - C_2 \quad (2)$$

where  $\Pi_1, P_1, q_1, C_1$  and  $\Pi_2, P_2, q_2, C_2$  are profit, price, demand and cost of production at home and foreign markets respectively. It then discriminates between two markets to maximise profit. This can be illustrated by a numerical example as given in the Appendix.

In order for an MNC to open a subsidiary in a foreign market the cost of exporting goods (transportation, tariff and other costs) must be higher than the fixed cost of setting up business in that foreign country. In the numerical example given in the appendix, where both operations have same marginal costs,  $TC > C_2 - C_1 = 800 - 200 = 600$ , where TC is the cost of exports. Bargaining on the share of profit for host and MNC has to be further considered in order to determine net benefits to each. Markusen (1995) nicely illustrated the strategic interaction issues of licensing versus subsidiary production. Taking a two period model of production with given rental fees of license or cost of subsidiary operation and possibility of defect in the second period. This can be summarised as  $R + D - FC < 2M - FC < 2R - FC$  where R is the rental income from licensing of a partner foreign firm, (M is the profit from subsidiary is FDI takes the form of subsidiary operation), D is the payments made in case the licensee defects in the second period (this deters the licensee from supplying the market itself after gaining the know-how from the MNC in the first period), and FC is the fixed cost of FDI to the MNC. He concludes that direct investment is more likely in cases where technology has the joint input characteristic of knowledge capital. This model provides a glimpse of the fundamentals of behavioral issues relating to the FDI activities of a MNC; it is not difficult to extend it to a dynamic monopoly and price discrimination model, which is skipped here for space reasons.

### 4 Growth Impacts of Foreign Capital for a Small Open Economy

The aggregate FDI amount is obtained when direct investment from all MNCs is added together. FDI not only has physical capital components, but also includes knowledge spill-over effects. It complements domestic investment and promotes

growth. This is analysed theoretically in the next section in the context of an endogenous growth model.

Bhagwati and Tironi (1980) presented a theoretical analysis in which tariff reduction can be immiserising when capital is owned by foreigners and labour intensive goods are imported from abroad under free trade arrangements. It is obvious that domestic workers producing labour intensive goods face lower wage rates due to the reduction in prices of goods they make under free trade agreements. Grossman and Helpman (1991) have reversed this argument and shown links between FDI and economic growth rate modelling how MNCs exploit the comparative cost advantage to operate their subsidiaries in foreign countries. They analyse the steady state path of the growth of variety of products produced and the expenditure on those goods in terms of firm specific skills, discount factors of consumers and the elasticity of substitution in production. Walz (1997) uses a dynamic general equilibrium model with endogenous technical change and shows how inter-regional knowledge spillover occurs from an advanced to a less developed country and is beneficial for host countries. Wang and Wang (2009) have highlighted the potentially heterogeneous growth effects of different entry modes.

In this section, a dynamic model of FDI, investment and growth is developed to illustrate how foreign capital is complementary to domestic capital as it involves technology transfer and diffusion of new management and processes. Countries aiming to attract foreign capital need to invest. In spirit of endogenous growth theory, the role of foreign capital in growth can be analysed using a standard growth model [see equations (3) to (24) below]. Thus equation (3) states standard utility [U] preferences in terms of consumption [C] while equation (4) states technology in terms of a Cobb-Douglas production function with domestic capital [K] and foreign capital [F] and technology. The infinite horizon utility maximisation problem subject technology, domestic and foreign capital accumulation and market clearing conditions can be written as:

$$\max U_0 = \int_0^{\infty} e^{-\rho t} U(C_t) dt ; U(C_t) = \frac{C_t^{1-\theta}}{1-\theta} \quad (3)$$

Subject to

$$Y_t = A_t K_t^\alpha F_t^{1-\alpha} \quad (4)$$

Net domestic investment that causes a change in physical capital:

$$\dot{K}_t = I_k - \delta K_{t-1} \quad (5)$$

Net foreign investment similarly causes accumulation of foreign capital:

$$\dot{F}_t = I_F - \delta_f F_{t-1} \quad (6)$$

Market clearing requires in each period requires that total output should equal total demand

$$Y_t = C_t + I_{k,t} + I_{F,t} \quad (7)$$

This infinite horizon constrained dynamic optimisation problem is solved using the current value Hamiltonian function as:

$$J = \frac{C_t^{1-\theta}}{1-\theta} e^{-\rho t} + \nu [I_k - \delta K_{t-1}] + \mu [I_F - \delta_f F_{t-1}] + \omega \left[ A_t K_t^\alpha F_t^{1-\beta} - C_t - I_{k,t} - I_{F,t} \right] \quad (8)$$

where  $C$  represents consumption,  $K$  capital stock,  $F$  amount of FDI,  $I_K$  and  $I_F$  domestic and foreign investments respectively,  $A$  technology,  $Y$  output,  $U$  utility of representative households;  $\theta$ ,  $\rho$ ,  $\alpha$ ,  $\nu$ ,  $\mu$ ,  $\delta$ ,  $\omega$  are parameters of the model. Symbol  $\theta$  measures relative rate of risk aversion in the inter-temporal preference of the household;  $\rho$  is the discount factor;  $\alpha$  the productivity of capital;  $\nu$ ,  $\mu$ , and  $\omega$  are shadow prices on domestic capital, foreign capital and the resources of the economy. First order conditions with respect to consumption, domestic and foreign capital and shadow prices are:

$$\frac{\partial J}{\partial C} = C^{-\theta} e^{-\rho t} - \omega = 0 \quad (9)$$

$$\frac{\partial J}{\partial I_K} = \nu - \omega = 0 \quad (10)$$

$$\frac{\partial J}{\partial I_F} = \mu - \omega = 0 \quad (11)$$

$$\dot{\nu} = \frac{\partial J}{\partial K} = 0 \quad (12)$$

$$\dot{\mu} = \frac{\partial J}{\partial F} = 0 \quad (13)$$

These five equations can be used to solve the values of  $K, F, Y, C, \mu$  and  $\nu$  to show analytically how such an economy can grow at a constant growth rate over time.

$$\dot{\nu} = \frac{\partial J}{\partial K} = \nu \delta - \omega \alpha A K^{\alpha-1} F^{1-\alpha} \quad (14)$$

$$\dot{\mu} = \frac{\partial J}{\partial F} = \mu \delta - \omega (1 - \alpha) A K^\alpha F^{-\alpha} \quad (15)$$

From equation (9) and (10)

$$C^{-\theta} e^{-\rho t} = \nu \quad (16)$$

Taking log both sides

$$-\theta \ln C - \rho t = \ln \nu \quad (17)$$

By differentiating both sides with respect to time:

$$-\theta \frac{\dot{C}}{C} - \rho = \frac{\dot{\nu}}{\nu} \quad (18)$$

Substituting

$$g_c = \frac{\dot{C}}{C} = -\frac{1}{\theta} \left( \frac{\dot{\nu}}{\nu} + \rho \right) = -\frac{1}{\theta} \left( \frac{\nu\delta - \omega\alpha AK^{\alpha-1} F^{1-\alpha}}{\nu} + \rho \right) = \frac{1}{\theta} (\alpha AK^{\alpha-1} F^{1-\alpha} - \rho - \delta) \quad (19)$$

Similarly from  $\mu = \omega$

$$\frac{\dot{\nu}}{\nu} = \frac{\nu\delta - \omega\alpha AK^{\alpha-1} F^{1-\alpha}}{\nu} = \delta - \alpha AK^{\alpha-1} F^{1-\alpha} \quad (20)$$

$$\frac{\dot{\mu}}{\mu} = \frac{\mu\delta - \omega\alpha AK^{\alpha-1} F^{1-\alpha}}{\mu} = \delta - (1 - \alpha) AK^{\alpha-1} F^{1-\alpha} \quad (21)$$

$\frac{\dot{\nu}}{\nu} = \frac{\dot{\mu}}{\mu}$  implies

$$\delta - \alpha AK^{\alpha-1} F^{1-\alpha} = \delta - (1 - \alpha) AK^{\alpha-1} F^{1-\alpha} \quad (22)$$

$$\frac{K^{\alpha-1} F^{1-\alpha}}{K^{\alpha-1} F^{1-\alpha}} = \frac{\alpha}{(1 - \alpha)} \text{ or } \frac{K}{F} = \frac{\alpha}{(1 - \alpha)} \quad (23)$$

Thus the ratio of domestic and foreign capital is constant. Putting this value in the production function:

$$Y = AK^{\alpha} F^{1-\alpha} = AK \frac{K^{\alpha}}{K} F^{1-\alpha} = AK \frac{F^{1-\alpha}}{K^{1-\alpha}} = AK \left( \frac{1 - \alpha}{\alpha} \right)^{1-\alpha} \quad (24)$$

So, despite the diminishing rate of return on domestic and foreign capital individually, the complementarity between them makes the marginal productivity of domestic capital  $[K]$  equal to  $A \left( \frac{1-\alpha}{\alpha} \right)^{1-\alpha}$ . It does not diminish and may increase with technology. Adding domestic or foreign capital generates economic growth at a constant rate in the manner close to the AK endogenous growth model as:

$$g = \frac{\dot{Y}}{Y} = \frac{\dot{C}}{C} = \frac{\dot{K}}{K} = \frac{\dot{F}}{F} = \frac{\dot{\mu}}{\mu} = \frac{\dot{\nu}}{\nu} = g_A + g_K + (1 - \alpha) \ln \left( \frac{1 - \alpha}{\alpha} \right) \quad (25)$$

Thus the growth rates of technology and capital directly correspond to the growth rate of output. This basic model can be extended by introducing a stochastic shock ( $z$ ) in technology,  $A(z)$ ; by making technical progress a function of accumulation of foreign or human capital appropriate for multinational firms to operate and invest in the domestic economy, thereby letting them fully realise their potential for increasing returns of scale.

## **5 Empirical Literature on FDI on Investment and Growth**

Wallis (1968) looked at increase in inflows of FDI from the US to the EU and assessed the importance of FDI in enhancing economic growth. Then Feldstein and Horioka (1980) estimated impacts of FDI on saving and investment. Desai, Foley and Hines (2005) had found an almost one to one positive relationship between FDI inflows and saving GDP ratios and investment, and negative relation between FDI outflows and reduction in investment among OECD countries in the 1990s. Borensztein et al. (1998) found the need of domestic absorptive capacity to make FDI important factor on economic growth in a study of FDI flows from industrialised countries to 69 developing countries. In a recent study de Mello (1999) used the panel data model to conclude that growth and FDI nexus are sensitive to country specific factors and generally supports a positive relationship between FDI and growth in the long run. Balasubramanyam et al. (1999) use panel data study of 46 developing countries to find support for the Bhagwati hypothesis that the impact of FDI is larger in countries that have adopted export led growth strategies. Similar findings are reported in country specific studies such as Ram and Zhang (2000) and Bin and Haughton (2002). Wang and Zhang (2008) look at the technology spillover effect across vertically and horizontally integrated firms and industries in China and find ownership of FDI an important variable in assessing externalities of FDI. Many other studies aim to measure the impact of foreign aid on a particular country (Helpman (2006)). More recently, using a sample of 84 countries from 1987 to 2001, it is shown that the effects of greenfield-investment and M&A have different impacts on actual economic growth. It is observed that, in most cases, greenfield-investment raises economic growth whereas M &A can be beneficial only when the host country has adequate human capital [Wang and Wong (2009)]. Taking account of these findings in the literature this section aims to test the predictions of the above theories, particularly the impact of FDI inflows and outflows in investment and growth in 30 OECD countries for the period of 1990 to 2004.

## **6 Panel Regression Analysis to Assess Impacts of FDI on Investment and Growth**

We have obtained the data for our analysis from the OECD database on FDI available from the economic and social database for the UK ( <http://www.esds.ac.uk/International/international>) for years 1990 to 2004.

**Table 1**  
**Pooled Panel Data Regression for OECD Countries (1990-2004)**  
**(a) Growth rate of output on investment ratio**

	Coefficient	Std. Error	t-value	t-prob
Investment ratio	0.1357	0.0589	2.30	0.02
Constant	-0.0018	0.0120	-0.15	0.88
R <sup>2</sup>	0.0406			
no. of observation	465			

**(b) Contribution FDI Inflows and Outflows in Domestic Investment**

	Coefficient	Std. Error	t-value	t-prob
Outflow investment ratio	-0.0175	0.0057	-3.06	0.00
Inflow investment ratio	0.0190	0.0061	3.10	0.00
Constant	0.2168	0.0065	33.20	0.00
R <sup>2</sup>	0.0180			

**(c) Contribution FDI Inflows and Outflows in Growth Rate of Output**

	Coefficient	Std. Error	t-value	t-prob
Outflow investment ratio	-0.0019	0.0059	-0.33	0.74
Inflow investment ratio	0.0028	0.0064	0.44	0.66
Constant	0.0269	0.0022	12.10	0.00
R <sup>2</sup>	0.0165			

The data on GDP and GFCF is taken using the currency for each country and then converting to US dollars using the exchange rate of the national currency to the US dollar. Growth rates of GDP, investment and FDI are computed by the authors. All variables used in this analysis were stationary. We do not find any evidence of reverse causality growth determining investment ratio as indicated by Blomstrom et al. (1996).

Results presented in section (a) to (c) of Table 1, estimated using the Pc-Give, reveal several interesting facts regarding the impact of FDI on growth and investment.

Firstly, the ratio of investment to GDP is a significant determinant of growth rates across OECD countries as shown in part (a). This is exactly what is expected from the theory of economic growth. Net investment adds to capital accumulation and more capital associated with given labour generates more output.

Secondly, inflows and outflows of FDI have expected signs and are statistically significant determinants of investment ratios among OECD countries as shown in part (b). A one percent increase in the ratio of FDI inflows to gross investment raises the investment to GDP ratio by about 2 percent. Thus, inflows contribute to the rise in investment. On the other hand, a one percent increase in FDI outflows to total investment lowers the investment to GDP ratio by about 2 percent. This finding is consistent with that of Desai, Foley and Hines (2005). Thus, the panel regression analysis clearly reveals the positive contribution of FDI inflows on investment and growth rates from analysis of the

results in table 1 (a) and (b). This also supports our theoretical proposition given above.

Thirdly, the contribution of FDI to economic growth is not direct. It first influences the amount of available investment and then the growth rate. This is clear from table 1 part (c) where outflows seem to influence growth rate negatively and inflows contribute positively but the coefficients are statistically insignificant.

As stated earlier, the inflows and outflows of FDI and growth rates vary significantly across OECD countries and over time. An attempt is made in this paper to measure the impact of country and time specific effects of FDI on economic growth and investment. Such effects are summarised in Tables 2 and 3 by including time variables for each year from 1991 to 2004 (1990 is the base year) for 30 OECD countries (Australia is the base country). As shown in Table 2 country specific factors are more important in determining the inflows and outflows of FDI. Some countries are more amenable to FDI than others and have favourable results from FDI on investment and growth. These time and country specific effects are found to be consistent with the stylized facts relating to the growth rates of output, investment ratios and inflows and outflows of FDI.

## 7 Conclusion

In this paper, the microeconomic effects of FDI have been illustrated with an example of a multi-plant MNC that faces a different structure of demand and costs between home and foreign countries with strategic consideration of licensing or subsidiary production in foreign countries. On the macro side, the total FDI aggregated over MNCs accounts for a significant proportion of total investment and has a significant impact on economic growth. This growth effect is shown theoretically using an endogenous growth model with FDI in which foreign capital complements domestic capital and contributes to both investment and growth rate of output. Our model predictions have been tested using panel data growth regressions for 30 OECD countries over 1990 to 2004. Our analysis establishes positive impacts of FDI inflows and negative impacts of FDI outflows on investment and economic growth. The impacts of time and country specific effects are found to be consistent with the stylized facts relating to growth rates of output, investment ratios and inflows and outflows of FDI. The empirical results illustrated in this paper are comparable to Desai et al. (2000).

## References

- [1] Asheghian, Parviz, (2004). Determinants of economic growth in the United States: the role of foreign direct investment, *International Trade Journal*, 18:1:62-83.

- [2] Atken Brian J and Ann E. Harrison (1999) Do Domestic Firms Benefit from Direct Foreign Investment: Evidence from Venezuela, *American Economic Review*, 89:3:June, 605-618.
- [3] Balasubramanyam,, V.,N., M. Salisu and David Sapsford (1996) Foreign Direct Investment and Growth in EP and is Countries, *Economic Journal*, 106: 434: 92-105.
- [4] Barrell, Ray and Nigel Pain, (1997) Foreign Direct Investment, Technological Change, and Economic Growth within Europe, *Economic Journal*, 107: 445.;1770-1786.
- [5] Batra Raveendra N., (1986) A General Equilibrium Model of Multinational Corporations in Developing Economies, *Oxford Economic Papers*, New Series, 38: 2 : 342-353.
- [6] Batra, Raveendra., N. and Rama Ramachandran, , (1980). Multinational Firms and the Theory of International Trade and Investment, *American Economic Review*, 70:3:278-290.
- [7] Bergstrand Jeffrey H. and Peter Egger (2007) A knowledge –and-physical-capital model of international trade flows, foreign direct investment, and multinational enterprises, *Journal of International Economics*, 73:278-308.
- [8] Bhagwati, Jagdih. N., Ernesto Tironi, (1980) Tariff change, foreign capital and immiserization : A theoretical analysis, *Journal of Development Economics*, 7:71-83.
- [9] Binh, NGuyen, N., and Jonathan Haughton, 2002. Trade liberalisation and foreign direct investment in Vietnam, *ASEAN Economic Bulletin*, 19:3:302-18.
- [10] Blomstrom Magnus, Robert E. Lipsey and Mario Zejan (1996) Is Fixed Intestment the Key to Economic Growth? *Quarterly Journal of Economics*, 111:1:269-276.
- [11] Blough Roy, (1956) United States Taxation and Foreign Investment, *Journal of Finance* 11: 2: May: 180-194.
- [12] Boatwright, B.D. and Renton, G. A. (1975) An Analysis of United Kingdom Inflows and Outflows of Direct Foreign Investment, *Review of Economics and Statistics*, 57:4: 478-486.
- [13] Borensztein, E, J. De Gregorio,J.W. Lee (1998) How does FDI affect economic growth, *Journal of International Economics*, 45:115-135.
- [14] Buckley, Peter., J. And MarkCasson, (1981) The Optimal Timing of a Foreign Direct Investment, *Economic Journal*, 91:361: 75-87.
- [15] Calderon Russell, Togret R., (1985) Towards the Theory of Foreign Direct Investment, *Oxford Economic Papers*, New Series, 37: 2 :282-291.

- [16] Campa, Jose M. (1993). Entry by foreign firms in the United States under exchange rate uncertainty, *Review of Economics and Statistics*, 75:4:614-622.
- [17] Caves, R.,E., (1982) *Multinational Enterprises and Economic Analysis*, Cambridge University Press.
- [18] Cheng, L., Qiu, L.D.,Tan, G. (2005) Foreign direct investment and international trade in a continuum Ricardian trade model, *Journal of Development Economics*, 77:477– 501.
- [19] Coughlin Cletus, C., Joseph V Terza and Vachira Arromdee , (1991) State Characteristics and the Location of Foreign Direct Investment within the United States, *Review of Economics and Statistics* , 73: 4: 675-683.
- [20] de Mello, Luiz R.. (1999) Foreign Direct Investment-Led Growth: Evidence from Time Series and Panel Data, *Oxford Economic Papers, New Series*, 51: 1: 133-151.
- [21] Desai Mihir.A. C. F. Foley, James R.Hines J.R. (2005) Foreign direct investment and domestic capital, *American Economic Review*, 95:5:33-38.
- [22] Doornik J A and Hendry D.F. (2001) *Econometric Modelling Using PcGive* vol. I-III. Timberlake Consultants, London.Dunning, John, H. (1973) *The Determinants of International Production*, *Oxford Economic Papers, New Series*, 25:3: 289-336.
- [23] Eaton Jonathan and Samuel Kortum (2002) Technology, Geography and Trade, *Econometrica*, 70:5:1741-1779.
- [24] Feldstein, Martin and Charles Horioka (1980) Domestic Saving and International Capital Flows, *Economic Journal*, 90:358:314-329.
- [25] Glass Amy,.J, Kamal Saggi (2002). Licensing versus direct investment: implications for economic growth, *Journal of International Economics*, 56, 1, Jan , 131-153.
- [26] Grubaugh, Stephen., G., (1987). Determinants of Direct Foreign Investment, *Review of Economics and Statistics*, 69: 1:149-152.
- [27] Grossman, Gene,M.,and Elhanan Helpman,(1990) Comparative Advantage and Long-Run Growth, *American Economic Review*, 80:4:796-815.
- [28] Helpman, Elhanan, (2006) Trade, FDI, and the Organization of Firms, *Journal of Economic Literature*, 44(3): 589–630.
- [29] Hortmann, Ignatius.,J.,Jame R. Markusen. (1987) Strategic investment of development of multinationals, *International Economic Review*, 28:109-21.
- [30] Hymer, Stephen H. (1976) *International operation of national firms: A study of direct foreign investment*, Cambridge, MIT Press.

- [31] Ihring Jane (2005 ) The Influence of Technology on Foreign Direct Investment. AEA Papers and Proceedings 95:2: May 309-313.
- [32] Javorcik, Beata S. (2004) Does foreign direct investment increase the productivity of domestic forms? In search of spillovers through backward linkages, *American Economic Review*, 94:3:605-627.
- [33] Klein, M. W., Joe Peek. Eric S. Rosengren, (2002) Troubled banks, impaired foreign direct investment: the role of relative access to credit, *American Economic Review*, 92:3:605-627.
- [34] Kogut, Bruce, and Sea J.Chang., (1991) Technological Capabilities and Japanese Foreign Direct Investment in the United States *Review of Economics and Statistics* , 73: 3: Aug., 401-413.
- [35] Lahiri, Sajal., Yoshiyashi Ono, (1998) Foreign Direct Investment, Local Content Requirement, and Profit Taxation', *Economic Journal*, 108:447: 444-457.
- [36] Loo, Frances V. (1977) The effect of foreign direct investment on investment in Canada, *Review of Economics and Statistics*,59:4:474-481.
- [37] Markusen. James., R. (1995) The boundaries of multinational enterprises and the theory of international trade, *Journal of Economic Perspective*, 9:2:169-189.
- [38] OECD,(1999) Investment Patterns in a Longer Perspective, DAFFE/IME (99) 21, 14-Ju-99.
- [39] Ram, Rati., Kevin H. Zhang (2002) Foreign direct investment and economic growth: Evidence from cross-country data for the 1990s, *Economic Development and Cultural Change*, 51:1:205-215.
- [40] Root Franklin R and Ahmed A. Ahmed (1979) Empirical Determinants of Manufacturing Direct Foreign Investment in Developing Countries, *Economic Development and Cultural Change*, 27:4:751-767
- [41] Tomas, Jonathan., and Tim Worrall (1994) Foreign Direct Investment and the Risk of Expropriation', *Review of Economic Studies*, 61:1:81-108
- [42] Wallis, Kenneth, F.,(1968) The E. E. C. and United States Foreign Investment: Some Empirical Evidence Re-Examined *Economic Journal* , 78: 311: 717-719.
- [43] Walz ,Uwe, (1997) Innovation, foreign direct investment and growth, *Economica*, 64:253:63-79.
- [44] Wang,,Miao ,M.C. Sunny Wong, (2009)What drives economic growth? The case of cross-border M & A and Greenfield FDI, *KYKLOS*,: 62: 316-330.

- [45] Wang , Chengqi., and Zhongxiu Zhao (2008) Horizontal and vertical spillover effect of foreign direct investment in Chinese manufacturing, Journal of Chinese Economic and Foreign Trade Studies 1:1: 8-20.
- [46] UNCTAD, (1996). Foreign Direct Investment, Trade, Aid and Migration, Geneva: United Nations.

## A Appendix

### A Numerical Example for an MNC

Let us assume that the demand of the monopolist in the home market is given by  $q_1 = 21 - 0.1P_1$  and its inverse demand is  $P_1 = 210 - 10q_1$ . If demand abroad is  $q_2 = 50 - 0.4P_2$  and the inverse demand abroad is  $P_2 = 125 - 2.5q_2$ .

Cost of production is different across countries. It is  $C_1 = 200 + 10q_1$  at home but it is costlier to set up business in foreign country because of higher fixed costs,  $C_2 = 800 + 10q_2$  (marginal costs may also be different). The optimal condition for profit maximisation is given by a point where the marginal revenue equals marginal cost in each market:

$$MR_1 = MC_1 \text{ and } MR_2 = MC_2 \quad (\text{A.1})$$

Given the above information, the total revenue from the home market is  $R_1 = P_1q_1 = (210 - 10q_1)q_1 = 210q_1 - 10q_1^2$ . Therefore, the marginal revenue from home market sales would be  $MR_1 = 210 - 20q_1$ . Similarly, the total revenue from the sales in the foreign market would be  $R_2 = P_2q_2 = (125 - 2.5q_2)q_2 = 125q_2 - 2.5q_2^2$  and associated marginal revenue would therefore be  $MR_2 = 125 - 5q_2$ .

Fixed costs of production are different across countries, but the marginal costs are assumed to be the same in both countries.

$$MC_1 = MC_2 = 10 \quad (\text{A.2})$$

Now it is possible to solve the model for the optimal amount of goods supplied at home and abroad by using conditions where the marginal revenue in each market needs to equal its marginal cost.

$$MR_1 = MC_1 \Rightarrow 210 - 20q_1 = 10 \Rightarrow q_1 = 10 \Rightarrow P_1 = 210 - 10q_1 \Rightarrow P_1 = 110 \quad (\text{A.3})$$

$$MR_2 = MC_2 \Rightarrow 125 - 5q_2 = 10 \Rightarrow q_2 = 23 \Rightarrow P_2 = 125 - 2.5q_2 \Rightarrow P_2 = 67.5 \quad (\text{A.4})$$

Thus, the amount supplied at home is much smaller than amount supplied abroad and prices charged at home are much higher than prices charged abroad. Corresponding revenues are:

$$R_1 = P_1q_1 = 110 \times 10 = 1100; R_2 = P_2q_2 = 67.5 \times 23 = 1552.5 \quad (\text{A.5})$$

The cost function is assumed to be known here for simplicity. It must be derived from the cost minimisation principle subject to a production technology constraint. The total cost of production at home and abroad are given by

$$C_1 = 200 + 10q_1 = 200 + 10 \times 10 = 300 \quad (\text{A.6})$$

$$C_2 = 800 + 10q_2 = 800 + 10 \times 23 = 1030 \quad (\text{A.7})$$

Now it is possible to calculate profits to the MNC from home and foreign markets:

$$\pi_1 = P_1q_1 - C_1 = 1100 - 300 = 800 \quad (\text{A.8})$$

$$\pi_2 = P_2q_2 - C_2 = 1552.5 - 1030 = 522.5 \quad (\text{A.9})$$

Table 2  
Contribution of FDI Inflows and Outflows to Domestic Investment  
Panel Data Regression for OECD Countries (1990-2004)

Determinants of FDI	Coefficient	Std. Error	t-value	t-prob	Determinants of FDI	Coefficient	Std. Error	t-value	t-prob
Outflow ratio	-0.0056	0.0042	-1.34	0.18	Outflow ratio	-0.0076	0.0044	-1.74	0.08
Inflow ratio	0.0060	0.0046	1.30	0.20	Inflow ratio	0.0078	0.0048	1.64	0.10
Constant	0.2355	0.0002	1086.00	0.00	Constant	0.2507	0.0043	58.70	0.00
AUT	-0.0139	0.0002	-77.40	0.00	T1991	-0.0087	0.0024	-3.69	0.00
BEL	-0.0368	0.0002	-207.00	0.00	T1992	-0.0165	0.0037	-4.43	0.00
CAN	-0.0414	0.0003	-151.00	0.00	T1993	-0.0238	0.0051	-4.67	0.00
CZE	0.0415	0.0005	77.90	0.00	T1994	-0.0240	0.0052	-4.66	0.00
DNK	-0.0457	0.0001	-654.00	0.00	T1995	-0.0235	0.0054	-4.37	0.00
FIN	-0.0438	0.0006	-73.10	0.00	T1996	-0.0165	0.0058	-2.87	0.00
FRA	-0.0444	0.0006	-80.40	0.00	T1997	-0.0113	0.0059	-1.91	0.06
DEU	-0.0244	0.0002	-101.00	0.00	T1998	-0.0070	0.0067	-1.04	0.30
GRC	-0.0329	0.0001	-432.00	0.00	T1999	-0.0086	0.0061	-1.41	0.16
HUN	-0.0233	0.0009	-25.60	0.00	T2000	-0.0101	0.0058	-1.76	0.08
ISL	-0.0379	0.0004	-88.40	0.00	T2001	-0.0149	0.0059	-2.51	0.01
IRL	-0.0382	0.0010	-39.20	0.00	T2002	-0.0219	0.0064	-3.43	0.00
ITA	-0.0351	0.0003	-138.00	0.00	T2003	-0.0232	0.0069	-3.37	0.00
JPN	0.0368	0.0003	122.00	0.00	T2004	-0.0194	0.0074	-2.63	0.01
KOR	0.1014	0.0002	526.00	0.00	AUT	-0.0138	0.0002	-74.70	0.00
LUX	-0.0176	0.0031	-5.65	0.00	BEL	-0.0368	0.0002	-205.00	0.00
MEX	-0.0362	0.0052	-7.00	0.00	CAN	-0.0412	0.0003	-143.00	0.00
NLD	-0.0222	0.0006	-39.90	0.00	CZE	0.0412	0.0005	75.10	0.00
NZL	-0.0300	0.0002	-140.00	0.00	DNK	-0.0456	0.0001	-517.00	0.00
NOR	-0.0369	0.0002	-167.00	0.00	FIN	-0.0435	0.0006	-69.10	0.00
POL	-0.0399	0.0004	-99.60	0.00	FRA	-0.0441	0.0006	-76.40	0.00
PRT	0.0083	0.0001	68.10	0.00	DEU	-0.0243	0.0003	-96.80	0.00
SVK	0.0487	0.0004	132.00	0.00	GRC	-0.0328	0.0001	-430.00	0.00
ESP	0.0044	0.0002	20.60	0.00	HUN	-0.0237	0.0009	-25.30	0.00
SWE	-0.0642	0.0001	-709.00	0.00	ISL	-0.0377	0.0004	-84.80	0.00
CHE	-0.0037	0.0008	-4.40	0.00	IRL	-0.0385	0.0010	-38.70	0.00
TUR	-0.0132	0.0001	-132.00	0.00	ITA	-0.0350	0.0003	-135.00	0.00
GBR	-0.0613	0.0007	-91.60	0.00	JPN	0.0369	0.0003	120.00	0.00
USA	-0.0550	0.0002	-256.00	0.00	KOR	0.1014	0.0002	518.00	0.00
EMU	-0.0272	0.0003	-78.00	0.00	LUX	-0.0069	0.0083	-0.84	0.40
					MEX	-0.0337	0.0054	-6.24	0.00
R^2	0.7456				NLD	-0.0218	0.0006	-36.70	0.00
					NZL	-0.0300	0.0002	-139.00	0.00
					NOR	-0.0368	0.0002	-160.00	0.00
					POL	-0.0401	0.0004	-96.70	0.00
					PRT	0.0083	0.0001	65.50	0.00
					SVK	0.0485	0.0004	127.00	0.00
					ESP	0.0045	0.0002	20.10	0.00
					SWE	-0.0640	0.0001	-503.00	0.00
					CHE	-0.0033	0.0009	-3.75	0.00
					TUR	-0.0132	0.0001	-131.00	0.00
					GBR	-0.0609	0.0007	-86.50	0.00
					USA	-0.0549	0.0002	-248.00	0.00
					EMU	-0.0270	0.0004	-69.60	0.00
					R^2	0.7764			

Table 3  
 Contribution of FDI Inflows and Outflows to Growth Rates of Output  
 Panel Data Regression for OECD Countries (1990-2004)

	Coefficient	Std. Error	t-value	t-prob
Outflow investment ratio	0.0005	0.0033	0.17	0.87
Inflow investment ratio	0.0001	0.0035	0.04	0.97
Constant	0.0278	0.0059	4.74	0.00
T1991	-0.0136	0.0043	-3.18	0.00
T1992	-0.0088	0.0055	-1.60	0.11
T1993	-0.0098	0.0070	-1.39	0.17
T1994	0.0109	0.0083	1.30	0.19
T1995	0.0099	0.0085	1.17	0.24
T1996	0.0114	0.0071	1.59	0.11
T1997	0.0179	0.0066	2.70	0.01
T1998	0.0089	0.0087	1.03	0.30
T1999	0.0133	0.0083	1.62	0.11
T2000	0.0213	0.0063	3.37	0.00
T2001	-0.0033	0.0088	-0.38	0.71
T2002	0.0004	0.0070	0.05	0.96
T2003	-0.0006	0.0077	-0.07	0.94
T2004	0.0144	0.0072	1.98	0.05
AUT	-0.0091	0.0001	-66.00	0.00
BEL	-0.0122	0.0001	-93.00	0.00
CAN	-0.0065	0.0002	-30.10	0.00
CZE	-0.0297	0.0004	-72.60	0.00
DNK	-0.0123	0.0001	-180.00	0.00
FIN	-0.0125	0.0005	-26.60	0.00
FRA	-0.0134	0.0004	-31.10	0.00
DEU	-0.0137	0.0002	-73.00	0.00
GRC	-0.0028	0.0001	-50.40	0.00
HUN	-0.0112	0.0007	-16.10	0.00
ISL	-0.0051	0.0003	-15.50	0.00
IRL	0.0300	0.0007	40.70	0.00
ITA	-0.0184	0.0002	-95.20	0.00
JPN	-0.0172	0.0002	-75.30	0.00
KOR	0.0272	0.0001	187.00	0.00
LUX	-0.0059	0.0065	-0.91	0.36
MEX	-0.0022	0.0040	-0.55	0.59
NLD	-0.0058	0.0004	-13.10	0.00
NZL	-0.0034	0.0002	-21.40	0.00
NOR	-0.0011	0.0002	-6.17	0.00
POL	0.0010	0.0003	3.25	0.00
PRT	-0.0083	0.0001	-87.50	0.00
SVK	0.0067	0.0003	23.50	0.00
ESP	-0.0029	0.0002	-17.60	0.00
SWE	-0.0122	0.0001	-123.00	0.00
CHE	-0.0204	0.0007	-31.00	0.00
TUR	0.0083	0.0001	113.00	0.00
GBR	-0.0092	0.0005	-17.40	0.00
USA	-0.0036	0.0002	-22.00	0.00
EMU	-0.0122	0.0003	-41.50	0.00
R <sup>2</sup>	0.3406			