

## MULTINATIONAL ENTERPRISES AND TOBIN'S Q: THE IMPLICATIONS FOR DIRECT FOREIGN INVESTMENT

CHIONIS, Dionysios\*

---

**Abstract:** This paper constructs a theoretical model of investment decision abroad supporting the idea that the Multinational Enterprises' internalization decision is influenced by the capital installation cost. This modification alters MNE's investment behavior. Using the idea that capital mobility across countries is associated with the capital installation cost then the firm's maximization problem may also incorporate the Tobin's  $q$  in a modified fashion.

JEL: F13, F21, F23

Keywords: Multinational Enterprises, Foreign Direct Investment, Tobin's  $q$ .

---

### 1. Introduction

Foreign Direct Investment (FDI) has been an important feature of the world economy for many years and has often been the principle vehicle for the movement of international capital. According to Lipsey (1999), FDI has accounted for about a quarter of total capital outflows in the 1990s. A particular framework of thought about foreign direct investment and multinational enterprises (MNE) is now dominant. Either by using a partial or a general equilibrium model this framework suggests why multinational firms should exist at all in the face of presumed barriers for operating across countries

---

\* Dionysios Chionis, Department of Economics, Democritus University of Thrace, Komotini, Greece, for correspondence: Dionysios Chionis, 18, P. Tsaldari, 11254 Marousi, Greece, email: [dchionis@ierd.duth.gr](mailto:dchionis@ierd.duth.gr),

(see *inter alia* Helpman (1984) Lipsey and Kravis (1987) Markusen and Venables (1998) ).

The more recent works, attempting to explain the pattern of FDI in relation to country and industry characteristics, the so-called new theory of MNE, incorporate elements from industrial organization approach to trade. In this research path an important aspect in the internalization decision undertaken by MNEs is the barriers and the cost associated with the internalization decision. Further, the distinction between “vertical” and “horizontal” firms provides the adequate framework for the separation of barriers in categories. Vertical MNEs (VER) are firms that geographically fragment production in stages according to the production factor intensity of the host country referring to single plant firms with their headquarter and plant in different countries. Horizontal MNEs (HOR) are multiplants firm that replicate the same activities in many locations to serve the local markets. This type of MNE refers to two plants firms with their headquarter in one country or another and are more likely to expand production horizontally across borders the higher are the transport costs and trade barriers and the lower are investment barriers and the size of scale economies at the plant level relative to the corporate level. For firms organized vertically across borders, the barriers are associated with the different factor supplies. Across to this line of research Markusen and Maskus (1999a,b) attempted to integrate these models, allowing firms the options of multiple plants<sup>1</sup>. According to this view, the MNEs are seen as firms exploiting some ownership advantage through investment abroad. The common characteristic in all these treatments of FDI is that capital will be adjusted into a different country without incurring frictional cost.

In this paper we adopt a rather different approach and the following question will be addressed here. Do capital installation cost influence MNE's investment decision? The Tobin's  $q$  model of investment explicitly accounts for the adjustment costs borne when a firm changes the amount of capital it is using. This modification alters MNE's investment behavior and the objective of this work is to extend the inquiry as regards the barriers by investigating the relative importance of the installation cost examining the effects of

capital's installation cost on FDI. It must be said that for the purpose of the present work, I did not separate MNE into categories since both classes of investments requires capital installation. Another reason of non-discriminating is related to the data. I don't have good data on the types of the existing firms and these pure types are greatly blurred in reality in any case.

The rest of the paper is organized as follows. The next section reviews the literature. The third section extends the theoretical model of Tobin's  $q$  to incorporate the investment decision abroad. At the end, section four concludes.

## **2. Previous Theoretical and Empirical Research**

The relevant analysis of MNE and FDI establishes the types of barriers for the active firms. MNE are seen as being willing to engage in FDI instead of alternatives activities if the benefits arising from the firm level economies of scale and the proximity advantage are important relative to plant level economies and to transport cost. Although there are interesting theoretical differences between the general and the partial equilibrium line of research, the econometric investigation ends-up with similar independent variables. The theoretical and empirical works of 1990's and the models developed probably provide the most coherent framework to analyze the increasing importance of FDIs as regards the industrial organization and the country incorporating simultaneously microfoundation features. Along with this research avenue, the barriers are significant factors affecting the FDI decision making of the MNEs. For example, Zakharov and Kušić, discussing the role of FDI in the Western Balkans accession process in the EU, identify both non-economic (e.g. ethnic nationalism, political instability, lack of laws, a "fragmented" region with numerous state borders on the small area, visas, bureaucracy, etc) and economic factors (e.g. low level of economic development, individual markets with low buying power, underdeveloped infrastructure, numerous trade restrictions, a large share of shadow economy) that impede the regional trade and the FDIs in the area. Worth (2003), in his study of the effect of regional

trade agreements on FDIs, mentions that Japanese FDIs appear to be sensitive to trade barriers or the threat of trade barriers. Japanese firms are more pessimistic about protectionism than are U.S. firms. However, it is worth mentioning that the U.S. firms don't ascribe to the trade barriers the importance the Japanese firms do when they consider to invest in the E.U. Several studies, referring to the FDIs from the U.S.A., show weakly positive effect of barriers on FDIs or no effect at all. Sivadasan (2003), referring to the Indian manufacturing sector, shows that FDIs liberalization (i.e. by removing several barriers that increased the FDIs) has led to a 25% increase in aggregate output growth and a 15% increase in aggregate productivity, with the major beneficiaries from the post-liberalization productivity gains being the consumers in the form of relatively lower prices. The analysis of barriers as factors affecting the FDIs are often discussed in a general equilibrium framework. In particular, the simulation results implemented by Markusen and Maskus (1999a,b) suggested a number of independent variables that can be considered as barriers. The authors propose an index of investment barriers and trade barriers, i.e. costs not including distance or freight into host country. They also use distance between pair of countries and hypothesize trade barriers back into the parent country. They define the cost of investing in the affiliate country as a simple average of several indexes of impediments to investment, reported in the World Competitiveness Report of the World Economic Forum. These indexes include restrictions on ability to acquire control in a domestic company, limitations on the ability to employ foreign skilled labor, restraints on negotiating joint ventures, strict controls on hiring and firing practices, market dominance by a small number of enterprises, an absence of fair administration of justice, difficulties in acquiring local bank credit, restrictions on access to local and foreign capital markets, and inadequate protection of intellectual property. A traded cost index is defined as a measure of national protectionism or efforts to prevent importation of competitive products. They also use distance capturing trade costs or investment costs since both should rise with distance. An interesting feature which arises from this work is that they separate the barriers according to the type of MNE. On the HOR model it is assumed positive traded cost. Since an HOR has usually several plants,

according to the trade off between exporting to a market and creating an affiliate there in order for the multiple plants to form a single multinational corporation, it is assumed that there are fixed costs at the firm level (in the form of knowledge capital, patents or blueprints). On the other hand a VER contains a headquarter that supplies headquarter services without transport cost (such as R&D, financial and strategic planning) to a plant.

Barrios *et.al.*, using a model developed by Markusen and Venables (1998) as a theoretical framework, address the properties of empirical measures to proxy displacement of national by MNE between two countries. These indexes are withdrawn from the World Competitiveness Report of the World Economic Forum. Other empirical investigations (see *inter alia* Brainard (1997)) of the FDI by MNEs are very often conducted with reference of the cost of investing in the affiliate country as a simple average of several indexes of impediments to invest.

### **3. The Model**

All the previous works highlight a number of important aspects in the overall investment decisions of a MNE which can negatively influence the decision, but they hypothesized that the capital moves without cost across national borders. This assumption is patently unrealistic. So, internalization decisions taken by MNE are frequently interdependent with investment decisions and thus with the commitment of the investor to increase the employed capital. The previous works often ignores this aspect because it does not arise in perfect capital markets or in market without installation cost. However, a firm wishing to internalize its business in a foreign country has to contribute a major share of capital abroad not without cost. Consequently, a possible way to explain the different performance of MNEs as regards FDI, might be the installation cost. Black and Lawrence (1991) present a test of direct foreign investment efficacy using Tobin's  $q$  ratio. The authors using a pooled time series cross sectional sample found that the firm value does not seem to increase as the FDI proportion increases nor as geographic

diversity increases in the examined sample. Disaggregation of the total sample by high and low  $q$ , which may proxy for differences in management quality, indicates statistical support for increased geographic diversity by high  $q$  firms. One more study, this by Santis, Anderton and Hijzen (2004), also employs the Tobin's  $q$  as a factor of the long-run determinants of the Euro area FDI to the U.S.A. during the period 1980-2001. The authors use panel data and fixed effects estimators, stock market indexes common to the U.S. and Euro areas, and a measure for economic development common to the both Euro area and the U.S.A. and the Tobin's  $q$ . They find that the Tobin's  $q$ , accounting for the euro area stock market development, among other factors (Euro area patents, productivity in the U.S.A., volume of bilateral telephone traffic to the U.S.A. relative to Euro area, and the Euro area GDP), is a statistically significant variable that enhances the traditional knowledge-capital framework specification.

Relied on a framework initialed developed for the Tobin's  $q$  model ((see Obstfeld and Rogoff (1996)), I extend a costly capital installation model. Recall that Tobin's  $q$  measures the ratio of the shadow value of a unit of capital (the return of capital) over the cost (not including installation cost) of new investment. In practice  $q$  is sometimes measured by the ratio of the market value of the firm to the book value of its assets. The model developed below views FDI as part of the profit maximization process of MNE.

Assuming that the firm's output is given by:

$$Y = A_s F(K_s, L_s) - w_s L_s - (K_{s+1} - K_s) \quad (1)$$

Then the decision to invest abroad and to add new capital is associated with an installation cost equal to  $-?I_s^2/2K_s$ . The output from the investment abroad is given by

$$Y^f = A_s^f F(K_{s+1}^f, L_s^f, N) - w_s^f L_{s+1}^f \quad (2)$$

Where: A, K, L, w stand for the productivity variable, capital stock, labour used between dates s and s+1 and wages paid respectively,

the deadweight installation cost is  $\frac{1}{2}I_s^2/K_s$  for purchasing the new capital good. The index f indicates the production factors abroad and N stands for the inputs financed by means of FDI.

The sum of the firm's present and discounted future profits from both production lines on date t is:

$$d_t + V_t = \max$$

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left[ A_s F(K_s, L_s) - \frac{c}{2} (I_s^2 / K_s) - w_s L_s - I_s \right] + \left[ A_{s+1}^f F^f(K_{s+1}^f, L_{s+1}^f, N_{s+1}) - w_{s+1}^f L_{s+1}^f \right] \quad (3)$$

subject to  $K_{s+1} - K_s = I_s$

In this case the firm's maximization problem is based on a Lagrangean expression.

$$L =$$

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left[ A_s F(K_s, L_s) - \frac{c}{2} (I_s^2 / K_s) - w_s L_s - I_s - q_s (K_{s+1} - K_s - I_s) \right]$$

$$+ \left[ A_{s+1}^f F^f(K_{s+1}^f, L_{s+1}^f, N_{s+1}) - w_{s+1}^f L_{s+1}^f \right] \quad (4)$$

The first order condition for investment is  $\partial L / \partial I = 0$  which implies:

$$-\frac{c}{2} (I_s^2 / K_s) + q_s - 1 = 0$$

$q_s$  has an interpretation as the shadow price of capital in place, this condition implies that  $q$  must be equal to marginal cost of investment including installation cost:  $1 + \frac{1}{2}(I_s / K_s)$  or alternatively:

$$I_s = \frac{q_s - 1}{c} K_s \quad (5)$$

Equation (5) is a version of the investment equation proposed by Tobin (1969) showing that investment is positive when the shadow

price  $q$  of installed capital exceeds 1, the price of new uninstalled capital.

The first order condition for capital is  $\partial L / \partial K = 0$  in an implicit form

$$F\{q_s, A_{s+1}, F_K, \frac{1}{2} (I_{s+1} / K_{s+1}), q_{s+1}, A_{s+1}^f, F_{K_{s+1}}, N_{s+1}\} = 0$$

The above equation states that, at an optimum for the MNE the date  $s$  shadow price of an extra unit of capital is the discounted sum of the capital's marginal product next period, the capital's marginal contribution to lower installation cost next period, the shadow price of capital on the next period and the foreign capital's marginal product next period.

The present section derives the conditions necessary for MNE to be involved in FDI. The framework developed above suggests that a reduced form equation for FDI should not only contain the stylized barriers of the host country but also elements from the parent company financial condition since MNE with  $q$  greater than unity are more likely to internalize their business.

#### 4. Conclusions

FDI as flow of capital and investment decision is strongly related to the activity of MNE. Although that FDI have been the least volatile source of international investment the fact that some countries (for example USA) have flipped back and fourth from net supplier to net recipient lead us to the conclusion that perhaps it was unmeasured investment barriers that accounted for this phenomenon. Most of what MNE do depends on the host environment but primarily depends on the decisions to maximize the present and future profits<sup>2</sup>. Firm in the position where it wishes to undertake productive activity both at home and abroad then it will maximize present and future profits. In this framework I argue that FDI is a function of installation cost.

Although my findings tend to support the Tobin's  $q$  approach to the investment decision abroad much more empirical research is required in order to assess this hypothesis empirically.



## **References**

Barrell R and N. Pain (1996): An Econometric Analysis of U.S. Foreign Direct Investment, *The Review of Economics and Statistics*.

Barrios S., H. Gorg and E Strobl (2000): Multinational Enterprises and the New Trade Theory: Evidence for the Convergence Hypothesis, FEDEA Documento de Trabajo 2000-28.

Black J. and R. Lawrence (1991): Evidence of the Impact of Foreign Direct Investment Strategies on the Firm Value, *Multinational Financial Management*, 1 (3).

Brainard L. (1997): An Empirical Assessment of the Proximity-Concentration Trade off Between Multinational Sales and Trade, *American Economic Review*, vol 87 no 4.

De Santis, R., R. Anderton, A. Hijzen (2003) : On the Determinants of Euro Area FDI to the United States: The Knowledge-Capital-Tobin's Q Framework, ECB Working Paper 329.

Helpman E. (1985): *Multinational Corporations and Trade Structure*, *Review of Economic Studies*.

Helpman E. (1984): A Simple Theory of International Trade with Multinational Corporations *Journal of Political Economy*.

Lipsey R. (1999): The Role of Foreign Direct Investment in International Capital Flows  
NBER Working Paper 7094.

Lipsey R. and I. Kravis: (1987): The Competitiveness and /comparative Advantage of US Multinationals 1957-1984 *Banca Nazionale del Lavoro-Quarterly Review* 161.

Markusen J. and K. Maskus: (1999a) *Multinational Firms: Reconciling Theory and Evidence*, NBER Working Paper 7163.

Markusen J. and K. Maskus (1999b): Discriminating Among Alternative Theories of the Multinational Enterprise, NBER Working Paper 7164.

Markusen J. and Venables A. (1998): The Increased Importance of Direct Investment in North Atlantic Economic Relationships: A Convergence Hypothesis, in Canzoneri, M. Ethier, W. and Grilli, V. (eds), *The New Transatlantic Economy* (Cambridge University Press: Cambridge)

Obsfeld M and K. Rogoff (1996): *Foundations of International Macroeconomics*, The MIT Press, Cambridge Massachusetts, London, England.

Sivadasan J (2003): Barriers to Entry and Productivity: Micro-Evidence from Indian Manufacturing Sector Reforms. Working Paper, University of Chicago.

Worth T. (2003): Regional Trade Agreements and Foreign Direct Investment. Working Paper, AER 771, Economic Research Service, United States Department of Agriculture.

Zakharov V and S. Kušić (2003): The Role of FDI in the EU Accession Process: The Case of the Western Balkans. Paper presented in the European's Trade Study Group Conference in Madrid, September 12.

---

<sup>1</sup> This has been referred to as the 'knowledge capital model'.

<sup>2</sup> Lipsey argues that the FDI is mainly financed by the retained earnings of the affiliates.