Dundee Discussion Papers in Economics 176

Chatterji, Monojit; Montagna, Catia

Publication date:
2004

Dundee Discussion Papers
in Economics

Foreign Direct Investment, Training and Absorptive Capacity

Monojit Chatterji
and
Catia Montagna

Working Paper
No. 176
December 2004
ISSN:1473-236X

Department of
Economic Studies,
University of Dundee,
Dundee.
DD1 4HN

Foreign Direct Investment, Training and Absorptive Capacity

Monojit Chatterji **and** **Catia Montagna**[a,b]

December 2004

Abstract

The empirical literature on FDI flows has noted a number of stylised facts: investment in training is carried out by MNEs, particularly those with sophisticated technologies, and host country absorptive capacity along with low wages attracts FDI. This paper explains these phenomena in an integrated theoretical framework.

JEL classification: F21, F23, J24

Keywords: Foreign Direct Investment, Training, Sophisticated Technology, Absorptive Capacity.

Corresponding author: Catia Montagna, Department of Economic Studies, University of Dundee, 3 Perth Road, Dundee, DD1 4HN, U.K. *tel*: (+)44-1382-344845, *fax*: (+)44-1382-34691 e-mail: c.montagna@dundee.ac.uk

[a] University of Dundee
[b] Leverhulme Centre for Research on Globalisation and Economic Policy, University of Nottingham.

1. Introduction

Although foreign Direct Investment (FDI) has grown dramatically in the last two decades, it is far from being evenly distributed across countries. In particular, many developing countries (LDCs) keep being persistently bypassed by FDI flows (e.g. Barba-Navaretti and Venables, 2004). Explanations for this vary. Obviously, factors like political instability, corruption, and lack of physical, legal and institutional infrastructures are important in explaining LDCs' unattractiveness to foreign MNEs. Amongst more narrowly economic factors, human resource inadequacy in the host LDC may well be important – as has been emphasised by Dunning (1988), Lucas (1990), and Zhang and Markusen (1999). It is this relationship between human capital and multinationals (MNEs) location decisions that we explore in this paper. Empirical studies have pointed to a number of (unrelated) stylised facts, as summarised by (Miyamoto, 2003). First, in some LDCs "rapid growth of FDI was accompanied by an increase in the level of human capital" (Miyamoto, 2003). Second, "training is no doubt the major source of HRD (human resource development) activities undertaken by the MNEs" (Miyamoto, 2003). Third, the more specialised and sophisticated is the technology of an MNE, the greater will be the training it undertakes (Tan and Batra, 1996; Zeufack, 1999; and Tan and Lopez-Acevedo, 2003).

In this paper, we develop a model in which creation of skills by means of training is fruitfully exploited by an MNEs with 'sophisticated' technology in a location with particular 'investment friendly' characteristics, namely low labour costs and high absorptive capacity. A major attractiveness in undertaking FDI in a developing country is the latter's availability of cheap labour. In this paper, we further suggest that the host country's absorptive capacity may additionally play an important role in determining MNEs location decisions. We conceptualise 'cheapness' of domestic labour as the price of unskilled labour in the host country. 'Absorptive capacity' is dependent on a host of domestic factors and we conceptualise it as reducing the non-labour costs of the training programme. Finally, we conceptualise the 'sophistication' of the foreign firm's technology as being measured by the difference between the productivity of MNE trainees when employed by the training firm and their productivity when employed by domestic firms. The model exploits the interaction between these three factors as the driver of FDI. The model is outlined in Section 2 and solved in Section 3. Section 4 concludes the paper.

2. The Model

We develop a partial equilibrium two-period model of a multinational that considers locating in an LDC. The multinational uses the host country as an export base and exports all its output to the world market. For simplicity, we shall assume that although a large player in the host country's labour market, the foreign firm holds no market power in world market, i.e. it is a price taker and can sell all its output at the prevailing world price. The MNE's investment involves the introduction of new technology to the LDC that would require training of domestic unskilled workers of which the MNE faces a perfectly elastic supply. Let the exogenous earning of an unskilled worker be denoted by b.[1]

In period zero (to which we refer to as the 'set-up and training period') the MNE enters the host country and chooses the number n of unskilled trainees to hire. Each trainee is paid a training wage t. No output is produced in this period. The training cost (that can be thought of as an investment/set up cost) incurred by the MNE is given by $\tau = \frac{1}{2}cn^2$, where $0 < c \leq 1$ is an inverse measure of the host country's absorptive capacity. As c approaches zero, the trainees' absorptive capacity is extremely high and the training cost tends to zero. Hence, the total cost incurred by the MNE in the set-up and training period is given by $TC(0) = \tau + t = \frac{1}{2}cn^2 + tn$.

We assume that the training process imparts both general and firm-specific skills. If, once trained, a worker stays with the multinational firm, he/she will have a productivity of α.

Domestic firms are assumed to have no ability to train, but they can use the skilled labour produced by the MNE by poaching from the foreign firm when training is complete. Let the productivity a of a trained/skilled worker employed in the domestic sector be uniformly distributed over the interval $[a^-, a^+]$.[2] To reflect the fact that whilst α embodies *both* general and specific training, a embodies only general training, we further assume that $\alpha > a^+$. The more sophisticated is the MNE's technology, the greater is α.

In period one (the production period), the multinational offers a wage w to its trained workers. Assuming that no worker quits at the end of the training period, the MNEs output in period 1 will be αn and its total cost will be given by wn.

[1] Since our focus is on the productive abilities of the MNE and there is no product market interaction between this firm and domestic producers, we do not develop the domestic production sector.

[2] Effectively, this amounts to assuming that the host country's firms are heterogeneous.

Assuming that labour is the only factor used by the indigenous industry and assuming competitive labour markets, the wage offered by the domestic firms to trained workers is $x=a$. It then follows that in the domestic industry wages of trained workers will be uniformly distributed over the interval $[a^-, a^+]$. Once trained, workers will quit the MNE if $x>w$. Let the quit rate from the MNE be denoted by $q = \Pr(x > w)$. Adopting for simplicity the normalisation $a^+ - a^- = 1$, the quit rate becomes:

$$q = \frac{a^+ - w}{a^+ - a^-} = a^+ - w \qquad (1)$$

The MNE's output in period one is then given by $y = \alpha(1-q)n$ where, from (1), the MNE's retention rate is $1-q = w - a^-$.

3. Solution of the Model

Solving the model backwards, in period one the MNE's problem involves the choice of w, given the number of trainees and the training wage t it has chosen in period zero. Normalising, for simplicity, the world price facing the MNE to unity, the profit of the MNE in period one will be:

$$\pi(1) = \alpha(1-q)n - w(1-q)n \qquad (2)$$

Proposition 1: *The optimal wage of the multinational is given by*

$$\textbf{\textit{(i)}} \quad w^* = \frac{\alpha + a^-}{2} \qquad \textit{if} \quad \alpha \geq a^+ + 1 \qquad (3.1)$$

$$\textbf{\textit{(ii)}} \quad w^* = a^+ \qquad \textit{if} \quad \alpha < a^+ + 1 \qquad (3.2)$$

Assuming that $q>0$, the profit function in (2) can be rewritten as $\pi(1) = \alpha(w - a^-)n - w(w - a^-)n$. Maximising this with respect to w, yields equation (3.1).[3] Note that $q>0$ requires the optimal wage w^* to lie within the interval (a^-, a^+). Clearly, $w^* > a^-$ since $\alpha > a^-$. Given (3.1), $w^* < a^+$ implies that $\alpha < a^+ + 1$ must hold. This condition places an upper bound on how productive the specific component of training is. If this bound does not bind, i.e. $\alpha \geq a^+ + 1$, then the optimal wage of the multinational will be given by (3.2), so that the quit rate is zero. In the rest of the paper we shall assume that $\alpha < a^+ + 1$.

As a result of (3.1), the optimal retention rate of the MNE is given by:

$$1-q^* = \frac{\alpha + a^-}{2} - a^- = \frac{\alpha - a^-}{2} \in (0,1) \tag{4}$$

Given (3.1) and (4), the maximised value of period one profits will be:

$$\pi^* = n\left(\frac{\alpha - a^-}{2}\right)^2 \tag{5}$$

In period zero, the MNE anticipates π^* and, assuming zero discount rate, its ex-ante profit will be:

$$\pi = \pi^*(1) - tn - \frac{1}{2}cn^2 \tag{6}$$

From an unskilled worker's perspective, the expected return to training, $E(R) = t + (1-q^*)w^* + q^*\left(\frac{a^+ + a^-}{2}\right)$, is given by the sum of the training wage, the expected wage if not quitting the MNE, and the average anticipated return from quitting the MNE once the training is complete. An unskilled worker can be induced to undertake training by the MNE if $E(R) \geq b$. Given the assumed abundance of unskilled workers, however, the MNE has no reason to offer prospective trainees a premium. Hence the MNE will maximise (6) with respect to *n* subject to the participation constraint:

$$t + (1-q^*)w^* + q^*\left(\frac{a^+ + a^-}{2}\right) = b, \tag{7}$$

to obtain:

$$n^* = \frac{\lambda - b}{c}, \tag{8}$$

where $\lambda = \left(\frac{\alpha - a^-}{2}\right)^2 + \left(\frac{\alpha - a^-}{2}\right)\left(\frac{\alpha + a^-}{2}\right) + \left(\frac{2 - \alpha + a^-}{2}\right)\left(\frac{a^+ + a^-}{2}\right)$.

Proposition 2: *Ceteris paribus, as unskilled labour gets cheaper (i.e. b falls), or as the absorptive capacity of the host country increases (i.e. c falls), or as the degree of sophistication of the MNE technology increases (i.e. α rises), the MNE's investment increases.*

Using (8) into (6) yields the MNE's optimal profits:

$$\pi^* = \frac{(\lambda - b)^2}{2c}. \tag{9}$$

[3] It is easy to verify that the second order condition for profit maximisation is satisfied since $\partial^2\pi(1)/\partial w^2 = -2n$.

Proposition 3: *Ceteris paribus, as unskilled labour gets cheaper (i.e. b falls), or as the absorptive capacity of the host country increases (i.e. c falls), or as the degree of sophistication of the MNE technology increases (i.e. α rises) the MNE's profit increases.*

The MNE will enter the country if the ex-ante profit in (9) is at least as high as the firm's outside reservation profit. Clearly, *ceteris paribus*, entry into the LDC will be more likely the lower is the price of its unskilled labour and the higher is its absorptive capacity.

4. Conclusions

Much empirical work has suggested that MNEs provide on the job training in LDCs and that such training is often associated with the use of 'sophisticated technologies'. The empirical importance of cheap labour and the host country's 'absorptive capacity' to the attraction of FDI is also well known. We combine these ingredients to provide a theoretical rationalisation of these hitherto apparently unrelated stylised facts. Our model suggests that LDCs with low labour costs matched by a sufficiently high absorptive capacity are particularly attractive only to those MNEs with 'sophisticated technologies'. This may suggest that FDI flows can perhaps be viewed as a matching relationship between some MNEs and some LDCs, each with particular characteristics which are mutually reinforcing. Further research into the nature of these mutually reinforcing characteristics is clearly required.

References

Barba Navaretti, G. and A.J. Venables (2004). *Multinational Firms in the World Economy*, Princeton University Press.

Dunning, J.H. (1988). *Explaining International Production*, Unwin Hyman, London.

Lucas, R.E. (1990). "Why Doesn't Capital Flow from Rich to Poor Countries?", *American Economic Review*, 80, 92-96.

Miyamoto, K. (2003). "Human Capital Formation and Foreign Direct Investment in Developing Countries", OECD Development Centre, Working Paper No.211.

Tan, H. and G. Batra (1996). "Enterprise Training in Developing Countries", World Bank, Washington D.C.

Tan, H. and G. Lopez-Acevedo (2003). "Mexico: In-Firm Training for the Knowledge Economy, World Bank Policy Research Working Paper 2957, World Bank, Washington.

Zeufack, A (1999). "Employer-Provided Training under Oligopolistic Labor Markets: Evidence from Thai Manufacturing Firms", mimeo, World Bank, Washington.

Zhang, K. and J. Markusen (1999). "Vertical Multinationals and Host-Country Characteristics", *Journal of Development Economics*, 59, 233-252.