Export Requirements and Special Features of Inward Foreign Direct Investment in China

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Abstract

The paper investigates the relationship between the policy of export requirements and special features of China's inward foreign direct investment (FDI), and examines how trade-related investment measures affect the investment decisions of multinational firms. A theoretical model is constructed that allows us to analyse how location advantages affect the equilibrium regime under which multinational firms and government policy toward FDI co-exist endogenously. The model also exam the welfare effects of export requirements policy by comparing with an alternative policy – production tax. The findings from this study accord well with the evidence regarding China's inward FDI. The main results indicate that the policy of export requirements is sub-optimal.

JET classification: F13; F23; H21

Keywords: China; export requirements; foreign direct investment; multinational firms; production tax; welfare effect

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1. Introduction

Since the adoption of more liberal economic policies under Deng Xiao-ping in the late 1970s, China has become the largest recipients of foreign direct investment (FDI) in the developing world. Two special features of China's inward FDI can be observed. First, a high proportion of FDI inflows into China comes from surrounding economies such as Hong Kong, Japan, Taiwan, Singapore and South Korea (Wei and Liu, 2001). The inflow of FDI from Asian economies accounted for more than 80% during the period of 1979-1998. Second, the regional distribution of FDI also shows a strong pattern of geographical proximity and border effect. FDI was mainly concentrated on east coastal areas during that period. Therefore, it seems that the shorter the distance, the greater the similarities in culture and linguistic features, and the lower the transport costs, the more FDI flows into China. These two special features of China's inward FDI, however, contradict conventional theoretical explanations for FDI. The theoretical models usually suggest that FDI occurs because there is a trade-off between fixed costs for setting up a plant abroad and transport costs. The higher the transport costs and the lower the fixed plant costs, the larger the proportion of FDI inflows into the host country (see, for example, Hortmann and Markusen, 1992; Brainard, 1993; Markusen and Venables, 1996). Theoretical models of this kind fit well with empirical evidence on cross-flow FDI between developed countries. However, in

developing countries, such as China, institutional factors, including policy instruments, play a critical role in affecting FDI inflows.

A wealth of literature has investigated different aspects of China's inward FDI in the context of the determinants and impact of FDI in the Chinese economy (see, for example, Lardy, 1994; Head and Ries, 1996; Broadman and Sun, 1997; Hu and Khan, 1997; Henley et al., 1998; Wei and Liu, 2001). Little attention, however, has been devoted to explaining the special features of China's inward FDI in the form of formal theoretical modelling, and in particular there is a lack of theoretical analysis on the relationship between the special features of China's inward FDI and government policy.

This paper aims to examine how trade-related investment measures, in particular, export requirements, affect the investment decisions of multinational firms (MNFs) and contribute to the special features of China's inward FDI. The policy of export requirements was implemented through China's Joint Venture Law in order to protect domestic firms, create employment for domestic labour force and earn foreign exchange (MOFTEC, 1998; Chao and Yu, 1994)[1]. However, the policy was relaxed, after Deng Xiaoping's well-known speech in 1992, in order to further opening up the Chinese economy and attract more FDI. Since 1992, foreign invested enterprises (FIEs) have increasingly targeted the Chinese domestic market. The share of industrial output value of FIEs in the national total increased steadily from 2 per cent in 1990 to 27 per cent in 1998 (Wei and Liu, 2001). In addition, the share of FIEs total trade (exports plus imports) increased dramatically. The figure was merely 0.1

[1] There were two conditions under which the export requirements were binding. The first was that the products of foreign-invested enterprises (FIEs) were restricted to exports when foreign investors had signed a contract to produce in China. The second condition was that FIEs should ensure that the sales of their products earn them enough foreign currency in order to import materials from international markets.

per cent in 1980, however, in 1998, almost half of China's total foreign trade was conducted by FIEs.

The main focus of the study is to find the conditions under which export requirements are feasible from standpoints of both MNFs and the host government. These have not been fully explored in the literature regarding export requirements in which this policy was taken as given (Rodrick, 1987; Chao and Yu, 1991, 1994, 1998), as well as in the literature regarding vertically integrated FDI which only focuses on the investment decisions of MNFs (Krugman, 1983; Helpman & Krugman, 1985; Zhang and Markusen, 1997; Venables, 1999). In addition, the welfare effect of export requirements is investigated by comparing it with an alternative policy of a production tax.

This paper is structured as follows: section 2 briefly reviews literature. Section 3 describes the basic structure and assumptions of the model, while the optimal duration of export requirements is deduced in Section 4. Section 5 compares and contrasts the welfare effects under export requirements with those under production tax. Section 6 concludes.

2. A Literature Review

Previous research on the issue of export requirements falls roughly into two groups. The first group investigates the welfare effects of export requirements on the host economy in the presence of pre-distortions of tariff and quota. The main focus of these studies is to examine whether the policy of export requirements is welfare-improving or worsening from the host country's perspective (Rodrik, 1987; Chao and Yu, 1991, 1994, 1998). The results from these studies are mixed. Rodrik's (1987) model suggests that export requirements

policy leads to a welfare improvement by reducing payments to foreign capital and shifting profits toward domestically owned firms. On the contrary, Chao and Yu's (1994) model shows that the welfare effect of export requirements under quota system is welfare reducing due to the price-induced higher payments to foreign capital, particularly when foreign firms locate in the import sector only. In their most recent study, Chao and Yu (1998) incorporate a trade balance problem into a two-period model. The results suggest that export requirements policy improves the trade balance in the short run and causes equilibrium real exchange rates to appreciate in both periods, which leads to an increase in inter-temporal welfare.

The second group analyses vertically integrated FDI from MNFs' viewpoint. The condition under which FDI arises in the equilibrium is discussed under the assumption that firms achieve their main objective, i.e. profit maximisation, by locating the different stages of production in different countries. This is because countries differ in factor endowments which in turn offer different kinds of location advantages. The results from the models depend on the crucial assumption of factor price equalisation. However**,** relationships between trade barriers and different types of FDI have not been fully investigated in this group. The earliest examples in this group include Krugman (1983), Helpman (1984) and Helpman and Krugman (1985). More recently, Zhang and Markusen (1997) also examine vertically integrated FDI and attempt to explain why small, least-developed countries attract very little FDI. They find that MNFs have to re-export most of the goods to other markets if the host country's market is relatively small and its ability to absorb these products is limited. As a result, an extra or aggregated transport cost is incurred, and this deters FDI flowing to the country. Venables (1999) has constructed a model in which the vertically

integrated FDI arises due to a reduction of trade costs. His study indicates that when trade costs are relatively low, so that it is profitable to move either upstream or downstream production (which depends on the factor intensity) to the country with lower wage rates, international production emerges.

These studies have shed light on the issue, and provided insights on the investment decisions of MNFs. However, they either treat the policy of export requirements as exogenous or simply omit it. Therefore their main results may not apply in the case that the policy of export requirements are imposed.

In the following sections a theoretical model is constructed in order to analyse how location advantages affect the equilibrium regime under which MNFs and government policy toward FDI co-exist endogenously and how a policy of export requirements contributes to the special features of China's inward FDI. The model also allows the examination of the welfare effects of export requirements by comparing it with the alternative policy of a production tax.

3. The Model

The model considers of a world with two countries: the host country of FDI, country *c*, and the source country *m*. There is one firm *h* in country *c* and one firm *f* in country *m*; the former is assumed to be a monopolist in the local market prior to the entry of the firm *f* and the latter is referred to as a MNF which possesses the relevant advanced technology. The product is homogenous. Labour is the only input of production, which is immobile across

countries. The wage rates in country *c* are lower than in country *m*, $w_m > w_c$. This depicts the location advantages of country *c*.

Since different technology incurs different marginal labour requirements, the more advanced the technology, the lower the marginal labour input; we have $\beta_f < \beta_h$, where β_j ($j = f, h$) stands for the marginal labour input. Let $\beta_f = (1-\xi)\beta_h$, $0 < \xi < 1$, which represents the technological gap between two firms. Both firms have constant marginal product of labour with

$$MP_j = \frac{1}{\beta_j} \qquad j = (f, h), \tag{1}$$

where MP_j denotes the marginal product of firm *j*. Therefore, firm *j*'s output and employment L_j^k are related by

$$q_{ji}^k = \left[\frac{1}{\beta_j}\right] L_j^k \qquad (i = c, m;\ j = f, h;\ k = c, m), \tag{2}$$

where q_{ji}^k is the quantities produced by the firm *j* locating in *k* and supplying market *i*. Firms compete in quantities and incur the fixed costs F_j^k only in the first period of operation[2].

It is also assumed that firm *f* can sell its products in all countries because of its technological superiority, while firm *h* can only sell in the local market[3]. Firm *f* needs to decide whether to engage in export or direct investment to serve market *c*. If firm *f* produces in the home country, it exports to country *c* at a transport cost of τ_1. We assume that the

[2] F_j^k represents sunk costs which only incur once, therefore can be omitted in the model with an infinite time span. The relaxation of this assumption does not affect the main results of the paper.

[3] This assumption can be relaxed by allowing firm *h* access to the international market. The key results from

transport cost is symmetrical between country *c* and country *m*, so that $\tau_{cm} = \tau_{mc} = \tau_1$. The transport cost is assumed to increase with distance, and it also represents a variety of other disadvantages, such as shipping costs, linguistic and cultural differences. The greater the physical and cultural distance, the higher are the transport costs.

If firm *f* invests in country *c*, the MNF cannot immediately sell its products in country *c* due to the policy of export requirements under which firm *f* have to re-export its products to other markets. This initial sales ban (i.e. export requirements), however, is lifted after *T* periods. Firms and the host country government make their decisions along an infinite time span.

For simplicity, the inverse demand functions in both markets are assumed to be linear:

$$P_i = A_i - Q_i, \tag{3}$$

where *P* and *Q* stand for the price and output in market *i*, respectively. Suppose the demand in market *m* is not affected by the firm *f*'s decision is. This implies that the firm *f* can perceive each country as a separate market and make distinct quantity decisions for each, so that the quantities produced for country *m*'s market are independent of those produced for the host country. Therefore, from period *T* onwards, only quantities produced for the host country are affected by the lifting of the policy. This assumption is consistent with the fact that even though MNFs sell their products in the local market after export requirements policy is lifted, they still export to the international market, as noted by Naughton, 1996.

This model differs from Lahiri and Ono's (1998) model in which the FDI equilibrium is determined given that a MNF should be indifferent to investing either in the host country or the home country. However, the profits of the rest of world in their model are exogenous,

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the model remain unchanged.

while in this model, the profits of the rest of world are deduced endogenously, and this property allows us to make comparisons between countries' characteristics and MNFs' locations. It also allows us to examine how the policy of export requirements affects the investment decisions of MNFs', as well as its welfare effects.

4. Optimal Duration of Export Requirements

In order to study the welfare effects of the export requirements policy, we need to identify the duration of export requirements from the perspectives of both the foreign firm and the host country government. If firm *f* invests in country *c*, given the cost and inverse demand functions, the first-period variable profits are given by

$$\Pi_f^c = [(A_m - q_{fm}^c)q_{fm}^c - (w_c\beta_f + \tau_1)q_{fm}^c] = G \qquad (4)$$

In Eq. (4), we assume that when firm *f* invests in country *c*, it shuts down its home plant and re-exports its products to serve the home market. The justification for this is that a single-plant or double-plant configuration of firm *f* depends on cost savings and profit maximisation. If firm *f* earns more profits by locating its production in country *c* than in the home country, it will move its plant to the host country completely. The proof is provided in Appendix A. The export requirements policy is only feasible in the country with low wage rates. When the real wage rates faced by firm *f* in the two countries are sufficiently different in relation to transport costs, i.e. $(w_m\beta_f - w_c\beta) > \tau_1$, firm *f* then has incentives to locate in country *c*, then re-export its products to country *m*.

The second-period variable profits after the sales ban is lifted take the form

$$(\Pi_f^c)^T = G + (A_c - q_{fc}^c - q_{hc}^c)q_{fc}^c - w_c\beta_f q_{fc}^c = G + S$$

(5)

where q_{fc}^c and q_{hc}^c are quantities produced by firm *f* and firm *h* for the local market of country *c*.

If firm *f* invests in country *c*, the profits of the local firm *h* for the first periods are

$$\Pi_h^c = (A_c - q_{hc}^c)q_{hc}^c - w_c\beta_h q_{hc}^c = M \tag{6}$$

The second-period profits are

$$(\Pi_h^c)^T = (A_c - q_{fc}^c - q_{hc}^c)q_{hc}^c - w_c\beta_h q_{hc}^c = N, \tag{7}$$

On the other hand, if firm *f* produces in the home country, the profits are

$$\Pi_f^m = (A_m - q_{fm}^m)q_{fm}^m - w_m\beta_f q_{fm}^m + (A_c - q_{fc}^m - q_{hc}^c)q_{fc}^m - (w_m\beta_f + \tau_1)q_{fc}^m = D, \tag{8}$$

Given the assumption that firms compete in quantities, partially differentiating the profit functions to obtain the quantities produced by the two firms under different conditions, then substituting the quantities back into Eqs. (4)-(8) to get the profits for firm *f* and *h* (see Appendix B).

Let ρ denote a discount factor $0 < \rho < 1$ which is assumed to be identical for all firms and the government of country *c*. Thus, the present values of the profits of firm *f* and *h* under the different options are as follows.

$$PDV(\Pi_f^c) = \frac{(1-\rho^T)\Pi_f^c}{1-\rho} + \frac{\rho^T(\Pi_f^c)^T}{1-\rho} \tag{9}$$

$$= \frac{[A_m - (w_c\beta_f + \tau_1)]^2}{4(1-\rho)} + \frac{\rho^T(A_c - 2w_c\beta_f + w_c\beta_h)^2}{9(1-\rho)},$$

$$PDV(\Pi_h^c) = \frac{(1-\rho^T)\Pi_h^c}{1-\rho} + \frac{\rho^T(\Pi_h^c)^T}{1-\rho} \tag{10}$$

$$= \frac{(1-\rho^T)(A_c - w_c\beta_h)^2}{4(1-\rho)} + \frac{\rho^T(A_c - 2w_c\beta_h + w_c\beta_f)^2}{9(1-\rho)},$$

$$PDV(\Pi_f^m) = \frac{\Pi_f^m}{1-\rho} \tag{11}$$

$$= \frac{(A_m - w_m\beta_f)^2}{4(1-\rho)} + \frac{[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2}{9(1-\rho)},$$

We need to find the time optimal time span *T** that would make firm *f* indifferent to investing in country *c* or locating in country *m*, since the foreign firm will move into, or out of, the host country if the profits it obtains in the host country are larger or smaller than the reservation profits which can be made in the rest of the world. That's, in the equilibrium,

$$PDV(\Pi_f^c) = PDV(\Pi_f^m) \tag{12}$$

Solving Eq. (12), the duration of the sales ban can be obtained

$$T^* = \frac{1}{\ln\rho}\ln\left\{\frac{9(A_m - w_m\beta_f)^2 - 9[A_m - (w_c\beta_f + \tau_1)]^2}{4[A_c - w_c(2\beta_f - \beta_h)]^2} + \frac{[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2}{[A_c - w_c(2\beta_f - \beta_h)]^2}\right\} \tag{13}$$

From Eq. (13), we can find the conditions under which the sales ban is feasible by making firm *f* indifferent between two production locations. In so doing, the equation can be broken into two parts.

As discussed above, $(w_m\beta_f - w_c\beta) > \tau_1$, then

$$\frac{9(A_m - w_m\beta_f)^2 - 9[A_m - (w_c\beta_f + \tau_1)]^2}{4[A_c - w_c(2\beta_f - \beta_h)]^2} < 0 \tag{14}$$

Inequality (15) is always true given that $w_m > w_c$, and $w_m\beta_f + \tau_1 > w_c\beta_f$.

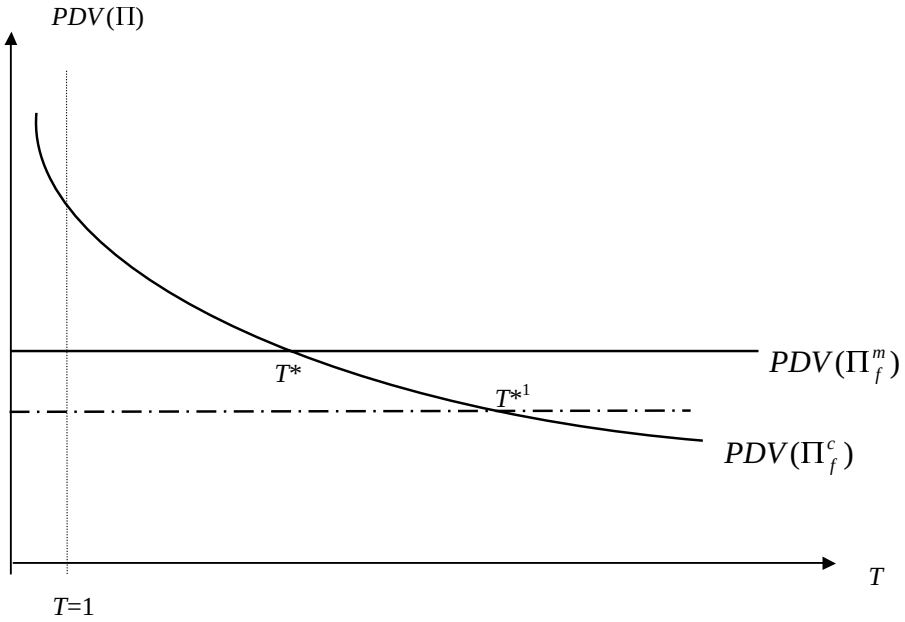
$$0 < \frac{[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2}{[A_c - w_c(2\beta_f - \beta_h)]^2} < 1,$$

(15)

so that $T^* \geq 1$ is possible, and the sales ban is feasible.

Figure 1 illustrates this case. The optimal strategy of firm *f* prescribes production in country *c* if $T < T^*$ and production in country *m* if $T > T^*$. The host country government should set the duration of export requirements on conditions under which firm *f* stays in country *c* and welfare maximisation holds. Since $PDV(\Pi_f^c)$ is decreasing in T^* and $PDV(\prod_f^m)$ is not a function of T^*, there is a unique solution for the duration of sales ban that makes firm *f* indifferent to choose between the two locations in the equilibrium.

Figure 1: FDI Equilibrium in the Case of Export Requirements



Now, we are in a position to study how the duration of export requirements varies with variables, w_m, w_c, τ_1 and ξ. Rearranging Eq. (13), the duration of sales ban can be deduced

$$T^* = \frac{\ln\gamma - \ln 4 - 2\ln[A_c + w_c\beta_h - 2w_c\beta_f]}{\ln\rho} \tag{16}$$

where $\gamma = 9(A_m - w_m\beta_f)^2 - 9[A_m - (w_c\beta_f + \tau_1)]^2 + 4[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2$.

Differentiating Eq. (16) with respect to w_m, we have

$$\frac{\partial T^*}{\partial w_m} = \frac{-\beta_f\{18[A_m - w_m\beta_f] + 16[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]\}}{\gamma\ln\rho} \tag{17}$$

Since $0 < \rho < 1$ (then $\ln\rho < 0$) by assumption, and the terms in the square brackets represent the quantities produced by firm f for markets m and c, respectively, $\frac{\partial T^*}{\partial w_m} > 0$. Therefore, the duration of the sales ban increases in wage rates in country m. The intuition is that relatively high wage rates in country m make the sales ban imposed by country c feasible because the relatively high w_m provides incentives for firm f to relocate its labour-intensive activities into low cost location, even this means that it has to bear the costs of re-export its products to country m. This can also be seen from Figure 1 if w_m increases, the curve $PDV(\prod_f^c)$ remains unchanged, while the curve $PDV(\prod_f^m)$ shifts downwards, and the new equilibrium is T^*[1], which indicates that the duration of the sales ban increases.

Differentiating Eq. (16) with respect to w_c, we have

$$\frac{\partial T^*}{\partial w_c} = \frac{8\beta_h[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h] + 18\beta_f[A_m - (w_c\beta_f + \tau_1)]}{\gamma\ln\rho} + \frac{2(2\beta_f - \beta_h)}{[A_c - w_c(2\beta_f - \beta_h)]\ln\rho} \tag{18}$$

Note the terms in the squared brackets represent the quantities produced by firm *f* for markets *m* and *c*, respectively. If $2\beta_f - \beta_h \geq 0$, i.e. $\xi \leq 0.5$, $\frac{\partial T^*}{\partial w_c} < 0$. If $2\beta_f - \beta_h < 0$, i.e. $\xi > 0.5$, it is not clear-cut. This is because firms compete in quantities, depending on the technological gap between firms, an increase in wage rates of country *c* reduces PDV(Π_f^c) at different degree levels. When the technological gap between firms *f* and *h* is relatively small, the duration of the sales ban should be short in order to keep firm *f* in country *c*. However, if the technological gap between firms *f* and *h* is relatively large, firm *f* can bear longer *T** because it expects, once the sales ban is lifted, it will definitely capture a large share of market *c*.

Differentiating Eq. (16) with respect to τ_1, we have

$$\frac{\partial T^*}{\partial \tau_1} = \frac{-16[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h] + 18[A_m - (w_c\beta_f + \tau_1)]}{\gamma \ln \rho}, \tag{19}$$

If $9(A_m - w_c\beta_f - \tau_1) > 8[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]$, then $\frac{\partial T^*}{\partial \tau_1} < 0$, otherwise $\frac{\partial T^*}{\partial \tau_1} > 0$.

Apparently, the result depends on the relative size of the home and host market. If the market size of country *m* is relatively large, then *T** decreases in τ_1. An increase in transport costs makes it less attractive for firm *f* to produce in country *c*, and then export to country *m*. Firm *f* would prefer to produce in country *m* to serve the local market. Therefore, *T** should be shorter.

We now turn to the analysis of the optimal duration of export requirements from the perspective of the host country government. The government's welfare function consists of

profits of firm *h*, consumer surplus, and labour income from serving both the local and world markets. That is

$$W(T^W) = PDV(\prod_h^c) + PDV(CS) + PDV[w_c(L_h^c + L_f^c)] \tag{21}$$

$$W(T^W) = \frac{3B}{24(1-\rho)} + \frac{\rho^{T^W}(A_c + w_c\beta_h - 2w_c\beta_f)(6w_c\beta_f - w_c\beta_h - A_c)}{24(1-\rho)} \tag{21'}$$

where, CS denotes consumer surplus, L_h^c and L_f^c are labour forces used by firm *h* and firm *f*, and $B = 3A_c^2 - 2w_c\beta_h A_c - (w_c\beta_h)^2 + 4w_c\beta_f(A_m - w_c\beta_f - \tau_1)$. All variable costs are labour costs (see Appendix C).

$W(T^W)$ is maximised when the second term of the RHS of Eq. (21') is maximised subject to $T^W \le T^*$. If $\frac{A_c + w_c\beta_h}{6} < w_c\beta_f$, i.e. $\xi < \frac{5}{6} - \frac{A_c}{6w_c\beta_h}$, the welfare function is maximised if and only if $T^w = 0$. If $\frac{A_c + w_c\beta_h}{6} > w_c\beta_f$, i.e. $\xi > \frac{5}{6} - \frac{A_c}{6w_c\beta_h}$, then $W(T^W)$ is maximised for $T^W = T^*$, and the sales ban is feasible. In other words, when technological gap between local and foreign firms is relatively large, the sales ban is binding, from the host country government's perspective. Otherwise there is no sales ban.

The interpretation of this condition is straightforward. When the technological gap is relatively large ($\xi > \frac{5}{6} - \frac{A_c}{6w_c\beta_h}$) between local firms and MNFs, local firms are unable to compete with foreign firms effectively. The government uses the policy of export requirements as an instrument to protect domestic firms, and maintain their monopoly position in the domestic market.

The next step is to bring together the conditions under which the firm on the one hand, and the government on the other hand, regarding the sales ban. From above discussion, we know that the condition for firm *f* to accept export requirements and locate in country *c* is that the wage rates between the two countries should be sufficiently different, and transportation costs are relatively low, while the host country government prefer the sales ban when there is large technological gap between local firms and MNFs. It is also interesting to note that MNFs are also willing to accept the relatively long but finite sales ban if they possess more advanced technologies comparing with the local firms.

5. Production Tax versus Export Requirements

Assume that the host country's government is willing to adopt an alternative policy - a production tax on the products of the MNF which are sold in market *c*. In this section we attempt to find the welfare effects of this policy and compare these with those of export requirements. In so doing, we first need to find the tax rate which makes firm *f* indifferent between investing in countries *c* and *m*.

The present value of profits for firm *f* if it invests in country *c*, is given by

$$PDV(\prod_f^c)^t = \frac{[A_m - (w_c\beta_f + \tau_1)]^2}{4(1-\rho)} + \frac{[A_c - w_c(2\beta_f - \beta_h) - 2t]^2}{9(1-\rho)}, \qquad (22)$$

The present value of profits for local firm *h* becomes

$$PDV(\prod_h^c)^t = \frac{[A_c - w_c(2\beta_h - \beta_f) + t]^2}{9(1-\rho)}, \qquad (23)$$

where *t* is the tax rate imposed on the products sold in country *c*. If firm *f* locates in country *m*, the profits are the same as Eq. (11).

For the MNF to be indifferent between the two production locations, we have

$$PDV(\prod_f^c)^t = PDV(\prod_f^m) \tag{24}$$

Solving (24), we have[4]

$$t^* = \frac{2A_c - 2w_c(2\beta_f - \beta_h) - \gamma^{1/2}}{4} \tag{25}$$

where $\gamma = 9(A_m - w_m\beta_f)^2 - 9[A_m - (w_c\beta_f + \tau_1)]^2 + 4[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2$, t^* is the tax rate under which firm *f* makes at least the same level of profits as the reservation profits made in country *m*.

Differentiating Eq. (25) with respect to τ_1, w_c and w_m, shows how the tax rate differs with these variables.

$$\frac{\partial t^*}{\partial \tau_1} = \frac{8[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h] - 9(A_m - w_c\beta_f - \tau_1)}{4\gamma^{1/2}}, \tag{26}$$

If $8[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h] > 9(A_m - w_c\beta_f - \tau_1)$, then $\frac{\partial t^*}{\partial \tau_1} > 0$. It suggests that the tax rate increases with transport costs given that firm *f* produces more quantities for market *c* than for *m*. If the size of the local market is relatively large, and firm *f* chooses FDI as the entry mode to serve market *c*, it can save transport costs. This kind of FDI is often referred as tariff-jumping FDI (Motta, 1992). Firm *f* has an incentive to locate in country *c* if the tax

4 $A_c - w_c(2\beta_f - \beta_h) - 2t_1^* < 0$ is eliminated because it implies that t^*_1 is too high to be acceptable from the perspective of firm *f*.

rate is low relative to transport costs. The higher the transport costs, the greater the incentive for firm *f* to produce in country *c*.

$$\frac{\partial t_2^*}{\partial w_m} = \frac{[8(A_c - 2w_m\beta_f - 2\tau_1 + w_c\beta_h) + 9(A_m - w_m\beta_f)]\beta_f}{4\gamma^{1/2}} > 0\,,$$

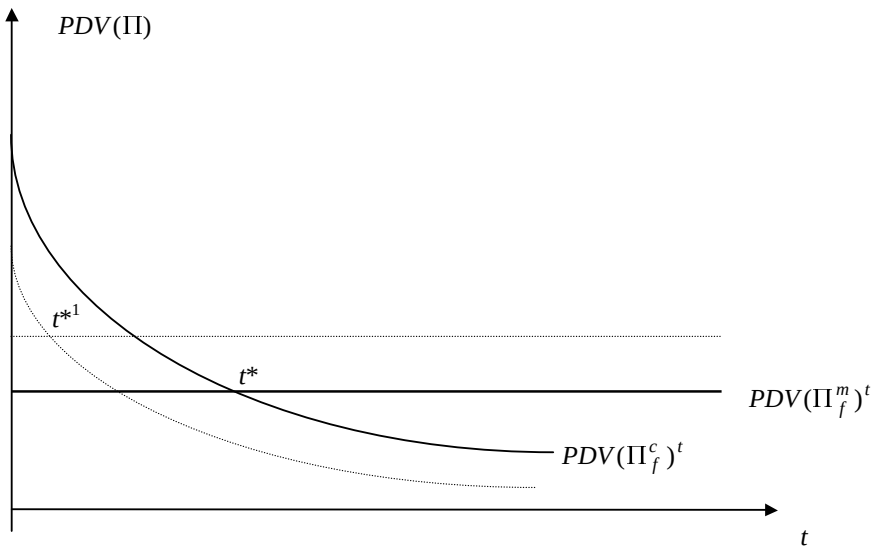
(27)

$$\frac{\partial t_2^*}{\partial w_c} = \frac{-2\gamma^{1/2}(2\beta_f - \beta_h) - 9(A_m - w_c\beta_f - \tau_1)\beta_f}{4\gamma^{1/2}} + \frac{-4(A_c - 2w_m\beta_f - 2\tau_1 + w_c\beta_h)\beta_h}{4\gamma^{1/2}} < 0$$

(28)

Given that $2\beta_f \geq \beta_h$, and the quantities produced by firm *f* for markets *c* and *m* are non-negative, the above inequality holds. These results indicate that the tax rate decreases with the wage rates in country *c* and increases in those of country *m*. When w_c increases, the government should reduce the tax rate otherwise firm *f* will withdraw from country *c* and locate in country *m*. On the other hand, relatively high wage rates in country *m* will allow the host government to charge a relatively high tax premium.

Figure 2: FDI Equilibrium in the Case of Production Tax



The case of a production tax is shown in Figure 2. FDI equilibrium is determined by the intersection (t^*) of firm f's profit functions by locating in country c and country m. The optimal strategy of firm f is to locate in country c if $t \le t^*$, and locate in country m if $t > t^*$. The government should set $t^w \le t^*$ on the condition that firm f locates in country c and the welfare maximisation holds. In the FDI equilibrium, an increase in w_c will shift the curve of $PDV(\prod_f^c)^t$ downwards and the curve of $PDV(\prod_f^m)^t$ upwards, so the tax rate will be lower in the new equilibrium.

Next, we consider the welfare effects of the tax rate policy from the government's perspective. In this case, the welfare function is given by

$$\begin{aligned} W(t^W) &= PDV(\prod_h^c)^t + PDV(CS)^t + PDV(t^W q_{fc}^c)^t + PDV[w_c(L_h^c + L_f^c)^t] \\ &= \frac{1}{1-\rho}\left[\frac{[A_c - w_c(2\beta_h - \beta_f) + t^W]^2}{9} + \frac{[2A_c - w_c(\beta_h + \beta_f) - t^W]^2}{18}\right. \\ &\quad + \frac{t^W[A_c - w_c(2\beta_f - \beta_h) - 2t^W]}{3} + \frac{w_c\beta_h[A_c - w_c(2\beta_h - \beta_f) + t^W]}{3}, \\ &\quad \left. + \frac{w_c\beta_f[A_c - w_c(2\beta_f - \beta_h) - 2t^W]}{3} + \frac{w_c\beta_f[A_m - (w_c\beta_f + \tau_1)]}{2}\right] \end{aligned} \tag{29}$$

where $PDV(t^w q_{fc}^c)$ denotes the present value of tax income. The government chooses t^W to maximise welfare subject to $t^w \le t^*$. Partially differentiate the welfare function to find the maximum point, we have

$$t^w = \frac{A_c - (3\beta_f - \beta_h)w_c}{3}, \tag{30}$$

The optimal tax rate is determined by comparing t^* and t^w. If $t^* < t^W$, then t^* is the optimal tax rate which is satisfactory to both the government and firm *f*. If $t^* > t^W$, then t^W is the optimal tax rate which is satisfactory to both the government and firm *f*.

In the first case, we have

$$3\gamma^{1/2} > 2(A_c + w_c\beta_h), \tag{31}$$

Solving this inequality, we obtain the following restrictions:

$$(w_m - w_c)\beta_f < \tau_1 \text{ and } A_c + w_c\beta_h - 2(w_m\beta_f + \tau_1) > w_m\beta_f + \tau_1. \tag{32}$$

As discussed above, under the first inequality, firm *f* chooses not to invest in country *c*.

In the second case, we have

$$3\gamma^{1/2} < 2(A_c + w_c\beta_h), \tag{33}$$

Solving this inequality, we obtain the following restrictions:

$$(w_m - w_c)\beta_f > \tau_1 \text{ and } A_c + w_c\beta_h - 2(w_m\beta_f + \tau_1) < w_m\beta_f + \tau_1 \tag{34}$$

These two inequalities indicate that if the real wage differences between the host and home country are sufficiently large, and the quantities exported by firm *f* in country *m* are relatively small, then t^w would be the optimal rate.

We can compare the two welfare consequences, given that different policies are imposed by the government, and the optimal policy can be found.

$$W(T^W) - W(t^w) = \frac{-(A_c + w_c\beta_h)^2 - 3\rho^{T^w}(A_c + w_c\beta_h - 2w_c\beta_f)(A_c + w_c\beta_h - 6w_c\beta_f)}{72(1-\rho)} < 0, \tag{36}$$

The result suggests that the policy of export requirements is sub-optimal. There are several reasons for this**. First,** the effects of MNFs on the host economy vary given that

different policies are imposed on FDI. Comparing Eqs. (9) with (22), we find that, under the policy of export requirements, MNFs are characterised as export-orientated firms. They can access to the world market and be able to operate with the minimum of administrative and other restrictions after they have set up subsidiary in the host country. As a result, they have made a great contribution to the export growth in the host country. On the other hand, this policy also insulates domestic firms from severe competition from MNFs. Since, during the initial period, the sales ban maintains the monopoly position of the local firms, the gains from competition and employment effects are reduced.

The gains from maintaining the monopoly position of firm *h*, however, are unable to offset the reduction in competition and employment effects. This implies that the policy for the protection of the domestic market has incurred extra costs, therefore the welfare effects of this policy are not as good as those of production tax policy. Furthermore, the production tax is an extra cost for firm *f* when it enters the local market, and it is a gain for the government in terms of tax revenue. This is the reason why the level of social welfare consequences is higher than in the former case. The results indicate that trade-related investment instruments, such as export requirements, are inferior instruments.

Theoretically, we find that the export requirements are sub-optimal compared with a production tax. In practice, it is easier for the host government to implement a policy of export requirements than a production tax. This is because imposing a production tax on MNFs' products is an obvious example of discrimination towards MNFs, which is not desirable for the host country to attract FDI.

6. Conclusions

This study explores the conditions under which the policy of export requirements is feasible from both MNFs' and the host government's standpoints. In the model, both the firm and government make their decisions endogenously. This differs from previous studies on export requirements in which the firm's decision and the policy of export requirements are assumed exogenously, making it hard to examine the relationship between firms' decisions, the policy and other variables, such as wage rates and transport costs. The results show that under the policy of export requirements MNFs are willing to invest in the host country as long as the wage rates of the two countries are sufficiently different and transportation costs are relatively low. The findings from this study accord well with the evidence that a large proportion of China's inward FDI emerges within the same region where the culture and language are homogenous.

The welfare effects of export requirements are also analysed by comparing this with alternative policies towards FDI. The key results show that the policy of export requirements is sub-optimal, capturing important features of Chinese institutional reality. The export requirements policy towards FDI makes a trade-off between the social benefits of increased FDI and the losses incurred by domestic firms due to liberalisation under the open-door policy. On the one hand, the government attempts to protect the domestic firms by adopting export requirements policy under which MNFs are not able to target the domestic market for some time. On the other hand, the production tax ensures a higher welfare outcome. However, because a production tax is not powerful enough to protect domestic firms from severe competitions from MNFs, the government is reluctant to adopt it. Therefore, as a pragmatic approach, export requirements have been implemented.

This paper contributes to the growing literature by not only considering the welfare effects of multinational production on the host country where different policies towards FDI are implemented, but also by providing theoretical explanations for the special features of China's inward FDI. The results from the model indicate that export requirements are counter-competitive, incur economic inefficiency, and should be abandoned. These findings can also be extended to other developing countries in which the policy of export requirements is implemented, notably Mexico, Venezuela and India.

APPENDIX

A. Proof that firm *f* shuts down its home country's plant if the differences in real wage rates it faces are sufficiently large comparing with transportation costs. Assuming that firm *f* keeps its plant in the home country, the profit before period *T* is

$$\begin{aligned}\Pi_f^c &= P_m(q_{fm}^m + q_{fm}^c) - (w_m\beta_f q_{fm}^m + w_c\beta_f q_{fm}^c) \\ &= (A_m - q_{fm}^m - q_{fm}^c)(q_{fm}^m + q_{fm}^c) - (w_m\beta_f q_{fm}^m + w_c\beta_f q_{fm}^c)\end{aligned} \tag{A.1}$$

Partially differentiate (A.1), we have

$$\frac{\partial \Pi_f^c}{\partial q_{fm}^m} = A_m - 2(q_{fm}^m + q_{fm1}^c) - w_m\beta_f \tag{A.2}$$

$$\frac{\partial \Pi_f^c}{\partial q_{fm}^c} = A_m - 2(q_{fm}^m + q_{fm}^c) - (w_c\beta_f + \tau_1) \tag{A.3}$$

If $w_m - w_c > \frac{\tau_1}{\beta_f}$, or $(w_m\beta_f - w_c\beta) > \tau_1$, then $\frac{\partial \Pi_f^c}{\partial q_{fm}^m} < \frac{\partial \Pi_f^c}{\partial q_{fm}^c}$. This implies that increasing production in the plant in country *c* generates more profits for firm *f* than increasing its production in the plant in country *m*. Therefore, if this is the case, firm *f* will shut down its

home plant completely. On the other hand, if $(w_m\beta_f - w_c\beta) < \tau_1$, $\frac{\partial \Pi_f^c}{\partial q_{fm}^m} > \frac{\partial \Pi_f^c}{\partial q_{fm}^c}$. Then firm f will not engage in direct investment. The assumption $q_{fm}^m = 0$ is justified as long as the real wage rates faced by firm *f* in two countries is sufficiently large relative to transportation costs.

B. The quantities produced by firm *f* and firm *h* given that the MNF makes a choice either undertake direct investment or exports to serve market *c*.

$$G = \frac{[A_m - (w_c\beta_f + \tau_1)]^2}{4} \quad \text{(B. 1)}$$

$$S = \frac{[A_c - w_c(2\beta_f - \beta_h)]^2}{9} \quad \text{(B. 2)}$$

$$M = \frac{(A_c - w_c\beta_h)^2}{4} \quad \text{(B. 3)}$$

$$N = \frac{[A_c - w_c(2\beta_h - \beta_f)]^2}{9} \quad \text{(B. 4)}$$

$$D = \frac{(A_m - w_m\beta_f)^2}{4} + \frac{[A_c - 2(w_m\beta_f + \tau_1) + w_c\beta_h]^2}{9} \quad \text{(B. 5)}$$

C**.** Equations (C.1) - (C.4) are the terms in welfare function (21).

$$PDV(\Pi_h^c) = \frac{(1-\rho^{T(W)})(A_c - w_c\beta_h)^2}{4(1-\rho)} + \frac{\rho^{T(W)}[A_c - w_c(2\beta_h - \beta_f)]^2}{9(1-\rho)} \quad \text{(C.1)}$$

$$PDV(CS) = \frac{(1-\rho^{T(W)})(A_c - w_c\beta_h)^2}{8(1-\rho)} + \frac{\rho^{T(W)}[2A_c - w_c(\beta_f + \beta_h)]^2}{18(1-\rho)} \quad \text{(C. 2)}$$

$$PDV(w_c L_h^c) = \frac{1-\rho^{T(W)}}{1-\rho} w_c \beta_h \left[\frac{A_c - w_c \beta_h}{2} \right] + \frac{\rho^{T^W}}{1-\rho} w_c \beta_h \left[\frac{A_c - w(2\beta_h - \beta_f)}{3} \right] \quad \text{(C.3)}$$

$$PDV(wL_f^c) = w_c \beta_f \left[\frac{(A_m - w_c \beta_f - \tau_1)^2}{2(1-\rho)} + \frac{\rho^{T(W)}[A_c - 2(\beta_f - \beta_h)]^2}{3(1-\rho)} \right] \quad \text{(C.4)}$$

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