# FDI and Outsourcing in a Service Industry: Welfare Effects of Liberalising Trade and Investment*

TE-CHENG LU AND
YAN-SHU LIN

*Department of Economics, National Dong Hwa University, Hualien, Taiwan*

JIN-LI HU

*Institute of Business and Management, National Chiao Tung University, Hsinchu, Taiwan*

*This study examines a foreign firm's entry decision and its effects on the host country's welfare in a model with a composite good in which both commodity and service generate utility for consumers. Along with the commodity it produces, a producer can provide the service by itself or outsource the service. The result shows that the incentive for foreign direct investment (FDI) in the service sector increases under liberalising trade in the final-good market. Moreover, there exist policy combinations of trade and investment liberalisation, whereby the domestic firms' profitability is traded off with the host country's social welfare when the foreign firm provides a service through FDI or through outsourcing, respectively. Finally, the welfare after simultaneously liberalising trade and investment is not necessarily greater than that under autarky.*

## I Introduction

According to the World Trade Organization (WTO), services have grown from 55 per cent of total GDP in the world to 70 per cent from 1977 to 2007, with the added value of the service industry contributing to 75 per cent of GDP in 2007 among Organisation for Economic Co-operation and Development (OECD) countries.[1] Foreign direct investment (FDI) and outsourcing are two major types of entry mode for a producer's service,[2] and service outsourcing has been a widely used strategy for many enterprises in the global market. Service outsourcing includes business process outsourcing and knowledge process outsourcing (Rajan & Srivastava, 2007). The Internet has also turned service into a tradable good instead of a non-tradable good.

*Correspondence*: Yan-Shu Lin, Department of Economics, National Dong Hwa University, No. 1, Sec. 2, Da Hsueh Rd., Shoufeng, Hualien 97401, Taiwan. Email: ylin@mail.ndhu.edu.tw

[1] The data are from Francois and Hoekman (2010).

[2] GATS (General Agreement on Trade in Services) classifies these four modes as follows: Mode 1, direct cross-border trade in services (OS); Mode 2, movement of the customer to the country of the provider (Consumption Abroad); Mode 3, sales of services through an offshore affiliate (FDI) and Mode 4, temporary entry of natural persons.

In addition to commodities, manufacturers nowadays also provide services called 'producer services' (Markusen, 1989). Multinational companies provide Internet, computer and telecommunications services to foreign customers by FDI or outsourcing. One Taiwanese Internet-related company, D-Link, provides network services worldwide to over 60 countries. Hewlett–Packard distributes its own brand of personal computers through local sellers worldwide. In Taiwan, Nokia outsources its service through Senao International, a local company. To enter an overseas market, a multinational firm can either directly invest in that market or outsource producer services (Markusen *et al.*, 2005).

In the USA, FDI in the service industry is the most important channel to serve overseas customers. Although FDI in the service industry is restricted by discriminatory and non-discriminatory barriers, the amount of FDI stood at US $15 trillion in 2007 worldwide, of which 60 per cent was contributed by FDI in the service industry. Discriminatory and non-discriminatory entry barriers include limits on equity ownership shares and limits on the number of multinational firms.[3] Whereas the USA, UK and many developed economies are usually service outsourcers, developing economies usually play the role of service providers (Amiti & Wei, 2005).

In 2006, almost one half of all services relates to business and ICT (Internet, computer and telecommunications).[4] Distribution contributes to nearly one-fifth of all services. This study therefore focuses on these major types (business, ICT and distribution) of services (i.e. producer services) and ignores finance and insurance services.[5]

A large share of the empirical literature focuses on a firm's productivity and profitability. Jabbour (2010), for example, finds that outsourcing firms are more efficient than vertical integrated (FDI) firms because outsourcing firms might concentrate on core activities and reduce

organisational cost. Tomiura *et al.* (2011) conclude that outsourcing (vertical integrated) firms provide incentives to supply a labour- (capital-) intensive good by sharing labour (investment) cost.

Markusen (1997, 2002) notes that liberalising trade and investment at the same time is very different from applying each policy separately. These two types of liberalisation complementarily affect social welfare. Markusen *et al.* (2005) find that liberalisation of inward FDI in producer services will increase the domestic total-factor productivity and real wage rate of domestic skilled labour. Egger *et al.* (2004, 2007) use a three-country knowledge–capital model of trade to check the effect of liberalising trade and investment in welfare, noting that trade and investment liberalisation are not substitutive under vertical FDI. After completely liberalised trade, both similar endowment countries gain from liberalising investment. Following the Markusen (1997, 2002) model, Amiti and Wakelin (2003) verify that liberalising investment increases (decreases) exports when trade costs are low (moderate to high). Srivastava (2006) presents that India has attracted a lot of FDI in the ICT services industry and shows a positive (or complementary) relationship between FDI in services and service exports when trade is liberalised. In contrast, our research focuses on FDI in services and exports in the final good through a theoretical model.

There is still not much theoretical literature on trade and investment liberalisation in the producer service industry. To the best of our knowledge, the literature most closely related is as follows. Ishikawa *et al.* (2010) investigate the connection between FDI in services and price competition in the final good. Trade liberalisation in the final good may decrease its social desirability if it is not combined with liberalisation of FDI in services. Mukherjee and Suetrong (2012) devise a model of home country export platform FDI to find a negative relation between trade cost and FDI. Collie (2011) discovers a 'regional tariff jumping' model that can explain the increases in both the amount of FDI and the volume of world trade, under which these increases are motivated by multilateral trade liberalisation. Beladi *et al.* (2009) show that trade liberalisation increases the incentives of FDI if the foreign firm undertakes joint ventures. In addition, Horiuchi and Ishikawa (2009) find that a tariff reduction on the final

[3] Further details on trade and policy for services can be found in Francois and Hoekman (2010).

[4] Abramovsky and Griffith (2006) find that ICT-intensive firms have more incentives to purchase offshore services than less ICT-intensive firms.

[5] The data are from IMF and OECD.

good attracts FDI in the presence of a North–South technology transfer. Neary (2009) discusses the relation between vertical (and horizontal) FDI and trade costs.[6]

Trade liberalisation has received much attention in the past few decades, but not many theoretical studies have combined trade and investment liberalisation at the same time.[7] Ederington and McCalman (2010) use a political economy model and find that the median voter prefers a simultaneous liberalisation of trade and investment rather than liberalising trade followed by liberalising investment. The recent related literature still focuses on the manufacturing industry and ignores the relation between domestic firms' profitability and social welfare. As a result, this study aims to study the welfare effects of liberalising both trade and investment in the service industry.

Most barriers to FDI are not in goods, but in service sectors (Arnold *et al.*, 2011). Several aspects of service liberalisation are discussed, such as the presence of foreign providers, privatisation and the level of competition. Results from the Czech Republic show a positive relation between service sector reform and the performance of domestic firms in manufacturing sectors. A number of studies

trace the issue of FDI policy and find that the host country prefers subsidising inward FDI from different aspects. Skaksen (2005), for instance, recommends that the WTO should not oppose host government subsidies to multinationals that produce complementary goods in the host country.

There are some studies that recommend that a FDI policy should be more flexible and varied under different situations. Demekas *et al.* (2007) suggest that tax holidays and domestic corruption do not seem to have a statistically significant impact on FDI. Qiu and Wang (2011) find that the domestic country adopts flexible FDI policy to maximise social welfare through changing the foreign firm's entry decision. Kayalica and Lahiri (2007) discover that domestic firms lobby for lower (higher) subsidies when a discriminatory (uniform) subsidy on FDI is applied. Chang (2004) argues that the benefits of liberalising foreign investment outweigh the costs when the domestic industry is complex and competitive. A range of instruments can develop the industry by limiting ownership, transferring technology or local procurement, focusing on joint ventures with local firms and restricting brownfield investments through mergers and acquisitions. Although regulations on FDI in the service sector are more personal than FDI in the goods sector, such as nationality quotas for managers of affiliates, this kind of discriminatory barrier eventually affects investment cost and entry decision. This study highlights the importance of timing on liberalising trade and investment to maximise a domestic country's welfare.

This study novelly explores the importance of a foreign firm's entry selection and suggests a significant policy implication of liberalising both trade and investment in the service industry. Comparing with the previous literature, we discover that liberalising trade in the final good market induces a foreign firm to undertake FDI in the service industry for 'service fee jumping', which is in parallel to Mukherjee and Suetrong (2012), Collie (2011), Beladi *et al.* (2009) and Horiuchi and Ishikawa (2009). Furthermore, the domestic firms' profitability is not consistent with the host country's social desirability in some policy combinations of liberalising trade and investment when the foreign firm provides a service by FDI or outsourcing respectively. Finally, the welfare after simultaneously liberalising trade and investment is not necessarily

[6] The following articles are in regards to FDI or outsourcing: Ishikawa and Horiuchi (2012) use a North–South trade model to discuss strategic FDI in vertically related markets. Lin and Saggi (2011) discuss the policy competition for FDI and the welfare effect in a vertical-related industry. Arya *et al.* (2008) compare Cournot competition and Bertrand competition when an upstream firm outsources an intermediate good to a vertically integrated rival. Buehler and Haucap (2006) find that outsourcing softens competition in the final good market through colluding or raising rivals' costs if firms foresee the effect of outsourcing prices. Shy and Stenbacka (2003) demonstrate how the competition among input suppliers makes components not only available but also firms take advantage of economies of scale. Grossman and Helpman (2005) find offshore outsourcing is determined by the thickness of the input suppliers' markets and the nature of the two parties' contracting environment. Aronsson and Koskela (2011) study optimal income taxation under FDI and outsourcing. Grossman and Helpman (2003) consider how the extent of contractual incompleteness and the relative wage rate affect FDI and outsourcing.

[7] For instance, trade liberalisation has been discussed in Chen *et al.* (2004) and Fujiwara (2011).

improved, which is in contrast to Ishikawa *et al.* (2010).

The remainder of the study is organised as follows. Section II provides the basic model. Section III discusses the welfare effect and policy implications of the host country. Section IV extends the basic model. Finally, Section V concludes this article.

## II  The Model

Firm $h$ and firm $f$ both produce a homogeneous final good $X$, located in the home country and foreign country respectively. The final good requires services before it can be sold in the home market, and the services must be provided by the home market – that is, the consumers consume composite goods consisting of both goods and services. To enter the home market, firm $f$ exports the final good to the home country and incurs a specific tariff $t$. Assume that one unit of the service is required for one unit of the final good. The two firms' production costs are zero without loss of generality. Because firm $f$ wants to provide a service in the home country, firm $f$ can choose either FDI or outsourcing as the entry mode. If firm $f$ chooses FDI for the service, then it incurs a fixed investment cost $F$ and a unit service cost $c$. If firm $f$ chooses outsourcing, then it incurs a service price $r$ that is charged by an independent service firm $s$. Firm $s$ is located in the home country. The service cost $c$ is identical, as firms $h$, $f$ and $s$ use the same resource to provide the same service in the home country.

This study constructs a Cournot model and rationalises the timing of the game. The timing of this three-stage game model is as follows. In the first stage, firm $f$ decides on FDI or outsourcing (OS). In the second stage, firm $s$ decides on the service price $r$ if firm $f$ undertakes OS. In the third stage, firms $h$ and $f$ compete over quantity in the final good market.[8]

We present the inverse linear demand function in the home country as $p(x_h + x_f)$, where $p$ is the price of good $X = x_h + x_f$ and the derivative of inverse demand $p' < 0$, $p'' = 0$, and $x_h$ and $x_f$

denote the production of firm $h$ and firm $f$ respectively.

### (i) Cournot Competition Under FDI

In the last stage of the FDI regime, firm $h$ and firm $f$ maximise their profits respectively.

$$\underset{x_h}{Max}\, \pi^h = (p - c)x_h, \qquad (1)$$

$$\underset{x_f}{Max}\, \pi^f = (p - c - t)x_f - F. \qquad (2)$$

We derive the first-order conditions due to profit maximisation by both firms.

$$\pi_h^h \equiv \frac{\partial \pi^h}{\partial x_h} = p + p' x_h - c = 0, \qquad (3)$$

$$\pi_{ii}^i \equiv \partial^2 \pi^i / \partial x_i^2 = 2p' < 0,\ i = h, f \qquad (4)$$

Denote the equilibrium outputs in the FDI subgame as $x_i(c, t)$, $i = h, f$. The second-order conditions require $\pi_{ii}^i \equiv \partial^2 \pi^i / \partial x_i^2 = 2p' < 0$, $i = h, f$. The following stability conditions are satisfied and there exists a unique equilibrium:

$$\pi_{ij}^i \equiv \partial^2 \pi^i / \partial x_i \partial x_j = p' < 0,\ i, j = h, f,\ i \neq j,\ \text{and}$$
$$D \equiv \pi_{hh}^h \pi_{ff}^f - \pi_{hf}^h \pi_{fh}^f = 3(p')^2 > 0.$$

We have the following comparative static effects:

$$\frac{\partial x_h}{\partial t} = \frac{-\pi_{hf}^h}{D} = \frac{-p'}{D} > 0,\ \frac{\partial x_f}{\partial t} = \frac{\pi_{hh}^h}{D} = \frac{2p'}{D} < 0. \quad (5)$$

Needless to say, these results are very standard.

### (ii) The Outsourcing Regime

Under outsourcing, the profit function and first-order condition of firm $h$ are identical to Equations (1) and (3). The foreign firm's profit function and first-order condition are respectively:

$$\underset{\hat{x}_f}{Max}\, \hat{\pi}^f = (\hat{p} - r - t)\hat{x}_f \qquad (6)$$

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[8] It is more reasonable that a foreign firm makes the entry decision, and then a service firm adjusts its price. However, Ishikawa *et al.* (2010) reverse the order of the above timing of the game.

$$\frac{\partial \hat{\pi}^f}{\partial \hat{x}_f} = \hat{p} + p'\hat{x}_f - r - t = 0. \qquad (7)$$

Denote the equilibrium outputs in the outsourcing subgame as $\hat{x}_i(r, c, t)$, $i = h, f$. By solving these equations, we have:

$$\frac{\partial \hat{x}_h}{\partial r} = \frac{\partial \hat{x}_h}{\partial t} = \frac{-\hat{\pi}_{hf}^h}{\hat{D}} = \frac{-p'}{\hat{D}} > 0, \qquad (8)$$

$$\frac{\partial \hat{x}_f}{\partial r} = \frac{\partial \hat{x}_f}{\partial t} = \frac{\hat{\pi}_{hh}^h}{\hat{D}} = \frac{2p'}{\hat{D}} < 0.$$

These comparative static results imply that trade liberalisation in the final good and/or a decrease in the service price decreases $\hat{x}_h(r, c, t)$, but increases $\hat{x}_f(r, c, t)$.

In the second stage of the OS regime, firm $s$ decides the service price to maximise profits.

$$\underset{r}{Max} \, \hat{\pi}^s = (r - c)\hat{x}_f(r, c, t). \qquad (9)$$

The first-order condition of firm $s$ is as follows:

$$\hat{\pi}_r^s \equiv \frac{\partial \hat{\pi}^s}{\partial r} = (r - c)\frac{\partial \hat{x}_f}{\partial r} + \hat{x}_f = 0. \qquad (10)$$

The equilibrium service price $r(c, t)$ is a function of $c$ and $t$. We therefore obtain the following lemma.

**Lemma 1** *A decrease in the tariff rate $t$ increases the service price $r$.*

**Proof** The second-order condition requires $\hat{\pi}_{rr}^s = 2\partial \hat{x}_f / \partial r < 0$. Totally differentiating Equation (10), we obtain $dr/dt = -\hat{\pi}_{rt}^s / \hat{\pi}_{rr}^s$, where $\hat{\pi}_{rt}^s = \partial \hat{x}_f / \partial t < 0$, and therefore $dr/dt = -1/2$.[9]

The logic behind Lemma 1 is as follows. Both an increase in service price $r$ and a decrease in the tariff $t$ raise the profit margin of independent service firm $s$. Intuitively, trade liberalisation in the final good induces an increase in the derived demand for firm $s$, and therefore firm $s$ maximises profits by raising service price $r$.

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[9] Throughout the article, we demonstrate the results in a linear demand function. The Appendix discusses the robustness of our lemmas and propositions under general demand.

*(iii) Firm f Undertakes FDI or OS*

In the first stage, firm $f$ undertakes FDI (OS) if $\pi^f - \hat{\pi}^f > (<)0$. In other words, firm $f$ undertakes FDI if $F < \overline{F} \equiv (p - c - t)x_f - (\hat{p} - r - t)\hat{x}_f$. Totally differentiating the critical value $\overline{F}$, we obtain:

$$\begin{aligned}
\frac{d\overline{F}}{dt} &= \frac{d\pi^f}{dt} - \frac{d\hat{\pi}^f}{dt} \\
&= [\underbrace{\frac{\partial \pi^f}{\partial x_h}\frac{\partial x_h}{\partial t}}_{indirect(FDI)} + \underbrace{\frac{\partial \pi^f}{\partial t}}_{direct(FDI)}] \\
&\quad - [\underbrace{\frac{\partial \hat{\pi}^f}{\partial \hat{x}_h}\frac{\partial \hat{x}_h}{\partial t}}_{indirect(OS)} + \underbrace{\frac{\partial \hat{\pi}^f}{\partial t}}_{direct(OS)}] \\
&\quad - [\underbrace{(\frac{\partial \hat{\pi}^f}{\partial \hat{x}_h}\frac{\partial \hat{x}_h}{\partial r} + \frac{\partial \hat{\pi}^f}{\partial r})\frac{dr}{dt}}_{outsourcing\,cost}]. \qquad (11)
\end{aligned}$$

This study highlights the above findings as Lemma 2.

**Lemma 2** *The incentive for FDI in the service industry increases when liberalising trade in the final good market.*

**Proof** By using Equations (5) and (8), it is easy to derive $(\partial \pi^f / \partial x_h)(\partial x_h / \partial t) + (\partial \pi^f / \partial t) = -4x_f/3$ and $(\partial \hat{\pi}^f / \partial \hat{x}_h)(\partial \hat{x}_h / \partial t) + (\partial \hat{\pi}^f / \partial t) = -4\hat{x}_f/3$. Here, $x_f > \hat{x}_f$ due to $r > c$, and the sum of the first and second terms is negative. Together with the outsourcing cost effect being positive in Equation (11), we verify that Equation (11) is negative.

Trade liberalisation in the final good sector affects the entry decision of firm $f$ through the following effects: direct effect and indirect effect under FDI (OS) and outsourcing cost effect, which can be, respectively, explained by Equation (11). We know that both the direct and indirect effects are negative under FDI or OS, and the magnitude of the negative effect under FDI dominates the latter one (OS). Therefore, the sum of the first and second terms is also negative. Taking into account these direct and indirect effects, it implies that trade liberalisation makes firm $f$ more willing to undertake FDI. By using Lemma 1, the positive outsourcing cost effect also increases the incentives for firm $f$ to undertake FDI as a reduction in $t$ raises $r$, which in turns increases the outsourcing cost of firm $f$. Combining these three effects, we notice a negative relation between the tariff rate $t$ and the incentive for FDI in the service ($\overline{F}$).

We analyse the entry decision of firm $f$ from the viewpoint of cost. The effective marginal cost of firm $f$ in the FDI regime is $(c, t)$, and in the OS regime it is $(r, t)$. Because the service price is always greater than the service cost, the operating profit of firm $f$ in the FDI regime is bigger than that in the OS regime. As the effective marginal cost is low under FDI, why does firm $f$ undertake OS when the trade barrier is high? The reason is that firm $f$ trades off the loss of sunken investment cost $F$ with the benefit of a low effective marginal cost in the FDI regime. The loss of sunken investment cost $F$ outweighs the benefit of a low effective marginal cost in the FDI regime when the trade barrier is high, which is why firm $f$ undertakes OS. By contrast, the benefit of a low effective marginal cost outweighs the loss of a sunken investment cost in the FDI regime when the trade barrier drops. Therefore, firm $f$ undertakes FDI. As a result, the incentive for FDI in the service industry increases when liberalising trade in the final good.

Figure 1 (by assuming linear demand $p = a - x_h - x_f$) show the intuition behind the foreign firm's decision. We know that firm $f$ cannot earn any positive profits at prohibitive tariff $\bar{t}$ (at point A, Figure 1a) in which the equilibrium outputs $x_f(c, t)$ equal zero. When the investment cost $F$ is zero, the profits under FDI are always greater than those under OS. Furthermore, the curve of profits under FDI shifts downward and intersects the curve of profits under OS at point B when the investment cost becomes larger, say $F1$. Given $F = F1$, firm $f$ prefers OS to FDI if $t_1 \leq t < \bar{t}$, whereas firm $f$

prefers FDI to OS if $0 < t < t_1$. The foreign firm's entry decision can be depicted as the ABF bold curve in Figure 1a. Similarly, the foreign firm's entry decision can be illustrated by the ACE curve in the situation of $F = F2$.

This study suggests that the foreign firm's decision features a negative relation between $F$ and $t$, as shown as Figure 1b. The incentive for FDI in the service $\bar{F}$ can be characterised by the AD curve. Given $F = F1$, firm $f$ is indifferent between choosing FDI or OS at point B when $t = t_1$. It is analogous that point C makes firm $f$ also indifferent between undertaking FDI or OS in the situation of $F = F2$ and $t = t_2$. As a result, firm $f$ is indifferent between FDI and OS on the locus of the AD curve. If the pairs of $(F, t)$ are below (above) the AD curve, then firm $f$ prefers FDI (OS).

We conclude the foreign firm's entry decision as follows. If firm $f$ does not incur any investment cost, then firm $f$ definitely undertakes FDI as the effective marginal cost under FDI is small. When $F$ is relatively small, the benefit of trade liberalisation easily dominates the sunken investment cost. When $F$ is relatively large, the sunken investment cost is difficult to overcome from the benefit of trade liberalisation. Therefore, firm $f$ trades off the loss of a sunken investment cost with the benefit of a low effective marginal cost under FDI.

### III The Domestic Country's Welfare

This section considers the welfare of the domestic country. We analyse the profitability of the domestic firms before the analysis of domestic country's desirability. Similar to the definition of

FIGURE 1
*(a) Foreign Firm's Decision. (b) Foreign Firm's Decision Under Different Values of F and t*
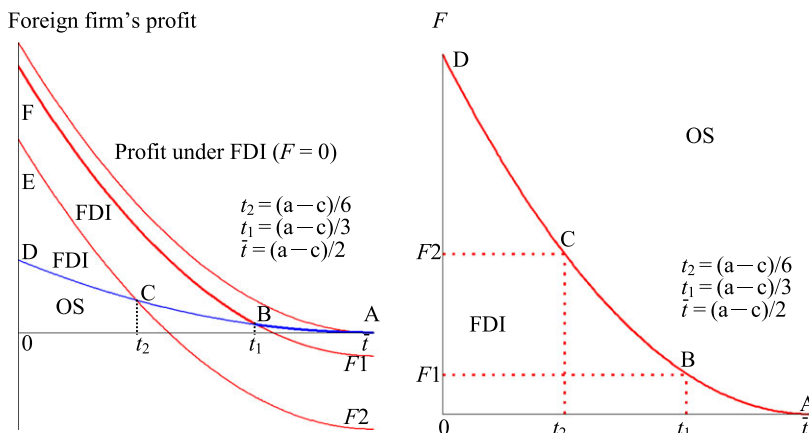
Chaudhuri and Benchekroun (2012), trade liberalisation is said to increase (decrease) the desirability of the foreign firm's entry at $t = t_0$ if and only if $\partial W/\partial t|_{t=t_0} < (>)0$. The analysis of profitability is analogous to the analysis of desirability.

### (i) Profitability of the Domestic Firms

The equilibrium profit of firm $h$ under FDI decreases with trade liberalisation (GH curve in Figure 2). In other words, a reduction in $t$ decreases the profitability of firm $h$ if firm $f$ undertakes FDI. By contrast, there are two firms, $h$ and $s$, in the OS regime. Accordingly, a tariff reduction decreases the profitability of firm $h$ (GI curve), but increases the profitability of firm $s$ (AD curve). Using the envelope theorem, we have:

$$
\frac{d(\hat{\pi}^h + \hat{\pi}^s)}{dt} = \underbrace{\frac{\partial \hat{\pi}^h}{\partial \hat{x}_f}\left(\frac{\partial \hat{x}_f}{\partial t} + \frac{\partial \hat{x}_f}{\partial r}\frac{dr}{dt}\right)}_{\text{strategic effect}}
$$
$$
+ [\underbrace{\frac{\partial \hat{\pi}^s}{\partial \hat{x}_f}\frac{\partial \hat{x}_f}{\partial t}\left(1 + \frac{dr}{dt}\right)}_{\text{quantity effect}} + \underbrace{\hat{x}_f\frac{dr}{dt}}_{\text{price effect}}] \qquad (12)
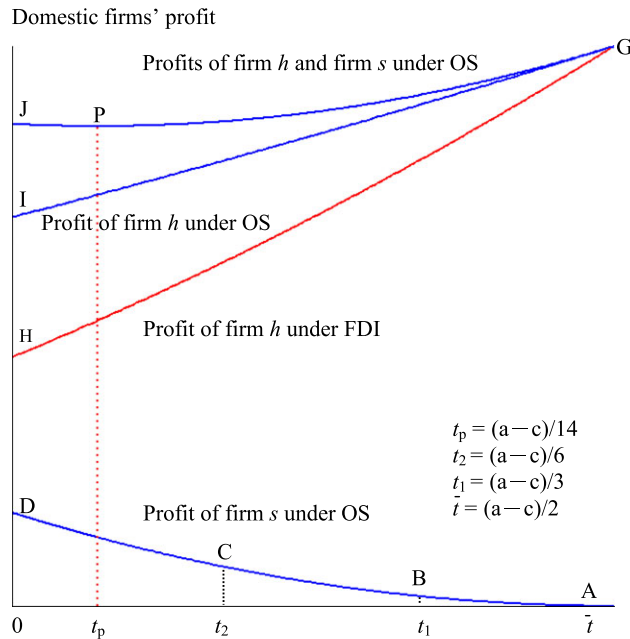$$

Substituting Equation (8) and Lemma 1 into Equation (12) shows $d(\hat{\pi}^h + \hat{\pi}^s)/dt = \hat{x}_h/3 - \hat{x}_f$, and $d^2(\hat{\pi}^h + \hat{\pi}^s)/dt^2 = (1/3)(d\hat{x}_h/dt) - d\hat{x}_f/dt > 0$. From Equation (12), the profits of domestic firms are minimised at $t = t_P$ (GJ curve). Therefore, this study suggests that the domestic firms' profitability is as follows.

**Proposition 1**   (i)   *Trade liberalisation decreases the total profits of the domestic firms if firm f undertakes FDI.*

*(ii) For $t_p < t < \bar{t}$ ($0 < t < t_p$), trade liberalisation decreases (increases) the total profits of the domestic firms if firm f undertakes OS.*

Figure 2 shows the results. From the viewpoint of firm $h$, liberalising trade makes firm $h$ less profitable as trade liberalisation induces firm $f$ to produce more. However, firm $s$ can charge a higher service price, which benefits firm $h$, as a higher service price induces firm $f$ to produce less. The former direct effect dominates the latter indirect service–price effect, which is why trade liberalisation decreases the profitability of firm $h$,

FIGURE 2
*Profitability of the Domestic Firms*



Domestic firms' profit

Profits of firm $h$ and firm $s$ under OS

Profit of firm $h$ under OS

Profit of firm $h$ under FDI

Profit of firm $s$ under OS

$t_p = (a - c)/14$
$t_2 = (a - c)/6$
$t_1 = (a - c)/3$
$\bar{t} = (a - c)/2$

which is summed up as the *strategic effect* in Equation (12). From the viewpoint of firm $s$, the direct and indirect effects are opposite, summing up as the *quantity effect*. Except for the quantity effect, firm $s$ directly benefits from a high service price, the *price effect*, which is induced by liberalising trade. Considering the quantity and price effects, trade liberalisation increases the profitability of firm $s$. As firm $h$ and firm $s$ are involved in the OS regime, trade liberalisation decreases the total profits of the domestic firms if $t$ is relatively large ($t_p < t < \bar{t}$) and increases the total profits of the domestic firms if $t$ is relatively small ($0 < t < t_p$).

### (ii) Trade Liberalising Effect on Consumer Surplus Under OS

Conventional wisdom tells us that trade liberalisation is beneficial for consumer surplus without OS. We check this viewpoint in the outsourcing regime by:

$$\frac{d(\hat{x}_h + \hat{x}_f)}{dt} = \left(\frac{\partial \hat{x}_h}{\partial r}\frac{dr}{dt} + \frac{\partial \hat{x}_h}{\partial t}\right) + \left(\frac{\partial \hat{x}_f}{\partial r}\frac{dr}{dt} + \frac{\partial \hat{x}_f}{\partial t}\right)$$
$$= \left(1 + \frac{dr}{dt}\right)\left(\frac{p'}{\hat{D}}\right). \tag{13}$$

By using Lemma 1, we know that a decrease in the tariff rate $t$ increases consumer surplus.

### (iii) Welfare Under Autarky, FDI and OS

First, we take the welfare of the domestic country under autarky (superscript $A$) as a benchmark case:

$$W^A = CS^A + \pi^{hA}, \tag{14}$$

where $CS$ denotes consumer surplus.

Second, the welfare of the domestic country under FDI is as follows:

$$W_h^{FDI} = CS + \pi^h + tx_f \tag{15}$$

where $tx_f$ is the tariff revenue. We derive the first-order condition as:

$$\frac{\partial W_h^{FDI}}{\partial t} = \underbrace{-p'\left(\frac{\partial x_h}{\partial t} + \frac{\partial x_f}{\partial t}\right)x_f}_{consumer\,surplus\,effect} + \underbrace{(p-c)\frac{\partial x_h}{\partial t}}_{profit\,effect}$$
$$+ \underbrace{\left(x_f + t\frac{\partial x_f}{\partial t}\right)}_{tariff\,revenue\,effect} = 0. \tag{16}$$

Substituting Equation (5) into Equation (16) shows $\partial W_h^{FDI}/\partial t = (2x^f + x^h - 2t)/3$, and $\partial^2 W_h^{FDI}/\partial t^2 = [2(\partial x^f/\partial t) + (\partial x^h/\partial t) - 2]/3 < 0$. Therefore, the welfare under FDI is maximised at $t = t_1$. Figure 3 shows the relation between the domestic country's welfare and $t$. The consumer surplus effect in Equation (16) implies that trade liberalisation is beneficial for consumer surplus. The profit effect points towards trade liberalisation being harmful to the profits of firm $h$. The tariff revenue effect is ambiguous.

Third, the welfare of the domestic country under OS is as follows:

$$W_h^{OS} = \hat{CS} + \hat{\pi}^h + \hat{\pi}^s + t\hat{x}_f. \tag{17}$$

The first-order condition is analogous to Equation (16) and goes as follows:

$$\frac{\partial W_h^{OS}}{\partial t} = \underbrace{-p'\left(\frac{d\hat{x}_h}{dt} + \frac{d\hat{x}_f}{dt}\right)\hat{x}_f}_{consumer\,surplus\,effect} + \underbrace{(\hat{p}-c)\frac{d\hat{x}_h}{dt}}_{profit\,effect}$$
$$+ \underbrace{\left[\frac{dr}{dt}\hat{x}_f + (r-c)\frac{d\hat{x}_f}{dt}\right]}_{outsourcing\,profit\,effect} + \underbrace{\left[\hat{x}_f + t\frac{d\hat{x}_f}{dt}\right]}_{tariff\,revenue\,effect} = 0. \tag{18}$$
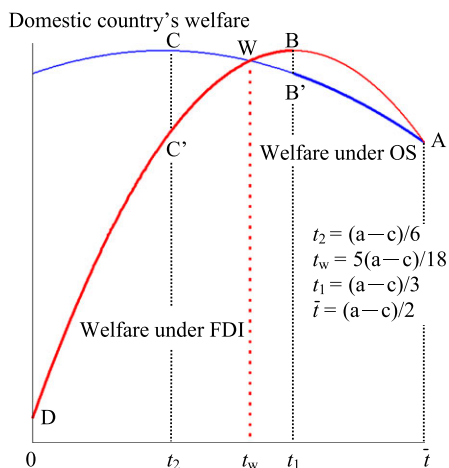
Substituting Equation (8) and Lemma 1 into Equation (18) shows $\partial W_h^{OS}/\partial t = (-\hat{x}^f + \hat{x}^h - 2t)/6$, and $\partial^2 W_h^{OS}/\partial t^2 = (-\partial \hat{x}^f/\partial t + \partial \hat{x}^h/\partial t - 2)/6 < 0$. The welfare under OS is maximised at $t = t_2$. The effects in Equation (18) are analogous to Equation (16). Note that trade liberalisation is beneficial for the profits of firm $s$, which is represented by the outsourcing profit effect.

### (iv) Discussion and Policy Implication

Now let us consider how the domestic country's welfare is affected by the foreign firm's entry decision. Given $F$ equals $F1$ in Figure 1b, firm $f$ prefers OS when the tariff drops from $\bar{t}$ to $t_1$ and the domestic country gets its welfare under outsourcing, which is AB' in Figure 3. On the other side, firm $f$ prefers FDI when the tariff drops from $t_1$ to zero and the domestic country gets its welfare under FDI, which is BD in Figure 3. As a result, the domestic country's welfare can be depicted as the bold curve AB'BD. Similarly, given $F$ equals $F2$, the domestic country's welfare can be presented as curve ACC'D.

*Relation Between the Domestic Country's Welfare and t*



liberalisation, tariff revenue under FDI is larger (smaller) than that under OS. Eventually, the positive effects induced by trade liberalisation will be balanced by the negative effects at point $t = t_w$, shown at point W in Figure 3.

Figure 4 illustrates the relation between the foreign firm's decision and the welfare of the domestic country by considering different values of $t$ and $F$. Because Equations (15) and (17) are not a function of $F$, the domestic country's welfare is indifferent between FDI and OS at the vertical line of $t = t_w$, and it is shown as a vertical line in Figure 4. First, firm $f$ undertakes FDI (OS) beneath (above) the AD curve as the investment cost is relatively small (large). Second, we know $W_h^{FDI} > (<) W_h^{OS}$ if $t > (<) t_w$ from Equation (19). Furthermore, the social welfare that the domestic country can get depends on the entry mode of firm $f$. As a result, the entry mode chosen by firm $f$ can generate the welfare that domestic government pursues in regions O1 to O5.[10] In contrast, the welfare cannot be maximised in regions N1 and N2. Our discussions focus on the reasonable regions of O1 to O5.

In the beginning of trade liberalisation, $t_1 < t < \bar{t}$, firm $f$ undertakes FDI within region O1, and liberalising trade decreases the profitability, but increases the desirability. In region O2, $t_w < t < t_1$, firm $f$ also undertakes FDI, and liberalising trade decreases both the profitability and the desirability. In region O3 (O4) $t_2 < t < t_w$ ($t_p < t < t_2$), firm $f$ undertakes OS, and trade liberalisation decreases the profitability, but increases the desirability (decreases both the profitability and the desirability). In the neighbourhood of free trade, region O5, $0 < t < t_p$, foreign firm $f$ also undertakes OS, and trade liberalisation increases the profitability, but decreases the desirability. The effect of trade liberalisation on profitability and desirability in each region can be represented as follows: Regions O1 $(-, +)$, O2 $(-, -)$, O3 $(-, +)$, O4 $(-, -)$ and O5 $(+, -)$. There are conflicts between social desirability and the firms' profitability in regions O1, O3 and O5. Summarising the above results of the profitability and the desirability, we obtain the following proposition.

After applying Equations (16) and (18), it is now straightforward to show that the respective slopes of curves AB and AB' near point $t = \bar{t}$ are $\partial W_h^{FDI} / \partial t \big|_{t=\bar{t}}$ and $\partial W_h^{OS} / \partial t \big|_{t=\bar{t}}$, which present that the welfare of the domestic country increases quicker in the FDI regime than that in the OS regime when liberalising trade near point A. Recalling Lemma 1, we note that both consumer surplus and tariff revenue increase quicker, as well as producer surplus decreases quicker in the FDI regime. However, the effect on consumer surplus and tariff revenue dominates the effect on producer surplus. Therefore, the welfare of the domestic country increases quicker in the FDI regime than that in the OS regime near point A.

Subtracting Equation (17) from Equation (15) yields:

$$W_h^{FDI} - W_h^{OS} \begin{cases} > 0 & t > t_w \\ = 0 & \text{if} \quad t = t_w \\ < 0 & t < t_w. \end{cases} \quad (19)$$

Given all the possible values of $t$ ($0 < t < \bar{t}$), we explore the welfare discrepancy between FDI and OS by the following effects: consumer surplus, profits of firm $h$ (and $s$) and tariff revenue. First, consumer surplus under FDI is definitely larger than that under OS due to severe competition under FDI. Second, domestic firms' profits under FDI are definitely smaller than those under OS (see Figure 2). Third, the tariff revenue effect is ambiguous. In the beginning (end) of trade

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[10] The definitions of regions O1 to O4 go according to the welfare functions' slope in Figure 3, and region O5 is defined by the slope of domestic firms' profit in Figure 2.
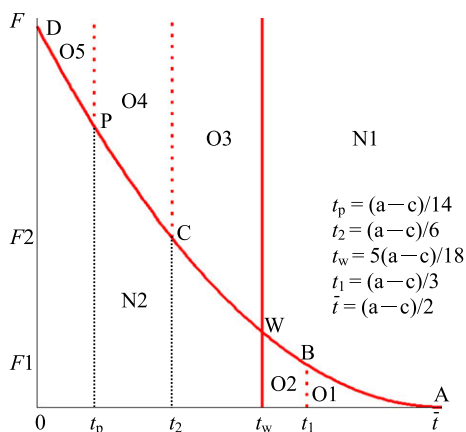
**Proposition 2** (*i*) *For* $t_1 < t < \bar{t}$ ($t_2 < t < t_w$), *liberalising trade decreases the profitability, but increases the desirability in the FDI (OS) regime.*

(*ii*) *For* $t_w < t < t_1$ ($t_p < t < t_2$), *liberalising trade decreases both the profitability and the desirability in the FDI (OS) regime.*

(*iii*) *For* $0 < t < t_p$, *trade liberalisation increases the profitability, but decreases the desirability in the OS regime.*

We further derive policy implications of liberalising both trade and investment in the service industry from Proposition 2. The domestic government can hence use different policy combinations (e.g. both trade and FDI liberalisation or trade liberalisation with a strict FDI policy) to induce the foreign firm to adopt FDI or outsourcing to improve the domestic welfare. For example, in Figure 4 if the current combination of tariff rate $t$ and FDI cost $F$ lies in region N1, then the optimal entry mode for the foreign firm is outsourcing. In this case the government may use FDI liberalisation to induce the outcome to be in region O1, while further using trade liberalisation to improve the domestic welfare. This complementary policy combination encourages firm $f$ to replace outsourcing with FDI, leading to larger social welfare, while being harmful to the domestic firm $h$. On the contrary, in Figure 4 if the current combination of tariff rate $t$ and FDI cost $F$ lies in region N2, then the optimal

entry mode for the foreign firm is FDI. In this case the government can apply a stricter investment policy (such as a more rigorous environmental standard) to induce the outcome to be in region O3, while further adopting trade liberalisation that will improve the domestic welfare. This substitutive policy combination encourages firm $f$ to replace FDI with outsourcing, leading to a higher level of domestic welfare. Our results are in contrast to Ishikawa *et al.* (2010), where complementary policies lead to domestic welfare improvement. We find that a stricter FDI and a looser trade policy combination may be welfare improving when the producer service is taken into account. These results suggest important policy implications as follows.

**Proposition 3** *For* $t_w < t < \bar{t}$, *the government may use FDI liberalisation, while further using trade liberalisation, to improve the domestic welfare. For* $0 < t < t_w$, *the government can apply a stricter FDI policy, while further adopting trade liberalisation, to improve the domestic welfare.*

## IV Model Extension: Firm f Outsources a Service to Firm h

In previous sections, the model assumes that the foreign firm $f$ outsources its service to a pure service provider, firm $s$. However, firm $f$ can also outsource its producer service to the final good competitor, the domestic firm $h$. The model set-up is the same as that in Section II, except that firm $h$ provides the service for firm $f$ and also determines the price of the outsourced service. In this case the domestic pure service provider $s$ is not involved in this market. As a result, firm $h$'s profit function becomes $\tilde{\pi}^h = (p - c)\tilde{x}_h + (r - c)\tilde{x}_f$, where the superscript $\sim$ indicates the situation when firm $f$ outsources the service to firm $h$.

The solution of quantity competition in the third stage of the game is the same as that in Section II. In stage 2, firm $h$ maximises its profit by choosing the price of the outsourced service under the incentive constraints of firm $f$ in the regime of OS instead of FDI: $\tilde{\pi}^f(r, c, t) - \pi^f(c, t, F) \geq 0$.[11] The

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[11] Firm $h$ maximizes the following objective function in the second stage:
$Max \tilde{\pi}^h = (p - c)\tilde{x}^h(r, c, t) + (r - c)\tilde{x}^f(r, c, t) \, s.t \, \tilde{\pi}^f(r, c, t) - \pi^f(c, t, F) \geq 0$. The incentive constraints of firm $f$ are bounded at $\bar{r} \equiv \tilde{\pi}^f(r, c, t) - \pi^f(c, t, F) = 0$. By assuming linear demand $p = a - x_h - x_f$, we have $\bar{r} = [(a + c - 2t) - ((2t - a + c)^2 - 9F)^{1/2}]/2$, with $\partial \bar{r}/\partial t > 0$.

optimal price for firm $h$ on the outsourced service is $\bar{r}$, where $\bar{r}$ is an increasing function in $t$. Intuitively, without taking into account the incentive constraint for firm $f$, firm $h$ will charge an extremely high price for the outsourced service, to drive firm $f$ out of the market and to become a domestic monopoly in the final good market. However, as long as the outsourced service's price is high enough, firm $f$ will provide its own service via FDI and hence make the domestic final good market structure a duopoly. As a result, the optimal outsourced service price of firm $h$ is to make firm $f$ feel indifferent between OS and FDI.

This finding differs from that in Lemma 1. The economic intuitions are as follows. When the firm service provider is firm $s$, its profit-maximising price always maintains a positive quantity of firm $f$. Therefore, when a drop in $t$ increases firm $f$'s exports, an increase in the derived demand for the service firm $s$ will increase the outsourced service price, *resulting in a negative relation between the tariff rate and service price*. However, as firms $h$ and $f$ compete in the final good market, firm $h$ has to take into account the incentive constraint for firm $f$ to keep using the OS strategy. Therefore, when firm $h$ provides the service to firm $f$, the equality of firm $f$'s incentive constraints between OS and FDI should always hold. When $t$ decreases, assuming the service price stays the same, firm $f$'s profit always increases under both OS and FDI strategies; moreover, the increase in firm $f$'s profit under FDI is larger than that under OS. In order for firm $f$ to still have an incentive to outsource the service, firm $h$ has to reduce the service price as the tariff rate decreases, *creating a positive relation between the tariff rate and service price*.

Summarising the above discussion, we find that trade liberalisation in the final good market always lowers the domestic firm's profit when the foreign firm outsources the service to it. The results are different from those in Proposition 1. However, there is an inverse U-shape relation between the tariff rate and domestic welfare. As a result, in this situation there is a trade-off between the domestic firm's profit and social welfare with respect to trade liberalisation, as Proposition 2 shows. As long as the FDI cost is positive, the domestic firm $h$ always charges a service price to induce firm $f$ to outsource the service and not to conduct FDI. As a consequence, there is no policy substitution between trade and FDI liberalisation, as Proposition 3 discusses.[12]

## V Conclusion

The composite good (with both final good and producer service) framework presented in this study highlights the importance of a foreign firm's entry selection and suggests a strong policy implication for liberalising both trade and investment in the service industry. Collie (2011) explains that trade liberalisation induces a foreign firm to undertake FDI when the inter-regional transport cost is sufficiently large. Ishikawa *et al.* (2010) discover that trade liberalisation in the final good may decrease social desirability if not combined with liberalisation of FDI in services. In our study we find that liberalising trade in the final good market induces a foreign firm to undertake FDI in the service industry. However, the domestic firms' profitability is not consistent with the host country's social desirability in some policy combinations of liberalising trade and investment when the foreign firm provides a service by FDI or outsourcing respectively. Finally, the welfare after simultaneously liberalising trade and investment is not necessarily greater than that under autarky.

Our research results show that there are many welfare trade-offs between liberalising trade and investment. Policy-makers therefore have to balance the welfare gains and losses between liberalising trade and investment at the same time. For example, Thailand and Philippines offer tax incentives to compete for inward FDI, whereas Vietnam offers a 10-year tax holiday to win over the competition (Bjorvatn & Eckel, 2006). Australia's import tariff on motor vehicles has been reduced from 57.5 to 17.5 per cent during the past few decades, but the FDI inflow has increased during this time (Lloyd, 2008; Sadleir & Mahony, 2009; and Crotti *et al.*, 2010). Taiwan signed an FTA with New Zealand to drive trade liberalisation, while also offering tax incentives to attract FDI (Claus, 2009). These policies should be cautiously checked under different situations. Future work will endogenise the choice of outsourcing services from a domestic firm or an independent service firm. Policy coordination

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[12] If the domestic government can use subsidies to attract FDI, then firm $f$ may still choose FDI in this situation. Future research may study this case.

among governments on both FDI and service outsourcing is also worth more in-depth research.

### Appendix

Recall Lemma 1, we know $dr/dt = -\hat{\pi}_{rt}^s/\hat{\pi}_{rr}^s$, where $\hat{\pi}_{rr}^s < 0$, and

$$\hat{\pi}_{rt}^s = (r - c)\frac{\partial^2 \hat{x}_f}{\partial r \partial t} + \frac{\partial \hat{x}_f}{\partial t}. \tag{A1}$$

From Equation (A1), we derive

$$\frac{\partial^2 \hat{x}_f}{\partial r \partial t} = \frac{-8(p')^3 p'' - (p'')^2[1 + 7(p')^2]\hat{x}_h - p'p''}{\hat{D}} . \tag{A2}$$
$$\frac{-p'(p'')^3(\hat{x}_h + \hat{x}_f)\hat{x}_h}{\hat{D}}$$

Equation (A2) is negative if $p'' < 0$. In summary, Lemma 1 holds if $p'' < 0$, $p'' = 0$ and $p'' > 0$ is not sufficiently large.

Recall Lemma 2, this study verifies

$$\frac{d\bar{F}}{dt} = [\hat{x}_f - x_f] + 3(p')^3\left[\frac{(p' + p''\hat{x}_h)\hat{x}_f - (p' + p''x_h)x_f}{D\hat{D}}\right]$$
$$+ (p')^2 p''\left[\frac{(p' + p''\hat{x}_h)\hat{x}_f X - (p' + p''x_h)x_f \hat{X}}{D\hat{D}}\right]$$
$$+ \left[\frac{p'(p' + p''\hat{x}_h)\hat{x}_f}{\hat{D}} + \hat{x}_f\right]\frac{dr}{dt}. \tag{A3}$$

Four terms in Equation (A3) are all negative if $dr/dt < 0$. Therefore, if $dr/dt < 0$, Lemma 2 holds.

The robustness of propositions 1 and 2 are analysed as follows:

$$\frac{d(\hat{\pi}_h + \hat{\pi}_s)}{dt} =$$
$$\left[\frac{2(p')^2\hat{x}_h + p'p''x_h\hat{x}_h + 2p'(r - c) + p''(r - c)x_h}{\hat{D}}\right]$$
$$(1 + \frac{dr}{dt}) + \hat{x}_f\frac{dr}{dt} \tag{A4}$$

$$\frac{\partial W_h^{FDI}}{\partial t} =$$
$$\frac{-(p')^2 x_f - p'(p - c) - p''(p - c)x_h + 2p't + p''tx_h}{D} + x_f \tag{A5}$$

$$\frac{\partial W_h^{OS}}{\partial t} =$$
$$\left[\begin{array}{c} (p')^2\hat{x}_f + p'(\hat{p} - c) + p''(\hat{p} - c)\hat{x}_h \\ \frac{-2p'(r - c + t) - p''(r - c + t)\hat{x}_h}{\hat{D}} \end{array}\right]\frac{dr}{dt} \tag{A6}$$
$$+ \left(1 + \frac{dr}{dt}\right)\hat{x}_f$$

The sign of above Equations also depends on the sign of $dr/dt$. In summary, all lemmas and propositions hold, if $p'' < 0$, $p'' = 0$ and $p'' > 0$ are not sufficiently large.

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