# FDI in Services and Market Access: A Paradox of Trade Liberalization

Jota Ishikawa*
Hitotsubashi University

Hodaka Morita
University of New South Wales

Hiroshi Mukunoki
Gakushuin University

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**Abstract**

In an international oligopoly model, this paper investigates interaction between trade liberalization in goods and liberalization in service FDI. Since some services are market-specific and have non-tradable nature, a foreign firm has a higher cost in service provisions compared to its domestic competitor and it can overcome the disadvantage by either outsourcing services to the domestic competitor or making service FDI. When the cost of service FDI is high enough, trade liberalization under service outsourcing may have an anti-competitive effect and benefit both domestic and foreign firms at the expense of consumers. A decline in the cost of service FDI makes this paradoxical effect less likely, and trade liberalization becomes pro-competitive when the cost is low enough so that the foreign firm actually makes service FDI.

* *Corresponding author*: Faculty of Economics, Hitotsubashi University, Kunitachi, Tokyo 186-8601, Japan; Fax: +81-42-580-8882; E-mail: jota@econ.hit-u.ac.jp

# 1 Introduction

In recent years, service sectors have been growing rapidly all over the world. As economies become more service oriented, business services are regarded as crucial inputs in production and sales of products. Accordingly, global business environment has been changed so that the accessibility to these services influences producers' competitiveness and becomes a key to success in the global market.

Due to the progress of information technology, international trade in services has been also growing and it facilitates doing business in the foreign country.[1] Some business services, however, have non-tradable nature and the cross-border supply of them is difficult. Examples of such services include distribution, advertising, marketing, providing sales finance, providing maintenance, and so on. Usually, they must be provided where they are utilized since these services needs the proximity between providers and clients. Broadly speaking, foreign producers have two options to provide these kinds of services and improve the market access in the service sectors of foreign countries, that is, *international service outsourcing* and *foreign direct investment (FDI) in services*.

International service outsourcing is a prevalent mean to access non-tradable business services, by which foreign producers contract with domestic service providers for providing necessary services in selling its product in the local market. For instance, Aisin, the Japanese firm which produce auto-parts and energy products, outsource its sales of the gas-heat pump air-conditioner in Korea to a Korean firm, Samsung. The outsourced firms are often rival producers in the product market. A German firm, Bayer, outsources sales of some remedies to its Japanese competitors in pharmaceutical products, Meiji Seika and Kyorin Pharmaceutical. Compared to service outsourcing, FDI in services (or service FDI) is a rather direct way to provide non-tradable services, by which a foreign firm establishes local affiliates (such as sales affiliates) to provide the services locally. Both modes of the service offshoring would reduce the foreign producers' operation costs associates with their foreign sales, but they would also incur some fixed costs such as the cost of enforcing service contracts, the set-up cost of establishing the service networks

[1]The World Trade Organization (WTO) reports that exports in services account for 19.3% of the total world exports in 2004. See WTO, *International Trade Statistics 2005*.

for imported goods, and so on. The existence of the fixed costs means the market size of imported goods is a key determinant to evolve these two modes of service offshoring. One of the objective of our paper is to explore how these two modes of service offshoring relates to the extent of market access *in goods*, that is, the degree of trade liberalization.

A typical example is the Japanese imported car market. Until the mid-1980s, foreign automobiles are distributed and sold within Japan by specific import agents or parallel importers, and its volume had been small. In the mid-1980s to the 1990s, the Japanese imports of foreign automobiles increased remarkably.[2] In response, many foreign auto-makers outsource sales of their products to the Japanese auto-makers in the late-1980s,[3] and others establish the sales affiliates by FDI (MITI, 1989).[4]

Although outsourcing of services for local sales seems to become common now, foreign producers still face difficulties in the access of foreign services suppliers because of exclusive dealings of domestic products by domestic distributors, for instance.[5] As for the service FDI, some cultural barriers or the lack of information make it difficult to operate in foreign countries as the conventional theory of FDI suggests. UNCTAD (2004) reports that FDI in service sectors have been growing but still less multinationalized than production sectors. Service FDI can be also deterred by the host country's regulations. An efficient provision of some producer services needs the movement of professional personnel, but many countries have the restrictions on the movement of personnel. The Chinese government had prohibited foreign firms' establishments of the affiliates that provide sales finance for automobiles until 2003. In Australia, the state

[2]Until the mid-1980s, the sales of imported car in Japan account for about thirty-five to forty thousands units. In the late 1980s, the Japanese imports of car grew rapidly and the sales exceeds one hundred thousand unit in 1988, and they surpass two hundred thousands in 1990 (MITI, 1989).

[3]Examples include Volkswagen-Nissan, Ford-Mazda, Citroën-Mazda, Fiat-Mazda, Volvo-Subaru, Peugeot-Suzuki, Opel-Subaru, and so on.

[4]Examples include BMW, Crysler, Jaguar, Mercedes-Benz, Rover, and so on.

[5]In 1995, Eastman Kodak complains that its market access to the Japanese market for photographic paper and film is deterred by the exclusive dealing contracts between its Japanese rival firms, Fuji, and Japanese distributors. In U.S.-Japan Auto Negotiation in 1995, the U.S. government demands the Japanese government to promote the dealership of imported car by the domestic dealers. In 2003, there was disputes that the Chinese government was going to prohibit the simultaneous dealings of domestic and imported cars by the domestic dealers.

approval is needed for foreign investors to provide auto dealership, housing construction, and so on.

Under the circumstances, obstacles that limit foreign market access in service sectors become perceived as a new trade barriers and they sometimes cause trade frictions between countries. To understand the role of service sectors in international trade, we must take a closer look at the effects of improving market access in service sectors and how they are connected to trade liberalization in goods. Although there are some analyses that consider cross-border services transaction[6], and FDI in services[7], it is not explored how trade liberalization in goods interact with liberalization in services including service FDI.

In this paper, we focus on the role of non-tradable services and investigate the interaction between the two dimensions of the international market access improvement: that is, trade liberalization in goods and liberalization in service FDI. The former and the latter are respectively represented as a reduction of tariff and a decline in the fixed cost of service FDI. To this end, we construct an international duopoly model in which a non-tradable service plays an important role in the entry into a foreign market. Specifically, one domestic firm that produces a good in the domestic country and one foreign firm that produces in a foreign country compete in the domestic market, and business services such as distribution or marketing are necessary inputs to supply goods efficiently in the domestic market.

Since these services are difficult to make cross-border supply, the domestic firm has an cost-advantages over the foreign firm in the input of services. The foreign firm can

[6]For example, Djajić and Kierzkowski (1989) introduce a labor-intensive service sector in Hecksher-Ohlin model and show that volume and direction of trade is influenced by whether services are traded internationally. Markusen (1989) and Francois (1990) show in a monopolistic competition model that producer services increase returns from specialization and liberalization in the service sectors makes gains from trade larger. Konan and Maskus (2006) compare goods-trade liberalization and service liberalization in Tunisia using a CGE model and show that reducing service barriers generates larger welfare gains.

[7]See, for instance, Raff and von der Ruhr (2001) and Markusen, Rutherford and Tarr (2005). In a monopolistic-competition model of intermediate producer services, the former paper investigates the determinants of FDI in producer services, and the latter examines the effects of service FDI on the market for domestic skilled labour.

overcome the disadvantage either by outsourcing the services to the domestic firm or by making a service FDI. Seemingly, these two modes of service offshoring have the same effects in that both of them improve the extent of market access in service sectors by foreign producers. This paper shows, however, they may have different consequences when the product market is imperfectly competitive, since they affect the degree of market competition differently.

The result shows that, when service liberalization does not proceed well and so the fixed cost of service FDI is high, trade liberalization in goods may have *anti-competitive effects*, in that both firms gain at the expense of consumers. Under service outsourcing with the high service-FDI cost, trade liberalization necessarily increases the service price the domestic firm offers to the foreign firm in the service contract, since it increases the foreign firm's gains from service outsourcing. The effect increases the cost of foreign producer and so the prices of goods, and it can outweigh the direct effect of trade liberalization and hurt consumers. It is worth mentioning that consumer surplus under free trade can be even lower than that under autarky.

A decline in the cost of service FDI raises the foreign firm's 'bargaining power' in the service contract and hurts the domestic firm and benefits consumers and the foreign firms. It also makes the paradoxical effect of trade liberalization under service outsourcing less likely since the trade liberalization also raises gains from service FDI. Hence, liberalization in service FDI has an effect to improve market access in goods even if service outsourcing is continued to be the equilibrium regime. It may not be sufficient, however, to help consumers. To make trade liberalization *pro-competitive* and secure the consumer benefits from trade liberalization, the fixed cost of service FDI is low enough so that the foreign firm actually engages in service FDI rather than service outsourcing. The result suggests that service FDI should be liberalized in order to guarantee the consumer gains from trade liberalization *in goods*.

Some papers have also considered non-tradable services in international trade frameworks. For instance, Richardson (2004) shows in a spatial-economy model that the domestic government have an incentive to open the access to retail distribution by foreign manufactures when tariffs can be used, but it may limit the access when trade policy is

not available. Francois and Wooton (2005) assume sales of imported goods require the domestic distribution services that are supplied under imperfect competition. They show that trade volumes and the level of optimal tariff are positively related to the degree of competitiveness in the service sector. Nocke and Yeaple (2005) investigate the role of the distribution costs on a foreign firm's choice of the three entry modes into the domestic market, that is, export, greenfield FDI, and cross-border M&A. Qiu (2006) considers cross-border strategic alliance in the distribution or marketing services and its effects on the choice between export and greenfield FDI. In contrast to these paper, our paper distinguishes service outsourcing and service FDI as a mean to offshore non-tradable services and focus on the connection between trade liberalization and liberalization in service FDI.

The choice between outsourcing versus FDI is related to the literature on international outsourcing versus vertical integration. In an incomplete contract approach, Grossman and Helpman (2003) and Antrás (2005) show that contractual environments affect the choice between international outsourcing and FDI.[8] To focus on the effect of service outsourcing on goods-trade liberalization, this paper does not address the issue of the incompleteness of the service contract.

In our model, international service outsourcing has a collusive effect that makes the equilibrium service price exceed the degree of the service cost differences. This strategic effect of outsourcing under an international oligopoly is first pointed out by Chen, Ishikawa, and Yu (2004).[9] Their paper, however, investigates the outsourcing of the production of intermediate goods from the domestic firm to the foreign firm, and focus on the effects of a tariff reduction in intermediate goods. Beside that, the choice between outsourcing and FDI is not considered in their paper.

Some papers point out that trade liberalization may have an anti-competitive effect in the framework of international oligopoly (for instance, Kabiraj and Marjit, 2003; Raff and Schmitt 2005, 2006; Ishikawa, Morita, Mukunoki, 2006). These papers show that the

[8]See also McLaren (2000) and Grossman and Helpman (2005) which consider the domestic and international outsourcing.

[9]Shy and Stenbacka (2003) also explore the strategic outsourcing between the domestic firms by assuming the intra-firm production of specific inputs incur the fixed cost.

endogenous switches of a domestic producer's choice of a regime induced by goods-trade liberalization, such as suspension of technology licensing to foreign producers (Kabiraj and Marjit, 2003), use of exclusive territories contract with a retailer (Raff and Schmitt, 2005), use of a common agency in retailing with a foreign firm (Raff and Schmitt, 2006), and unauthorized repairs of imports (Ishikawa, Morita, Mukunoki, 2006), are the sources of the anti-competitive effect. Although our paper can be categorized into this line of literature, the mechanism behind our result is different from them. Especially, our paper can obtain an anti-competitive effect even if firm's choice of regimes in the service sector did not change with trade liberalization.

The remainder of the paper is organized as follows. In section 2, we explain the model and the timing of the game. In section 3, the equilibria under non-use of local services, under service FDI, and under service outsourcing are respectively derived. In section 4, the interaction between goods-trade liberalization and liberalization in service FDI is explored when the firms' entry decisions into the service market are taken into account. In section 5, we summarize and conclude the paper.

## 2 Model

Demands in the home country are characterized by a representative consumer who consumes non-numeráire goods and also a numeráire good. The non-numeráire goods consist of good $D$ and good $F$ which are imperfect substitutes. The numeráire good is competitively produced and freely traded between countries. The indirect utility function is given by

$$V(p_D, p_F) = \overline{V} - a\,(p_D + p_F) + \frac{(p_F)^2}{2} + \frac{(p_D)^2}{2} - bp_D p_F + Y, \tag{1}$$

where $p_D$ and $p_F$ are the prices of good $D$ and good $F$ respectively, $\overline{V}$ is a positive constant, and $Y$ is the income in the domestic country.[10] By using Roy's identity, the demand for each product $i$ ($\in \{D, F\}$) is given by

$$x_i(p_i, p_j) = a - p_i + bp_j \quad (i, j \in \{D, F\},\ i \neq j) \tag{2}$$

[10]This indirect utility function is derived from a standard quasi-linear utility function given by $U(x_D, x_F, M) = \alpha\,(x_D + x_F) - \beta\{(x_D)^2 + (x_F)^2\}/2 - \gamma x_D x_F + M$ where $x_D$ and $x_F$ denote the consumption of good $D$ and that of good $F$ respectively, and $M$ is the consumption of a numeráire good.

where $a$ and $b \in (0,1)$ respectively represent the market size and the substitutability of the two products. As $b$ approaches one, the two products become more similar.

We consider the duopoly model where the domestic firm (firm $D$) compete with the foreign firm (firm $F$) in the domestic market. Firm $D$ produces good $D$ and firm $F$ produces good $F$. The unit costs of producing goods are identical across firms and constant. Without loss of generality, they are normalized to be zero. An *ad valorem* tariff, $t$ ($\geq 0$), is imposed on imports of good $F$.

We assume both firms must utilize services as an input after production in order to serve products in the domestic market. Specifically, one unit of sales needs one unit of services. The services are market-oriented that includes marketing, distribution, and so on (henceforth, called distribution services), and they are difficult to make cross-border supply. We assume the distribution services can be provided only by goods producers because of the economies of scope. We also assume firm $D$ has already established its own distribution networks in the domestic country, and the unit service cost is $c_S$ ($\geq 0$) which is constant. For firm $F$, on the other hand, the cost is $c_S + m$ when it does not access to the local distribution service in the foreign country where $m > 0$ represents the cost disadvantage of the foreign firm. Firm $F$ can overcome this cost disadvantage by offshoring the distribution services to the domestic country. We consider the two types of service offshoring: (i) service FDI in which firm $F$ establishes affiliates in the domestic country and provides the services by itself, and (ii) service outsourcing in which firm $F$ contracts with firm $D$ and delegates the provision of the distribution services for good $F$ to its rival firm in the product market. The fixed FDI cost, $K_F$, is incurred to firm $F$ under service FDI whereas firm $F$ pays service price (or royalty) $r$ per unit of services to firm $D$ under service outsourcing. Firm $D$ must pay the fixed cost, $K_D$, when it also provides distribution services for firm $F$. The $K_F$ includes the set-up cost of establishing service networks, the cost of acquiring information on the domestic market, and the cost of sending professional personnel from the home country, and so on. On the other hand, $K_D$ includes the communication cost between the outsourcing firm and the outsourced firm, the cost of learning know-how of marketing the rival's product, and the negotiating cost or enforcement cost of the service contract.

To simplify mathematical expressions, we set $c_S = 0$.[11] We can express the profits of the two firms as

$$\pi_D(p_D, p_F) = p_D x_D(p_D, p_F) + \mu \left[ r x_F(p_F, p_D) - K_D \right], \tag{3}$$

$$\pi_F(p_F, p_D) = \left[ \frac{p_F}{1+t} - (1-\lambda)(1-\mu) m - \mu r \right] x_F(p_F, p_D) - \lambda K_F \tag{4}$$

where the parameter $\mu$ takes $\mu = 1$ if firm $F$ outsources services to firm $D$ and $\mu = 0$ otherwise, and the parameter $\lambda$ takes $\lambda = 1$ if firm $F$ makes a service FDI and takes $\lambda = 0$ otherwise. Note that when $\lambda = 1$, $\mu = 0$ always holds (though the reverse does not always hold).

The timing of the game is as follows. In the first stage, firm $D$ decides whether to offer a service contract to firm $F$. If firm $D$ offers, it commits to a service price, $r$. If firm $D$ offers a contract, then firm $F$ decides whether to accept the offer or not. If firm $F$ accepts the offer, service outsourcing becomes an equilibrium. We assume firm $F$ commits to outsource all services associated with its sales in the domestic market. By this assumption, we can treat three options as distinctive alternatives. If firm $F$ rejects the offer, or firm $D$ does not make a offer, firm $F$ decides whether to make service FDI or not to utilize local services, and its choice becomes the equilibrium regime. Figure 1 depicts the choice of service mode in the first stage. In the second stage, firm $D$ and firm $F$ simultaneously set prices of their own products and consumers buy them.

**[Insert Figure 1 around here]**

## 3 Product Market Competition and Service Outsourcing

Now, we derive the equilibrium. Depending on the firms' decisions in the first stage, there are four cases. When firm $F$ does not outsource services or firm $D$ does not make the offer, there are two possibilities: firm $F$ does not utilize local services (called the NS case), and firm $F$ makes service FDI (called the FDI case). When firm $F$ outsources services to firm $D$, there are also two possibilities: fixed cost of service FDI is high so that firm $F$'s outside option is no-use of local services (called the OH case), and it is low

[11] The assumption does not change the qualitative results of our paper.

so that the firm $F$'s outside option is service FDI (called the OL case). In what follows, we investigate each of them in order.

### 3.1 Equilibrium under in-house services

First consider the case where firm $F$ does not outsource the distribution services to firm $D$. In this case, $\mu = 0$ applies in equations (3) and (4). In the second stage, each firm maximizes its own profits. The first-order conditions are

$$\begin{aligned}\frac{\partial \pi_D(p_D, p_F)}{\partial p_D} &= x_D(p_D, p_F) + p_D \frac{\partial x_D(p_D, p_F)}{\partial p_D} = 0, \\ \frac{\partial \pi_F(p_D, p_F)}{\partial p_F} &= \frac{x_F(p_D, p_F)}{1+t} + \left[\frac{p_F}{1+t} - (1-\lambda)m\right] \frac{\partial x_F(p_D, p_F)}{\partial p_F} = 0.\end{aligned}$$

By solving these two equations, we can derive the equilibrium prices as:

$$\widetilde{p}_D(m, t; \lambda) = \frac{a}{2-b} + \frac{(1+t)(1-\lambda)bm}{4-b^2}, \tag{5}$$

$$\widetilde{p}_F(m, t; \lambda) = \frac{a}{2-b} + \frac{2(1+t)(1-\lambda)m}{4-b^2}. \tag{6}$$

Since the cost of supplying the domestic market is (weakly) higher for firm $F$ that that for firm $D$, we have $\widetilde{p}_F(m, t; \lambda) \geq \widetilde{p}_D(m, t; \lambda)$. The producer price of good $F$ is given by $\widetilde{p}_F(m, t; \lambda)/(1+t)$. The equilibrium sales are given by

$$\widetilde{x}_D(m, t; \lambda) = \frac{a}{2-b} + \frac{(1-\lambda)(1+t)bm}{4-b^2}, \tag{7}$$

$$\widetilde{x}_F(m, t; \lambda) = \frac{a}{2-b} - \frac{(1-\lambda)(1+t)\left(2-b^2\right)m}{4-b^2}. \tag{8}$$

To ensure the positive equilibrium sales, we assume

$$\frac{a(b+2)}{(2-b^2)} = \overline{m} > m, \quad \frac{a(2+b) - \left(2-b^2\right)m}{(2-b^2)m} \equiv \overline{t} > t \tag{9}$$

are always satisfied.

#### 3.1.1 No local services (NS) versus service FDI (FDI)

When firm $F$ chooses not to use local services, $\lambda = 0$ applies. We let the equilibrium prices and the equilibrium sales as $p_D^{NS} \equiv \widetilde{p}_D(m, t; 0)$, $p_F^{NS} \equiv \widetilde{p}_F(m, t; 0)$, $x_D^{NS} \equiv \widetilde{x}_D(m, t; 0)$, and $x_F^{NS} \equiv \widetilde{x}_F(m, t; 0)$. When firm $F$ chooses service FDI, on the other hand, $\lambda =$

1 and the equilibrium prices and the equilibrium sales become $p_D^{FDI} \equiv \widetilde{p}_D(m,t;1)$, $p_F^{FDI} \equiv \widetilde{p}_F(m,t;1)$, $x_D^{FDI} \equiv \widetilde{x}_D(m,t;1)$, and $x_F^{FDI} \equiv \widetilde{x}_F(m,t;1)$. The equilibrium profits, consumer surplus, the domestic welfare, and world welfare in the regime $k \in \{NS, FDI\}$ are respectively given by $\pi_D^k = \pi_D(p_D^k, p_F^k) = (p_D^k)^2$, $\pi_F^k = \pi_F(p_F^k, p_D^k) = \{p_F^k - (1+t)m\}^2/(1+t)$, $CS^k = V(p_D^k, p_F^k) - Y$, $W_D^k = CS^k + \pi_D^k + tp_F^k x_F^k/(1+t)$, and $W^k = W_D^k + \pi_F^k$.

By comparing $\pi_F^{FDI}$ with $\pi_F^{NS}$, we have

$$\pi_F^{FDI} \gtreqless \pi_F^{NS} \Longleftrightarrow \frac{\left(2-b^2\right)\{2a(2+b) - m\left(2-b^2\right)(t+1)\}m}{\left(4-b^2\right)^2} \equiv \overline{K}_F \gtreqless K_F$$

where $\overline{K}_F$ is the cut-off value of the fixed cost of service FDI. Note that $\overline{K}_F$ is decrease in $t$ and so trade liberalization in goods makes service FDI more profitable. We can also represent the same condition as

$$\pi_F^{FDI} \gtreqless \pi_F^{NS} \Longleftrightarrow \frac{m\left(2-b^2\right)\{2a(2+b) - m\left(2-b^2\right)\} - \left(4-b^2\right)^2 K_F}{m^2\left(2-b^2\right)^2} \equiv \widetilde{t} \gtreqless t.$$

### 3.2 Equilibrium under service outsourcing

Next consider the case where firm $F$ delegates the necessary services to firm $D$. In this case, $\mu = 1$ and $\lambda = 0$ apply. In the second stage, each firm maximizes its profits with respect to its price given the service price, $r$, set by firm $D$ in the first stage. The first-order conditions become

$$\begin{aligned}
\frac{\partial \pi_D}{\partial p_D} &= x_D(p_D, p_F) + p_D \frac{\partial x_D(p_D, p_F)}{\partial p_D} + r \frac{\partial x_F(p_F, p_D)}{\partial p_D} = 0, \\
\frac{\partial \pi_F}{\partial p_F} &= \frac{x_F(p_D, p_F)}{1+t} + \left[\frac{p_F}{1+t} - r\right] \frac{\partial x_F(p_D, p_F)}{\partial p_F} = 0.
\end{aligned}$$

By solving these equations, we have the equilibrium consumer-prices of products as functions of the service price:

$$\widehat{p}_D(r,t) = \frac{a}{(2-b)} + \frac{(3+t)br}{4-b^2}, \tag{10}$$

$$\widehat{p}_F(r,t) = \frac{a}{(2-b)} + \frac{\{2(1+t) + b^2\}r}{4-b^2}. \tag{11}$$

The consumer surplus is given by $\widetilde{CS}(r,t) = V(\widehat{p}_D(r,t), \widehat{p}_F(r,t)) - Y$. Since both prices are increasing in $r$, a rise of the service price reduces consumer surplus given $t$. Similarly,

the equilibrium sales become

$$\widehat{x}_D(r,t) = \frac{a}{(2-b)} - \frac{b\left(1-b^2-t\right)r}{4-b^2}, \tag{12}$$

$$\widehat{x}_F(r,t) = \frac{a}{(2-b)} - \frac{\left\{2\left(1-b^2\right)+\left(2-b^2\right)t\right\}r}{4-b^2}. \tag{13}$$

The effect of an increase in $r$ on $\widehat{x}_D(r,t)$ is ambiguous whereas the effect on $\widehat{x}_F(r,t)$ is always negative. On one hand, an increase in $r$ shifts demands from good $F$ to good $D$, but it gives firm $D$ an incentive to raise the price of good $D$. The first effect increases but the second effect decreases $\widehat{x}_D(r,t)$, so the overall effect is ambiguous. The equilibrium profits of firm $D$ and those of firm $F$ are respectively given by

$$\widehat{\pi}_D(r,t) = \left\{\widehat{p}_D(r,t)\right\}^2 + r\left[\widehat{p}_F(r,t) - b\widehat{p}_D(r,t) - (1+t)r\right], \tag{14}$$

$$\widehat{\pi}_F(r,t) = \frac{\left\{\widehat{p}_F(r,t) - (1+t)r\right\}^2}{(1+t)}. \tag{15}$$

We have the effect of an increase in $r$ on firm $F$'s profits as

$$\begin{aligned}\frac{\partial\widehat{\pi}_D(r,t)}{\partial r} &= 2\widehat{p}_D(r,t)\frac{\partial\widehat{p}_D(r,t)}{\partial r} + r\left[\frac{\partial\widehat{p}_F(r,t)}{\partial r} - b\frac{\partial\widehat{p}_D(r,t)}{\partial r} - (1+t)\right] \\ &\quad + \left[\widehat{p}_F(r) - b\widehat{p}_D(r) - (1+t)r\right].\end{aligned}$$

Since an increase in $r$ raises $\widehat{p}_F(r,t)$ and thereby raises $\widehat{p}_D(r,t)$, it increases firm $D$'s profits in the product market. The first term of the above equation represents this strategic effect and it is positive. Although an increase in $r$ increases firm $D$'s profits in the service sector given the amount of imports, it also decreases imports and so changes in profits of the service contracting represented in the second and the third term are ambiguous. We restrict our attention to the case where $\partial\widehat{\pi}_D(r,t)/\partial r > 0$ is satisfied for the relevant range of $r$.[12] Namely, we consider the case where firm $D$ would like to increase $r$ as high as possible when it contracts on service provisions with firm $F$.

Under the situation, firm $D$ sets $r$ that satisfies $\widehat{\pi}_F(r,t) = \widetilde{\pi}_F(m,t)$ in the first stage, and $\widetilde{\pi}_F(m,t)$ can be either $\pi_F^{NS}$ or $\pi_F^{FDI}$ depending on the fixed cost of FDI, $K_F$. We examine the equilibrium in each case below.

[12] In the subsequent analysis, we will derive the condition under which $d\widehat{\pi}_D(r)/dr > 0$ is satisfied in equilibrium.

### 3.2.1 Outsourcing under high cost of service FDI (OH)

Suppose $K_F > \overline{K}_F$, so that the fixed cost of service FDI is high enough to make firm $F$ prefer non-offshoring to service FDI (i.e., $\pi_F^{NS} \geq \pi_F^{FDI}$). In this case, the service price is set to satisfy $\widehat{\pi}_F(r,t) = \pi_F^{NS}$, which is given by

$$r^{OH} \equiv \widehat{r}(m,t) = \frac{(2-b^2)(1+t)m}{(2-b^2)t + 2(1-b^2)}. \tag{16}$$

When $b$ is large, $a$ is large, or $m$ is small, firm $D$'s profits are maximized at this service price (see Appendix A1). By substituting the equilibrium service price into (10), (11), (12), and (13), we have the equilibrium prices of products as $p_D^{OH} \equiv \widehat{p}_D\left(r^{OH},t\right)$ and $p_F^{OH} \equiv \widehat{p}_F\left(r^{OH},t\right)$, and the equilibrium sales as $x_D^{OH} \equiv \widehat{x}_D\left(r^{OH},t\right)$ and $x_F^{OH} \equiv \widehat{x}_F\left(r^{OH},t\right) = x_F^{NS}$. We have the following lemma.

**Lemma 1** *In equilibrium, (i)* $r^{OH} > m$*, (ii)* $\partial r^{OH}/\partial m > 0$*, and (iii)* $\partial r^{OH}/\partial t < 0$ *hold.*

**Proof.** By (16), $\widehat{r}(m,t) - m = mb^2/\{\left(2-b^2\right)t + 2\left(1-b^2\right)\} > 0$, $\partial\widehat{r}(m,t)/\partial m = (2-b^2)b^2/\{\left(2-b^2\right)t + 2\left(1-b^2\right)\}^2 > 0$, and $\partial\widehat{r}(m,t)/\partial t = -\{(2-b^2)b^2m\}/\{\left(2-b^2\right)t + 2\left(1-b^2\right)\}^2 < 0$. ■

Hence, the equilibrium service price exceeds the degree of the service cost disadvantage of firm $F$ and a tariff reduction necessarily increases the service price. The first result is due to the strategic effect of outsourcing introduced by Chen, Ishikawa, and Yu (2004). Even if $r = m$ and so firm $F$'s service cost is the same as if it chooses non-offshoring of services, $\widehat{\pi}_F(m,t) > \pi_F^{NS}$ holds because firm $D$, who now earns profits from the service contracting, becomes less willing to reduce the price of good $D$ since the price-cut reduces imports and so service demands by firm $F$. As a result, $\widehat{p}_D(m,t) > \widetilde{p}_D(m,t)$ holds and so $\widehat{p}_F(m,t) > \widetilde{p}_F(m,t)$ and $\widehat{\pi}_F(m,t) > \pi_F^{NS}$ also hold at $r = m$. Hence, the service price $r^{OH}$ which makes $\widehat{\pi}_F(r^{OH},t) = \pi_F^{NS}$ is higher than $m$. As for the second result, a larger cost disadvantage in services means the cost-reduction of service offshoring is high, and so firm $D$ is able to set a higher service price.

The intuition behind the third result is as follows. Let $t_0$ and $r_0 \equiv r^{OH}\big|_{t=t_0}$ denote the pre-liberalization tariff rate and the pre-liberalization optimal service price respectively.

By definition, they satisfy $\widehat{\pi}_F(r_0, t_0) = \pi_F^{NS}$. As is discussed above, $p_F^{OH} > p_F^{NS}$ at $r = r_0$. By (6) and (11), the direct effect of a tariff reduction on consumer prices are identical between $p_F^{OH}$ and $p_F^{NS}$ given $r = r_0$. Hence, $p_F^{OH} > p_F^{NS}$ means an increase in producer prices under outsourcing, $p_F^{OH}/(1+t)$, is higher than that under non-offshoring, $p_F^{NS}/(1+t)$, when $r$ is kept constant at $r = r_0$. Hence, a tariff reduction ($t < t_0$) makes $\widehat{\pi}_F(r^0, t) > \pi_F^{NS}$. Consequently, the domestic firm increases $r$ to shifts profits from the foreign firm. We call the effect *profit-absorbing motive* of a service price change. Note that $r^{OH}$ is convex in $t$, so the degree of an increase in $r^{OH}$ by a tariff reduction is larger as the initial tariff rate is smaller.

Now we investigate how trade liberalization affects the equilibrium consumer price. By differentiating the equilibrium price with respect to $t$, we have

$$\begin{aligned}
\frac{\partial p_D^{OH}}{\partial t} &= \frac{b}{4-b^2} r^{OH} + \frac{(3+t)\,b}{4-b^2}\left(\frac{\partial r^{OH}}{\partial t}\right), \\
\frac{\partial p_F^{OH}}{\partial t} &= \frac{2}{4-b^2} r^{OH} + \frac{2\,(1+t)+b^2}{4-b^2}\left(\frac{\partial r^{OH}}{\partial t}\right).
\end{aligned}$$

Since $\partial r^{OH}/\partial t < 0$, the signs of the above equations are ambiguous. Although a tariff reduction directly reduces the commodity prices by reducing costs of firm $F$, it raises them through the indirect effect caused by an increase in the service price. We have the following lemma.

**Lemma 2** *Under the OH case, $dp_i^{OH}/dt < 0$ $(i = D, F)$ holds if $b$ is large and $t$ is small. Otherwise, $dp_i^{OH}/dt > 0$ $(i = D, F)$ holds. As for the equilibrium sales, $dx_D^{OH}/dt > 0$ and $dx_F^{OH}/dt < 0$ are always satisfied.*

**Proof.** See the Appendix A2. ■

The possible cases is depicted in Figure 2. Since an increase in $\widehat{\pi}_F(r^0, t) - \pi_F^{NS}$ by a trade liberalization given $r = r^0$ is large when $t$ is small, the degree of increases in $r$ by a trade liberalization is large when $t$ is small, and its effects on commodity prices and their repercussion effects are large when $b$ is large. The amount of imports of good $F$, on the other hand, necessarily increases and the sales of good $D$ decrease with a tariff reduction.

**[Insert Figure 2 around here]**

The equilibrium consumer surplus is given by $CS^{OH} = V(p_D^{OH}, p_F^{OH}) - Y$, which is a decreasing function of each price. By Lemma 1 and 2, it is straightforward to obtain the following proposition.

**Proposition 1** *Under the OH case, a tariff reduction hurts consumers if the substitutability of products is large and the initial tariff rate is small. Given the tariff rate, consumer surplus of the OH case is lower than that of the NS case.*

Figure 3 shows in numerical examples the relationship between consumer surplus and a tariff rate for $t \in [0, \overline{t}]$.[13] As is shown in the figure, consumer surplus can be lowered by a tariff reduction. It is worth noting that when the substitutability between the products is very large, the consumer surplus under free trade can be lower than that under autarky.

**[Insert Figure 3 around here]**

**Corollary 1** *Under the OH case, consumer surplus under free trade can be lower than that under autarky when the substitutability between products is high and the cost disadvantage under non-offshoring is relatively large.*

The equilibrium profits of the firms are given by $\pi_D^{OH} = \widehat{\pi}_D(\widehat{r}(m,t),t)$ and $\pi_F^{OH} = \pi_F^{NS}$. The domestic welfare and world welfare in equilibrium are respectively given by $W_D^{OH} = CS^{OH} + \pi_D^{OH} + tp_F^{OH}x_F^{OH}/(1+t)$ and $W^{OH} = W_D^{OH} + \pi_F^{OH}$. Since the price of good $D$ can increase with a tariff reduction, and firm $D$ also earns profits from providing services to its competitor, trade liberalization may increase the firm $F$'s profits, as a numerical example in Figure 4 shows.

**[Insert Figure 4 around here]**

**Proposition 2** *Under the OH case, a tariff reduction is likely to benefit firm $D$ if the service cost disadvantage of firm $F$ is large, the substitutability of the products is large, and the initial tariff rate is small.*

[13] Since $\overline{t}$ depends on $b$, the right endpoints of the figures are different. These examples satisfy the condition that $\partial\widehat{\pi}_D(r,t)/\partial r > 0$.

### 3.2.2 Outsourcing under low cost of service FDI (OL)

Next, we consider service outsourcing with $0 < K_F \leq \overline{K}_F$ and compare it with the high fixed-cost case. In this case, $\pi_F^{FDI} \geq \pi_F^{NS}$ is satisfied so that firm $F$ prefers service FDI to non-offshoring if firm $D$ does not offer service subcontracting to firm $F$. Under the circumstance, firm $D$ sets $r$ to make firm $F$ break even between service outsourcing and service FDI, that is, $\widehat{\pi}_F(r,t) = \pi_F^{FDI}$. It is given by

$$r^{OL} \equiv \widehat{r}'(K_F,t) = \frac{(2+b)\left\{a - \sqrt{a^2 - (2-b)^2(1+t)K_F}\right\}}{(2-b^2)t + 2(1-b^2)}. \tag{17}$$

By substituting the equilibrium service price into (10), (11), (12), and (13), we have the equilibrium prices of products as $p_D^{OL} \equiv \widehat{p}_D(r^{OL},t)$ and $p_F^{OL} \equiv \widehat{p}_F(r^{OL},t)$, and the equilibrium sales as $x_D^{OL} \equiv \widehat{x}_D(r^{OL},t)$ and $x_F^{OL} \equiv \widehat{x}_F(r^{OL},t)$.[14] The equilibrium profits of firms are given by $\pi_D^{OL} = \widehat{\pi}_D(r^{OL},t)$ and $\pi_F^{OL} = \pi_F^{FDI}$. The domestic welfare and world welfare in equilibrium are respectively given by $W_D^{OL} = CS^{OL} + \pi_D^{OL} + tp_F^{OL}x_F^{OL}/(1+t)$ and $W^{OL} = W_D^{OL} + \pi_F^{OL}$.

We can verify that $\partial\pi_D^{OL}/\partial r > 0$ is satisfied for $r \in [0, r^{OL}]$ so this is the profit-maximizing price that firm $D$ can accept (see Appendix A1). It is apparent that $\partial r^{OL}/\partial K_F > 0$, which gives the following proposition.

**Proposition 3** *Under the OL case, a decrease in $K_F$ lowers the service price and thereby hurts firm $D$ and benefits firm $F$ and consumers. Given the tariff rate, the equilibrium service price is lower than that of the OH case.*

**Proof.** By (17), $\partial r^{OL}/\partial K_F > 0$ is satisfied. Since $r^{OL}\big|_{K_F=\overline{K}_F} = r^{OH}$, we have $r^{OL} \leq r^{OH}$ given $t$ for $K_F \in [0, \overline{K}_F)$. ■

When service FDI is profitable for firm $F$, an decrease in $K_F$ raises firm $F$'s profits under service FDI. As a result, the service price that makes firm $F$ indifferent between service outsourcing and service FDI, $\pi_F^{OL} = \pi_F^{FDI}$, becomes smaller. In other words, a lower fixed cost of service FDI affects the equilibrium under service outsourcing in

[14] As will be shown in Proposition 3, $r^{OL} \leq r^{OH}$ is satisfied given $t$. Hence, $x_F^{OL} > 0$ is guaranteed as long as (9) is satisfied.

favor of firm $F$ since smaller $K_F$ raises the value of firm $F$'s outside option as well as its effective bargaining power. Service liberalization that facilitates service FDI has an favorable effect on consumers and exporters, even if it does not lead to service FDI.

Besides that, a sufficiently small $K_F$ makes service outsourcing cost-improving for firm $F$ as the following lemma states, which could not be the case when high $K_F$ deters service FDI.

**Lemma 3** *If $K_F$ is small enough to satisfy $K_F \leq \widetilde{K}_F$ ($\widetilde{K}_F$ is the cut-off value), $r^{OL} \leq m$ holds. Otherwise, $r^{OL} > m$ holds.*

**Proof.** By (17), $r^{OL} - m = [(2+b)\{a - \sqrt{a^2 - (2-b)^2(1+t)K_F}\} - m\{(2-b^2)t + 2(1-b^2)\}]/\{(2-b^2)t + 2(1-b^2)\}$ which is (weakly) negative if $K_F \leq \{(2-b^2)t + 2(1-b^2)\}\{2a(2+b) - m(2-b^2)(1+t)\}m/\{(4-b^2)^2(1+t)\} \equiv \widetilde{K}_F$ and positive otherwise. ■

By this lemma and Proposition 3, we have the following proposition.

**Proposition 4** *Given the tariff rate, consumer surplus of the OL case is (i) higher than that of the OH case, (ii) higher (resp. lower) than that of the NS case if the fixed cost of service FDI is small (resp. large).*

Next, we investigate the effects of trade liberalization in good on the equilibrium service price. As before, firm $D$ has the profit-absorbing motive to increase the service price since trade liberalization increases net gains from service outsourcing. However, trade liberalization also increases profits from service FDI relative to profits under no local services and the effect decreases the service price, which we call the *FDI-deterrence motive* of a service price change. Hence, the overall effect is ambiguous. We have the following lemma.

**Lemma 4** *Let $\widehat{t} \equiv 2\{ab\sqrt{(2-b^2)K_F} - (2-b)K_F\}/\{(2-b^2)(2-b)K_F\}$. In equilibrium, (i) $\partial r^{OL}/\partial t \geq 0$ holds if $K_F$ is high enough to satisfy $\widehat{t} \leq 0$, (ii) $\partial r^{OH}/\partial t < 0$ holds if $K_F$ is low enough to satisfy $\overline{t} < \widehat{t}$, and (iii) $\partial r^{OL}/\partial t < 0$ holds for $0 \leq t < \widehat{t}$ and $\partial r^{OL}/\partial t \geq 0$ holds for $\widehat{t} \leq t < \overline{t}$ otherwise.*

**Proof.** See the Appendix A3. ■

Trade liberalization increases both the profit-absorbing motive and the FDI-deterrence motive, but the effect on the former motive becomes larger as the tariff rate becomes smaller. Hence, there is a cut-off value of the tariff rate, $\widehat{t}$, which makes the service price increase with trade liberalization for $\widehat{t} \leq t$ and decrease with it for $t < \widehat{t}$. When $K_F$ is large, the tariff rate must be sufficiently low to make service FDI profitable (that is, $\widetilde{t}$, is low). As a result, the scope of trade liberalization under service outsourcing becomes thin. In this case, the FDI-deterring motive always dominates. When $K_F$ is small, on the other hand, a relatively high tariff rate makes service FDI profitable and so $\widehat{t}$ can be large enough to satisfy $\overline{t} < \widehat{t}$. Hence, the profit-absorbing motive dominates even at the prohibitive rate of tariff. Otherwise, the equilibrium service price is inverse U-shaped in $t$.

We have seen that trade liberalization may decrease the service price, but it can also increases the service price. The following lemma shows that even if the service price increases with trade liberalization, it is more moderate than the case with $\overline{K}_F < K_F$.

**Lemma 5** *Given the initial tariff rate $t$, $\partial r^{OH}/\partial t < \partial r^{OL}/\partial t$ holds for $0 < K_F < \overline{K}_F$.*

**Proof.** See the Appendix A4. ■

This is because the existence of the FDI-deterrence motive always weakens the degree of service-price increase in the service price by trade liberalization. By Lemma 4 and 5, we have the important proposition.

**Proposition 5** *Under service outsourcing with $0 < K_F \leq \overline{K}_F$, a tariff reduction is less likely to hurt consumers and benefit firm D than the case under service outsourcing with $\overline{K}_F < K_F$.*

Thus, liberalization of service FDI is beneficial to consumers even if service FDI does not occur in equilibrium since it increases the value of outside options of the foreign firm in the service contract and improves its bargaining position.

# 4 Trade Liberalization under Endogenous Service Offshoring

Now we describe the equilibrium at stage 1. As is shown in Section 3, firm $F$ chooses not to use local services for $\widetilde{t} < t$ and service FDI for $t \leq \widetilde{t}$ without service outsourcing. Then, firm $F$'s net gains from outsourcing is given by

$$\Delta\pi_D \equiv \begin{cases} \Delta\pi_D^{OH} = \pi_D^{OH} - \pi_D^{NS} - K_D & \text{for} \quad \widetilde{t} < t \\ \Delta\pi_D^{OL} = \pi_D^{OL} - \pi_D^{FDI} - K_D & \text{for} \quad t \leq \widetilde{t} \end{cases} . \tag{18}$$

Given $t$, $r^{OH} \geq r^{OL}$ and so $\pi_D^{OH} \geq \pi_D^{OL}$, but service FDI makes $\pi_D^{NS} \geq \pi_D^{FDI}$. Hence, the ranking between $\Delta\pi_D^{OH}$ and $\Delta\pi_D^{OL}$ given $t$ is ambiguous. Besides that, although $\Delta\pi_D^{OH}$ increases with trade liberalization, the relation between $\Delta\pi_D^{OL}$ and $t$ is ambiguous and it can be either increasing, decreasing, or inverse U-shaped as is indicated by Lemma 4.

To make clear the relationship between the trade liberalization and the service liberalization, we show in numerical examples a typical case of the trade-liberalization paradox, and also how the paradox is resolved by the progress of service liberalization. In all cases, we set parameters at $a = 2$, $b = 0.85$, $m = 1.2$, and $K_D = 3$. Under these parameter values, the prohibitive tariff rate becomes $\overline{t} = 2.718$.

## 4.1 Case 1: Anti-competitive trade liberalization

Suppose $K_F = 2$ and so the fixed cost of service FDI is relatively high. In this case, $\widetilde{t} = -2.705$ so that service FDI is always unprofitable. Hence, $\Delta\pi_D = \Delta\pi_D^{OH}$ and $\Delta\pi_D^{OH} = 0$ at $t = t^{OH} = 0.908$. $\Delta\pi_D \leq 0$ for $t \in [t^{OH}, \overline{t})$ which results in the NS case, and $\Delta\pi_D > 0$ for $t \in [0, t^{OH})$ which results in the OH case. Figure 5 shows the effects of trade liberalization under the situation.

**[Insert Figure 5 around here]**

As is confirmed in the figure, trade liberalization can change the regime from the NS case to the OH case, and the regime-shift worsens consumer surplus, the domestic welfare, and also world welfare. This is due to the strategic effect of service outsourcing, which weakens the product market competition and raises the equilibrium price of goods as well

as the service price. Under the OH regime, trade liberalization increases the domestic firm's profit, and it becomes to hurt consumers as the tariff rate becomes smaller. This is because the lower tariff increases the profit-gains of firm $F$ from the service outsourcing given the service price, and so firm $D$ raises the service price largely to 'vacuum' the profit margin. It is worth noting that, in this example, consumer surplus is the lowest under free trade.

Hence, trade liberalization with the high fixed-cost of service FDI has an anti-competitive effect, which is fairly paradoxical from the viewpoint of conventional wisdom on trade liberalization in goods.

### 4.2 Case 2: Trade liberalization and FDI deterrence

Suppose $K_F = 1$. In this case, $\widetilde{t} = 1.866$ so that service FDI is profitable for $t < \widetilde{t}$. Since $\widetilde{t} > t^{OH}$, the OH case cannot be an equilibrium in this case and so the NS case becomes the equilibrium regime for $t \in [\widetilde{t}, \overline{t})$. For $t < \widetilde{t}$, $\Delta\pi_D = \Delta\pi_D^{OL}$ and it is necessarily positive. Thus, the OL case becomes the equilibrium for $t \in [0, \widetilde{t})$. When the tariff rate is large, firm $D$ chooses not to use local services since service outsourcing is unprofitable for firm $D$. As trade liberalization proceeds, however, service FDI becomes profitable for firm $D$, and firm $F$ comes to offer a service contract to deter service FDI. As a result, the regime changes from the IN case to the OL case. Figure 6 shows the effects of trade liberalization under the situation.

**[Insert Figure 6 around here]**

As is depicted in the figure, the regime-shift from the NS case to the OL case again worsens consumer surplus, the domestic welfare, and world welfare, but now hurts the domestic firm. If service FDI were not possible, firm $D$ is unwilling to make a service contracting since the fixed cost of it is large. When service FDI is possible, however, firm $D$ becomes willing to offer the service contract for the purpose of deterring service FDI. The service contract compensates for the possible loss caused by service FDI, but it cannot recover the profits it earns when the service FDI is impossible.

Under the OL regime, trade liberalization has similar effects as the OH regime. For instance, consumer surplus are decreased and firm $D$'s profits are increased with trade

liberalization near free trade. Its magnitudes, however, are moderate compared to the OH case due to the FDI-deterring effect holds down the degree of the service-price increase. Thus, a liberalization of services FDI is beneficial to consumers in that it weakens the strong position of the domestic firm in the service contract.

However, it is worth noting that there is also a bad news if we should take time passage into account. Since a 'threat' of service FDI also raises the potential loss from non-contracting, the domestic firm becomes more eager to offer the service contract. Consequently, the service contract, which can be detrimental to consumers, is made at the earlier stage of trade liberalization. Hence, if the trade liberalization is made gradually and over time from the high tariff-rate, consumers' short-run losses may be larger. To overcome the problem, the service trade liberalization should be more progressed, as the next case indicates.

### 4.3 Case 3: Pro-competitive trade liberalization

Finally, suppose $K_F = 0.6$ holds. In this case, $\widetilde{t} = 3.694$ and since $\widetilde{t} > \overline{t}$ firm $F$ would always choose service FDI if a service contract is not offered by firm $D$. Hence, $\Delta\pi_D = \Delta\pi_D^{OL}$ and by solving $\Delta\pi_D^{OL} = 0$, we have the cut-off value of the tariff rate, $t^{OL} = 1.976$, by which $\Delta\pi_D^{OL} \geq 0$ holds for $t \in [t^{OH}, \overline{t})$ and $\Delta\pi_D^{OL} < 0$ holds for $t \in [0, t^{OH})$.

At the high tariff rate, the equilibrium regime becomes the OL case. Now the fixed cost of service FDI is low enough to make consumer surplus of the OL case is higher than that of the IN case. This is because the sufficiently low $K_F$ makes the equilibrium service price lower than the degree of cost advantage (see Lemma 3 and Proposition 4). Figure 7 depicts the case.

**[Insert Figure 7 around here]**

If the tariff rate strides over $t^{OH}$, the equilibrium regime shifts from the OL case to the FDI case. Since the equilibrium service price is lowered by a tariff reduction under the OL regime and then kept low under the FDI regime, firm $D$ cannot profitably deter the service FDI when the tariff becomes low enough. The regime-shift improves

consumer surplus and hereafter consumers cannot be worse off by trade liberalization. Firm $D$'s profits also cannot be increased with trade liberalization.[15] The shift also improves domestic welfare and world welfare. Thus, an anti-competitive effect of trade liberalization and service outsourcing is absent in this case.

# 5 Conclusion

In an international oligopoly model, this paper investigates interaction between the two aspects of market-access improvements: trade liberalization in goods and liberalization in domestic service sectors. Since some services are market-specific and have non-tradable nature, a foreign firm have cost-disadvantage in services to its domestic competitor. The foreign firm can overcome the disadvantage by either outsourcing services to the domestic competitor or making FDI in services.

The results of the paper show that the two modes of service offshoring may have different effects on the degree of market competition. Under service outsourcing with the high fixed cost of service FDI, the domestic firm does not face the threat of service FDI and it can capture all the rents from the outsourcing by offering high service price to the foreign firm. Since trade liberalization in goods raises rents from service outsourcing, it increases the equilibrium service price and the effect can outweigh the direct effect of trade liberalization when the products are close substitutes and as tariff rate becomes smaller. As a result, trade liberalization has an anti-competitive effect which increases consumer prices, benefits both the domestic firm and the foreign firm, and hurts consumers. When the fixed cost of service FDI becomes smaller (but not so small), service FDI becomes an outside option of the foreign firm. Under the situation, the equilibrium service price becomes lower to deter service FDI, and the anti-competitive effect of trade liberalization becomes less likely since trade liberalization raises both rents from service outsourcing

[15] In this example, consumer surplus, firm $D$'s profits, and world welfare are independent of the tariff rate under the FDI case. The property depends on $c = 0$ and $c_S = 0$. Under the assumption, the ad valorem tariff coincides with a profit tax under the FDI case and so it does not affect the equilibrium prices. If either or both of which is positive, trade liberalization under the FDI case increases consumer surplus and world welfare whereas it decreases firm $D$'s profits, though the modification makes the mathematical expressions in Section 2 highly complicated.

and rents from service FDI. However, promoting service FDI as a threat is not sufficient to guarantee consumer benefits and the threat also has an effect to make service outsourcing more likely. To secure a pro-competitive effect of trade liberalization, the cost of service FDI should be small enough so that service FDI actually occurs in equilibrium.

Our result has significant policy implications for trade liberalizations in the presence of service sectors. The limited market access in service sectors not only affects the service sectors per se, but also affects the market access in commodities. By the progress of the multilateral trade negotiation under GATT/WTO, the extent of market access in goods has already been improved among countries. Now, growing attention is paid to trade liberalization in services. The Uruguay Round negotiations of GATT succeeded in establishing the framework of service trade liberalization, that is, the General Agreements on Trade in Services (GATS). The actual degree of liberalization, however, has been relatively small. For instance, only 52 WTO-members make commitments in distribution services under GATS (Roy, Marchetti, and Lim, 2006). Our result supports the recent multilateral efforts of service liberalization, and particularly it suggests that facilitating service FDI is important for the success of trade liberalization in goods. The importance of liberalization in service FDI becomes more significant as trade liberalization proceeds.

The result also indicates that improving market access in the service sectors by promoting service outsourcing is not recommended from the consumers' point of view, since it may have an anti-competitive effect when service contracts are made between rivals in the product market. In the same reason, prohibiting the domestic exclusive dealing and promoting sales alliances between firms may not be good for consumers. Service FDI is an important activity to connect improved market access in service sectors to enhanced market competition.

# Appendix

### A1. Conditions for $\partial\hat{\pi}_D(r,t)/\partial t > 0$ in equilibrium

By (14),

$$\frac{\partial\widehat{\pi}_D(r,t)}{\partial r} = \frac{a\,(2+b)\left\{(1+b)\left(4-2b+b^2\right)+2bt\right\}-2\beta\,(b,t)\,r}{\left(4-b^2\right)^2}$$

where $\beta(b,t) = 8\left(1-b^2\right)(1+t)+b^2\left(1-b^2-t^2\right)$. When $b$ is large and $t>0$, $\beta(b,t)<0$ and so $\partial\widehat{\pi}_D(r,t)/\partial r>0$ always holds. When $\beta(b,t)>0$, $\partial\widehat{\pi}_D(r,t)/\partial r$ is concave in $r$. When it is evaluated at $r=r^{OH}$, we have

$$\left.\frac{\partial\widehat{\pi}_D(r,t)}{\partial r}\right|_{r=r^{OH}} = \frac{a(2+b)\left\{(1+b)\left(4-2b+b^2\right)+2bt\right\}}{\left(4-b^2\right)^2} - \frac{2m\left(2-b^2\right)(1+t)\beta(b,t)}{\left(4-b^2\right)^2\left\{\left(2-b^2\right)t+2\left(1-b^2\right)\right\}}$$

and it is positive if $a$ is large enough or $m$ is small enough. Since $r^{OL}<r^{OH}$ is satisfied by Lemma 3, $\partial\widehat{\pi}_D(r,t)/\partial r>0$ also holds under $r=r^{OL}$ .

## A2. Proof of Lemma 2

By (10), (11), and (16),

$$\frac{\partial p_D^O}{\partial t} = \frac{\Omega_D(b,t)(2-b^2)bm}{\left(4-b^2\right)\left\{\left(2-b^2\right)t+2\left(1-b^2\right)\right\}^2}, \quad \frac{\partial p_F^O}{\partial t} = \frac{\Omega_F(b,t)\left(2-b^2\right)m}{\left(4-b^2\right)\left\{\left(2-b^2\right)t+2\left(1-b^2\right)\right\}^2},$$

where $\Omega_D(b,t) = 2-5b^2+4\left(1-b^2\right)t+\left(2-b^2\right)t^2$ and $\Omega_F(b,t) = \left(4-6b^2-b^4\right)+8\left(1-b^2\right)t+2\left(2-b^2\right)t^2$. Since $\partial\Omega_i(b,t)/\partial b<0$ and $\partial\Omega_i(b,t)/\partial t>0$ $(i=D,F)$, the sign of $\partial p_i^O/\partial t$ is more likely to be negative when $b$ is large and $t$ is small. Since $\Omega_D(b,0)<0 \Longleftrightarrow b>\sqrt{10}/5$, $\Omega_F(b,0)<0 \Longleftrightarrow b>\sqrt{\sqrt{13}-3}$ $(>\sqrt{10}/5)$, $\Omega_D(1,t)<0$ $\Longleftrightarrow t<\sqrt{3}=3$, and $\Omega_F(1,t)<0 \Longleftrightarrow t<\sqrt{6}/2$ $(<\sqrt{3})$, the price of good $D$ declines with a tariff reduction only if $b>\sqrt{10}/5$ and $t<\sqrt{3}$, and the prices of both goods decline with a tariff reduction only if $b>\sqrt{\sqrt{13}-3}$ and $t<\sqrt{6}/2$.

As for the equilibrium sales, we have

$$\begin{aligned}\frac{\partial x_D^O}{\partial t} &= \frac{b\left(2-b^2\right)\left\{\left(1-b^2\right)\left(2+b^2\right)+4\left(1-b^2\right)t+\left(2-b^2\right)t^2\right\}m}{\left(4-b^2\right)\left\{\left(2-b^2\right)t+2\left(1-b^2\right)\right\}^2}>0,\\ \frac{\partial x_D^O}{\partial t} &= -\left(\frac{2-b^2}{4-b^2}\right)m<0\end{aligned}$$

and so a tariff reduction always increases imports and decreases sales of domestically produced good. ■

## A3. Proof of Lemma 4

By differentiating (17) with respect to $t$, we have

$$\frac{\partial r^{OL}}{\partial t} = \frac{(2+b)\left[2a\left(2-b^2\right)\left\{a-\sqrt{a^2-(2-b)^2(1+t)K_F}\right\}-(2-b)^2\left\{2+\left(2-b^2\right)t\right\}K_F\right]}{2\left\{\left(2-b^2\right)t+2\left(1-b^2\right)\right\}^2\sqrt{a^2-(2-b)^2(1+t)K_F}}.$$

By this equation, we can calculate that

$$\frac{\partial r^{OL}}{\partial t} \gtreqless 0 \Longleftrightarrow t \gtreqless \widehat{t} \equiv \frac{2\left(ab\sqrt{(2-b^2)\,K_F} - (2-b)\,K_F\right)}{(2-b^2)\,(2-b)\,F}$$

When $K_F > K_F' = \left(2-b^2\right)\{ab/(2-b)\}^2$, $\widetilde{t} < 0$ and so $\partial r^{OL}/\partial t > 0$ holds for $t \in [0, \overline{t})$. It can be verified that there is a case where $K_F' < \overline{K}_F$ is satisfied. Since

$$\overline{t} - \widehat{t} = \frac{(2-b)\,\{a\,(2+b) + b^2 m\}K_F - 2abm\sqrt{(2-b^2)\,K_F}}{m\,(2-b)\,(2-b^2)\,K_F},$$

$\overline{t} < \widehat{t}$ holds if $K_F < K_F'' = \left(2-b^2\right)[2abm/(2-b)\{a(2+b)+b^2m\}]^2$. In this case, $\partial r^{OL}/\partial t < 0$ holds for $t \in [0, \overline{t})$. Otherwise, $\partial r^{OL}/\partial t < 0$ holds for $t \in [0, \widehat{t})$ and $\partial r^{OL}/\partial t > 0$ holds for for $t \in [\widehat{t}, \overline{t})$. ■

## A4. Proof of Lemma 5

By (16) and (17), we have

$$\frac{\partial r^{OL}}{\partial t} - \frac{\partial r^{OH}}{\partial t} \equiv \Gamma = \frac{\left[\begin{array}{c}(2+b)\,[2a^2\left(2-b^2\right) - (2-b)^2\,\{2+\left(2-b^2\right)t\}K_F] \\ -2\left(2-b^2\right)\{a\,(b+2) - b^2 m\}\sqrt{a^2 - (2-b)^2\,(1+t)\,K_F}\end{array}\right]}{2\{(2-b^2)\,t + 2\,(1-b^2)\}^2\sqrt{a^2-(2-b)^2\,(1+t)\,K_F}}.$$

Since

$$\frac{\partial \Gamma}{\partial K_F} = -\frac{(2+b)\,(2-b)^2\,[2a^2b^2 - (1+t)\,(2-b)^2\,\{2+\left(2-b^2\right)t\}K_F]}{4\{(2-b^2)\,t + 2\,(1-b^2)\}^2\left(\sqrt{a^2-(2-b)^2\,(1+t)\,K_F}\right)^3},$$

$\partial\Gamma/\partial K_F < 0$ if $K_F < J \equiv 2a^2b^2/[(1+t)\,(2-b)^2\,\{2+\left(2-b^2\right)t\}]$ and $\partial\Gamma/\partial K_F \geq 0$ if $K_F \geq J$. Evaluated at $K = \overline{K}_F$, it becomes

$$\widehat{K}_F - \overline{K}_F = -\frac{2a^2b^2\,(2+b)^2 - m\left(2-b^2\right)(1+t)\,\{2+\left(2-b^2\right)t\}\{2a\,(2+b) - m\left(2-b^2\right)(1+t)\}}{(1+t)\,(4-b^2)^2\,\{2+(2-b^2)\,t\}}$$

and $\partial(J-\overline{K}_F)/\partial m > 0$. Since $J - \overline{K}_F < (J-\overline{K}_F)\big|_{m=0} = -2a^2b^2\,(2+b)^2\,/[(1+t)\,(4-b^2)^2\{2+(2-b^2)t\}] < 0$, $J < \overline{K}_F$ holds for $K_F \in [0, \overline{K}_F)$. Hence, $\partial\Gamma/\partial K_F < 0$ is satisfied for $K_F \in [0, \overline{K}_F)$. By evaluating $\Gamma$ at $K_F = \overline{K}_F$, we have

$$\begin{aligned}\frac{\partial r^{OL}}{\partial t} - \frac{\partial r^{OH}}{\partial t} &> \left(\frac{\partial r^{OL}}{\partial t} - \frac{\partial r^{OH}}{\partial t}\right)\Big|_{K=\overline{K}_F} \\ &= \frac{\left(2-b^2\right)^2\,(1+t)\,m^2}{2\,(2+b)\,\{2\,(1-b^2) + (2-b^2)\,t\}\sqrt{a^2 - F\,(b-2)^2\,(t+1)}} > 0.\end{aligned}$$

Consequently, $\partial r^{OL}/\partial t > \partial r^{OH}/\partial t$ holds for $K_F \in [0, \overline{K}_F)$. ■

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## Figures

Figure 1: Choice of Service Mode

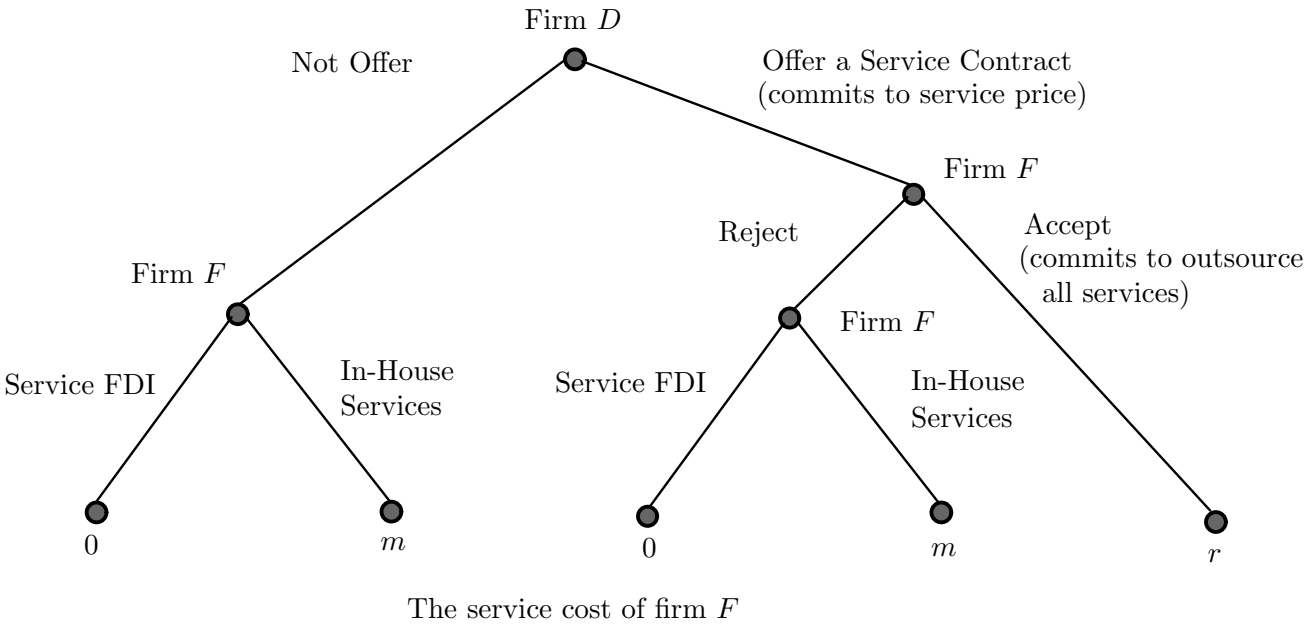



Figure 2: Effects of tariff reduction on commodity prices under service outsourcing with high $K_F$

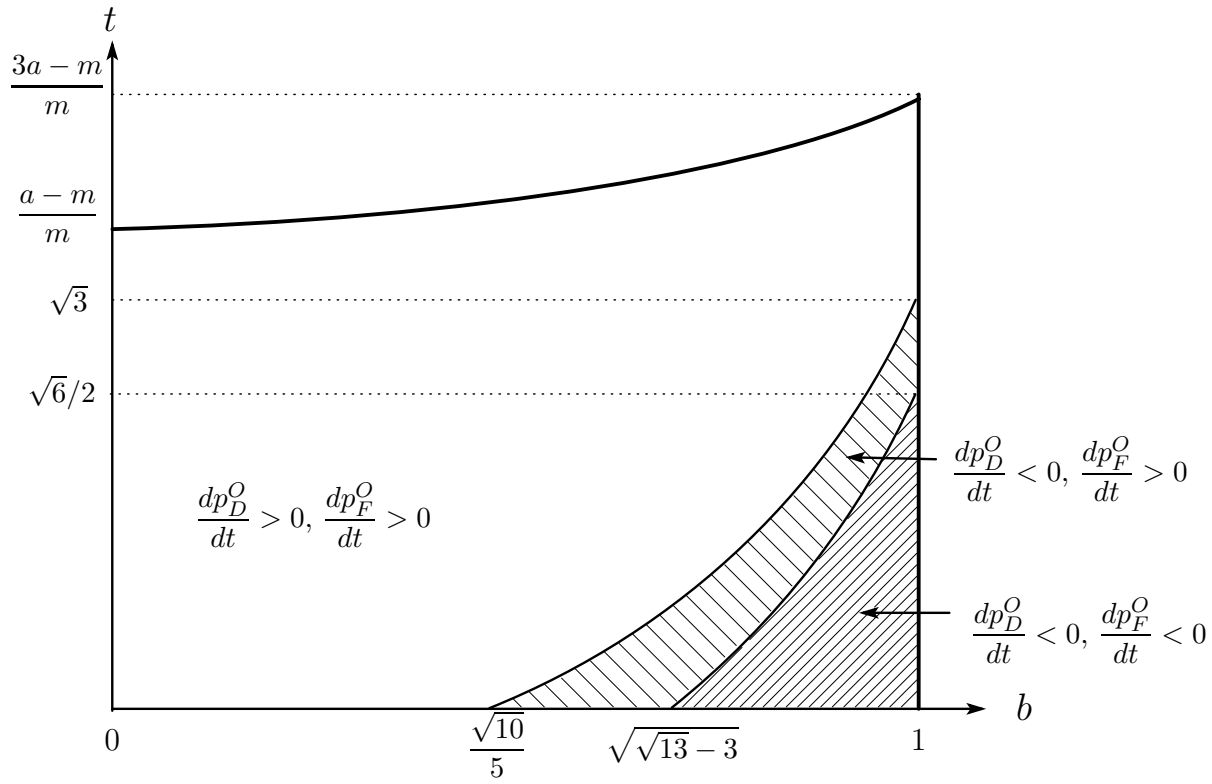


Figure 3: Changes in consumer surplus with high $K_F$
$\left(a = 2, m = 1.2, \overline{V} = 50\right)$

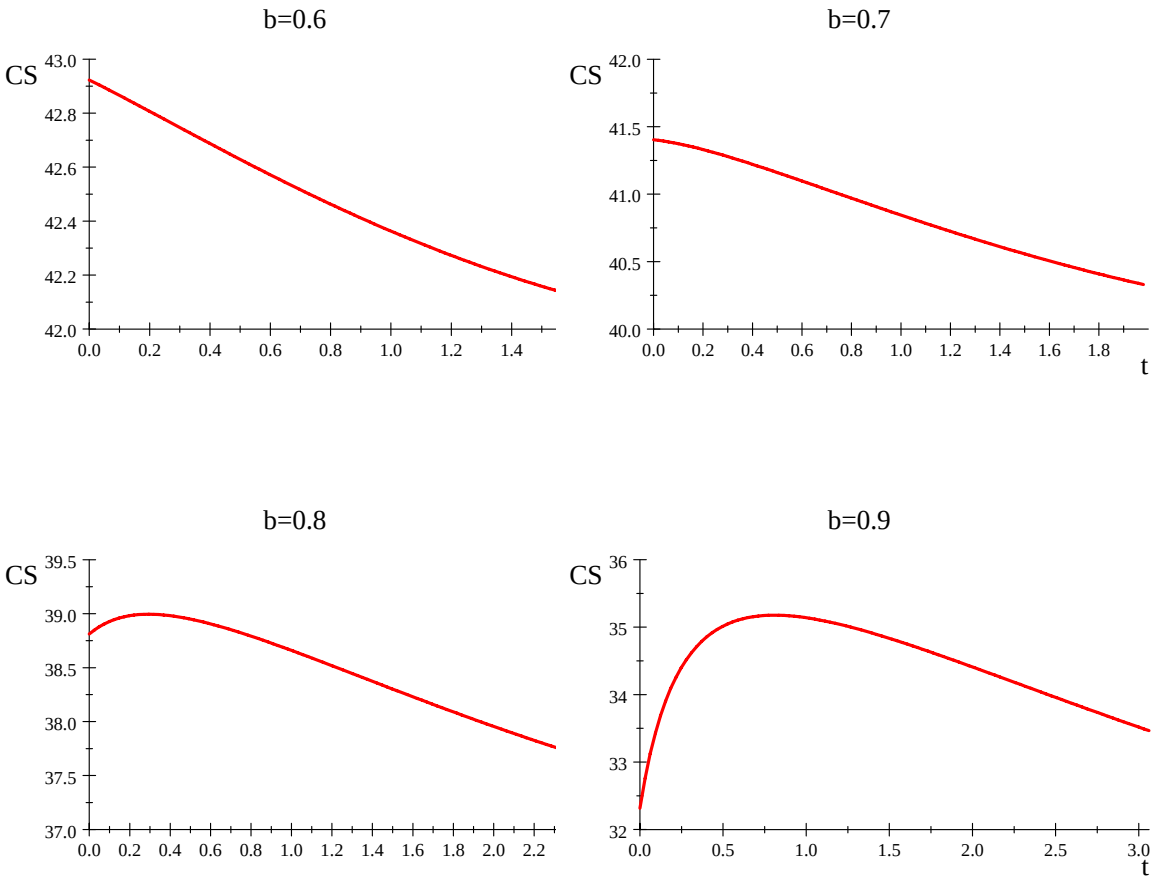


Figure 4: Changes in Firm D's profits with high $K_F$
$(a = 3, b = 0.4)$

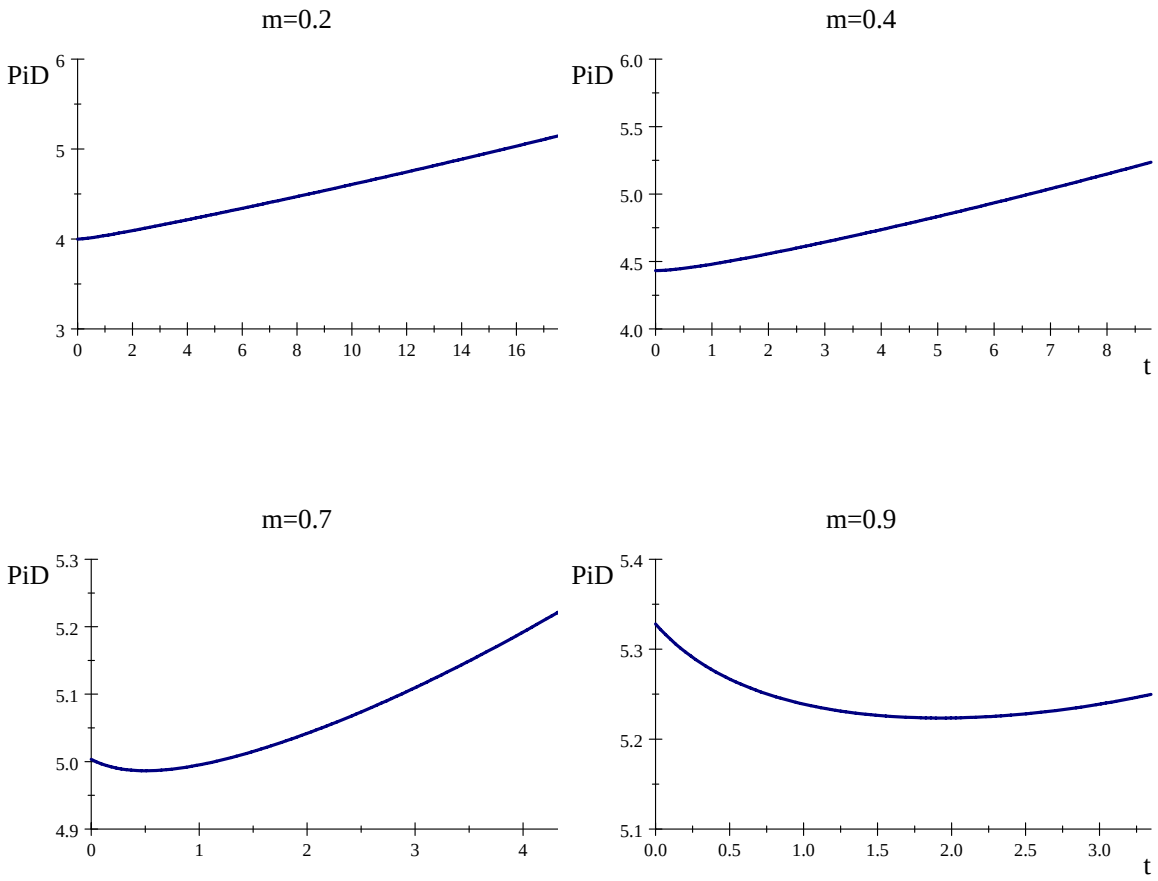


Figure 5: Trade Liberalizatoin with high $K_F$

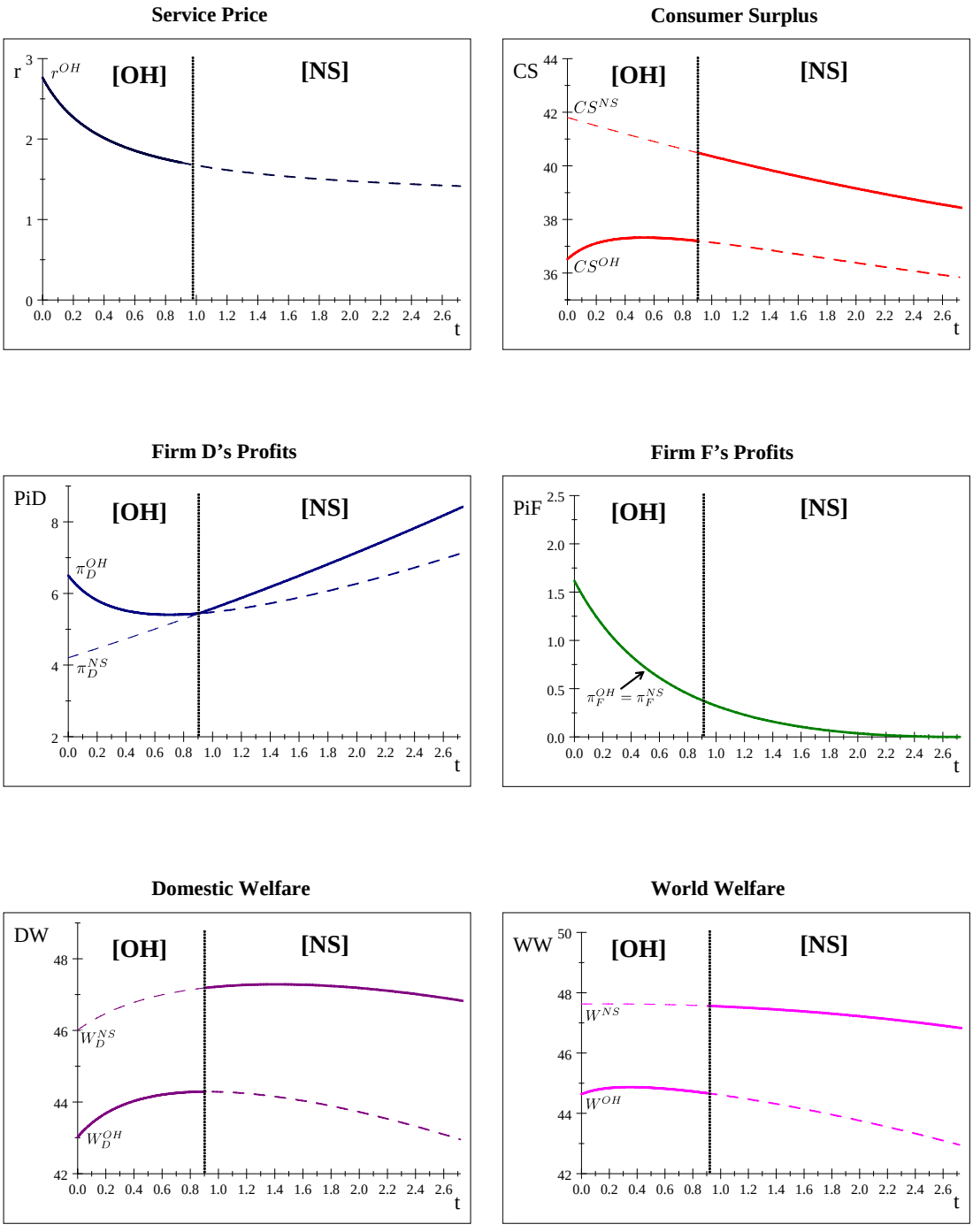


Figure 6: Trade Liberalizatoin with middle $K_F$

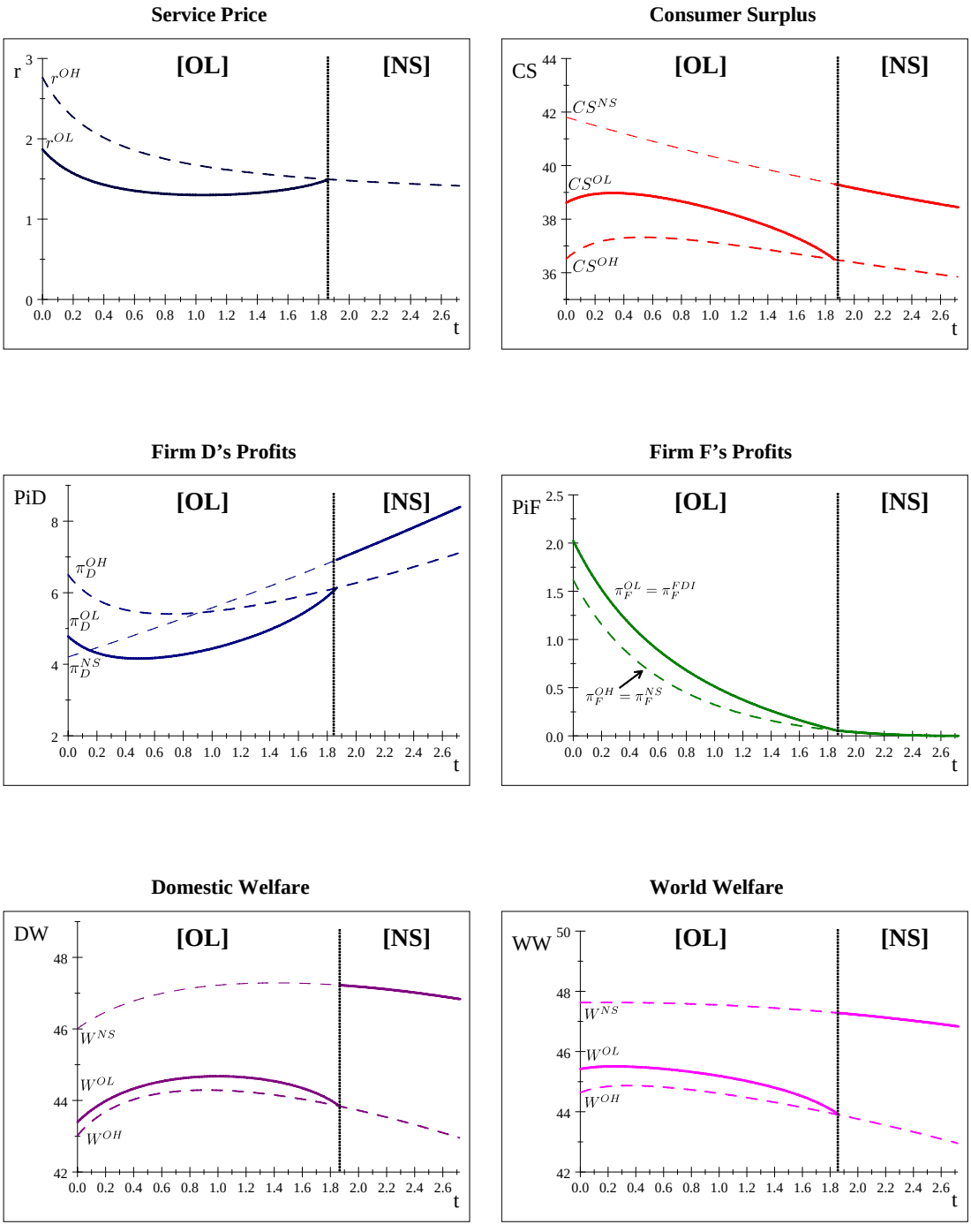
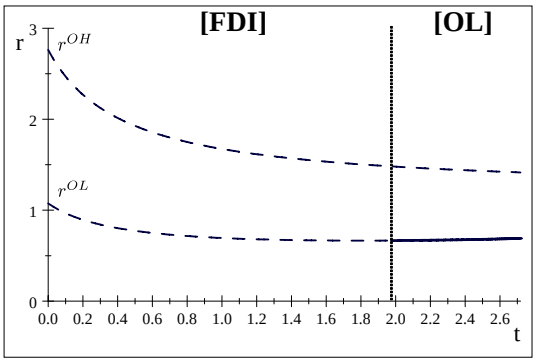
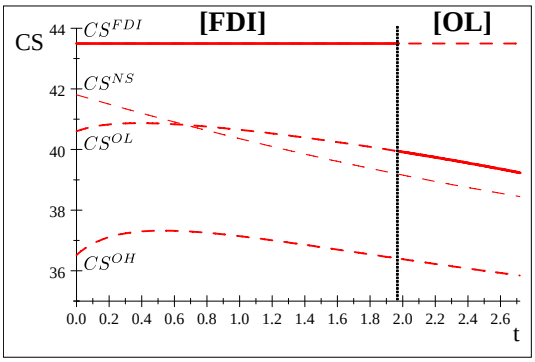


Figure 7: Trade Liberalizatoin with low $K_F$

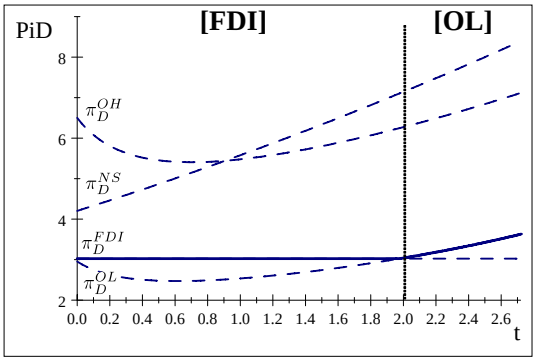
**Service Price**



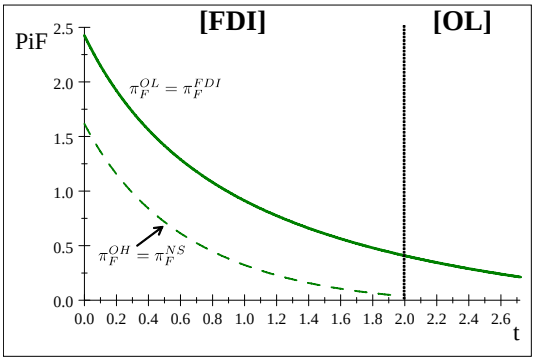

**Consumer Surplus**



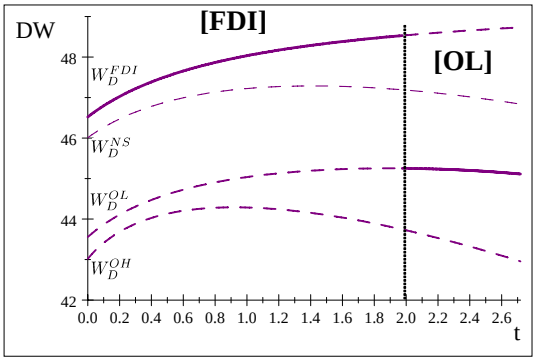

**Firm D's Profits**




**Firm F's Profits**




**Domestic Welfare**




**World Welfare**