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Free Trade Agreements and Decision Rights in Multinationals

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Abstract

Free trade agreements with rules of origin affect the location of input production for vertically integrated multinational enterprises. The relocation induced by a free trade agreement changes the allocation of decision rights within multinational enterprises and the purpose of transfer pricing from avoiding high taxes to strengthening their product-market competitiveness. This study shows that a free trade agreement with rules of origin may hurt both a multinational enterprise and a local firm, despite tariff elimination, when the relocation occurs and the decision rights change from centralization to decentralization. Moreover, such a free trade agreement can hurt consumers. Nevertheless, rules of origin increase the feasibility of free trade agreements due to larger tax revenues.

Keywords: Transfer pricing; Rules of origin; Free trade agreements; Managerial incentives;

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1 Introduction

For the last few decades, a proliferation of regional trade agreements (RTAs) has played a key role in liberalizing trade among countries.[1] As RTAs eliminate or reduce trade barriers, they are supposed to lower consumer prices and raise export prices, benefiting consumers and exporters. However, the preferential nature of RTAs may make their effects more complicated than they seem because of specific rules in implementing RTAs. Among others, firms need to comply with rules of origin (ROO) to use preferential tariffs of an FTA. ROO require firms to prove that the exported products originated within the FTA.[2] This study demonstrates that an FTA formation with ROO can hurt all exporters or consumers, even though they are eligible for preferential tariffs.

The keys to understanding these paradoxical results are changes in the location of input procurement and those in multinational enterprises (MNEs)' managerial decisions. ROO prevent MNEs from establishing efficient production networks because they induce exporters to change their location of input procurement from outside an FTA region to within an FTA region for making their products qualified for the preferential tariffs.[3] Such a change in the procurement pattern affects MNEs' pricing for intra-firm trade. Specifically, when an MNE procures inputs from its related company outside an FTA region, the MNE has some degrees of freedom to determine a transfer price, namely the price of intra-firm trade, which enables the MNE to save the overall corporate tax payments by shifting profits from a high-tax to a low-tax country.[4] This MNE's price manipulation is called transfer pricing, and MNEs may manipulate transfer prices for tax avoidance purposes.[5] As some MNEs relocate their

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[1]As of December 2024, 373 RTAs are in force. See `http://rtais.wto.org/UI/PublicAllRTAList.aspx`. See Freund and Ornelas (2010) for a review of the literature on RTAs.

[2]Unlike a custom union, member countries of an FTA independently set their external tariffs against non-member countries. If the external tariffs are different for the same product, firms producing outside the FTA can save tariff payments by exporting a product to the member country whose external tariff is lowest and then re-exporting it to other FTA member countries whose external tariffs are higher. For instance, Stoyanov (2012) empirically examined firms' incentive to transship goods through FTA members. To forestall firms from tariff avoidance, member countries of FTAs stipulate ROO.

[3]Although ROO aim at preventing trade deflection, Felbermayr et al. (2019) show that most trade deflection is not profitable even without ROO because of small differences in external tariffs and non-negligible transportation costs. Nevertheless, ROO affect exporting firms' strategies such as their input procurement or location choices. For example, Conconi et al. (2018) concluded that the ROO of the North American Free Trade Agreement (NAFTA) reduced imports from non-member countries, which indicates that ROO cause inefficiency in input procurement.

[4]Transfer prices are subject to the arm's-length principle, as MNEs' tax avoidance through transfer pricing is a main profit-shifting channel. However, some factors, such as the presence of intangible assets, prevent high-tax countries from perfectly applying the arm's-length principle, and practitioners need to rely on a plausible range of transfer price, known as the arm's length range. Therefore, even under the arm's-length principle, MNEs can manipulate their transfer price to some extent. Online Appendix B.1 introduces the costs of transfer pricing and discusses the robustness of our results.

[5]Although the relocation of intellectual property rights and the internal debt shifting are other ways to shift

input production in the same country inside the FTA region to satisfy ROO, they lose the opportunity of saving overall tax payments. Thus, FTA formation with ROO can prevent MNEs from tax avoidance.

Besides that, the change in MNEs' input procurement can also negatively influence local firms inside the FTA. After vertically integrated MNEs locate their upstream affiliate inside the FTA, they can delegate decision rights to their downstream affiliates and strategically use their internal prices on inputs to make their downstream affiliates more aggressive in the product market. Existing studies have suggested the role of internal input pricing to make the behavior of managers of downstream affiliates aggressive and shift profits from rival firms.[6] For example, Fershtman and Judd (1987) and Sklivas (1987) showed that firm owners have incentives to give their managers decision-making rights in the product market. It has also been reported that some MNEs conduct transfer pricing for managerial use. For instance, Czechowicz et al. (1982) reported that 89% of U.S. MNEs manipulated a transfer price for both tax avoidance and strategic motives. Ernst & Young (2003) also reported that over 80% of their sample firms use a single transfer price for these two purposes. After MNEs locate both an upstream and a downstream entity in the same country, they use their internal prices solely for managerial purposes. Therefore, their output decisions become more aggressive, hurting local firms in the country.

Although the above argument seems realistic, this is the first study that examines how FTAs with ROO affect the MNEs' managerial decisions on input production and transfer pricing. To this end, this study builds an international duopoly model with two exporters, an MNE and a local firm in an FTA region. The MNE produces a final good within an FTA member country and exports the good to another FTA member country. The MNE's location for input production is either in the final-good-production country or in a low-tax country outside the FTA. The MNE can shift profits across countries by manipulating the transfer price if it locates its input production outside the FTA countries. The MNE competes with the local firm, which also produces the final good within the FTA and exports its product to the same member country.

The MNE prefers to locate its upstream and downstream affiliates in different countries

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profits across borders, Beer et al. (2020) suggests that transfer pricing on intra-firm trade is still one of the main channels. Some empirical research has provided evidence of transfer pricing to save tax payments (Davies et al., 2018; Liu et al., 2020). Blouin et al. (2018) found conflicting motives of transfer price when MNEs use it for corporate tax saving and also for tariff saving.

[6]See Göx and Schiller (2006) for a survey of transfer pricing manipulation for strategic motives.

when the tax gap is large. This is because a larger tax differential increases the MNE's gains from tax savings. The decision-making of the two affiliates is centralized in this case because a high transfer price to save tax payments discourages the downstream affiliate if the MNE chooses decentralization. In this case, the MNE (regarded as a "Lion") is sleeping in the sense that it is less aggressive in the product market. When the tax gap is small, however, the MNE prefers to locate both affiliates in the same country, and the decision-making of the downstream affiliate is decentralized for managerial purposes. Then, the upstream affiliate sets a low input price to make the downstream affiliate more competitive in the product market.[7] In this case, the MNE as the Lion is waking in the sense that it is aggressive in the product market and uses its transfer price to "attack" the rival firm.

An FTA formation can induce the relocation of the MNE's input production from a country outside the FTA to a country inside the FTA. A notable result is that FTA formation with the MNE's input relocation may hurt the local firm even though the local firm benefits from tariff elimination as part of the FTA. This is because the loss from the strategic effect of transfer pricing outweighs the gain from tariff elimination for the local firm. Thus, an FTA hurts the local firm despite tariff elimination because it awakens the Lion.

In the presence of ROO, the MNE is not always qualified for tariff-free exports and chooses either of the two options: (i) producing inputs inside an FTA to comply with the ROO and enjoying tariff elimination with paying high-taxes, or (ii) producing inputs outside an FTA and manipulating the transfer price to save tax payments with paying tariffs. An FTA formation always hurts the MNE in the latter case, and it can damage the MNE even in the former case. Compared with the case without ROO, the MNE is more likely to choose to produce inputs inside an FTA due to non-qualification for preferential tariffs. In other words, the MNE has to choose tariff savings at the expense of avoiding taxes. Thus, we found that an FTA formation with ROO reduces the MNE's post-tax profits under a large gap between corporate taxes.

Therefore, unlike the case without ROO, FTA formation leading to the relocation of the MNE's upstream production can reduce the profits of both the MNE and the local firm, even though both of them comply with ROO and make tariff-free exports within the FTA due to a disappearing opportunity of tax avoidance and intense market competition. This exporter-hurting FTA occurs when the tariff is low because the direct gains from the elimination of

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[7]This is in line with Schjelderup and Sorgard (1997), who showed that, when the decisions of the headquarters and foreign affiliates are decentralized and those affiliates compete with rival firms in the product market, MNEs may use their transfer price as a strategic tool to shift rents from rival firms.

the tariff are small. An FTA with ROO hurts the awakened Lion itself in addition to the local firm, but the MNE's profit is still larger than the profit when it is sleeping.

We also show that an FTA with ROO can decrease total exports and hurt consumers in the importing country, even if all firms comply with ROO and make tariff-free exports. When the tax gap is large, the MNE has an incentive to make a large amount of exports to increase the value of intra-firm transaction and save its tax payments. After the FTA formation, if the MNE changes the location of input production from offshoring to inshoring to comply with ROO, it no longer makes large exports to avoid a high tax. Although the inshoring provokes a strategic delegation of the decision rights and has an effect of increasing exports, it decreases exports and hurts consumers if the former effect dominates the latter. The negative trade effects of RTAs are found in some empirical studies. For instance, Cipollina and Salvatici (2010) conducted a meta-analysis on the coefficients of RTA dummy variables in gravity analyses and reported that the estimated coefficients are even negative in 312 out of 1827 studies. These results shed new light on the welfare effects of FTA formation. When the ROO of FTAs change MNEs' decisions on input procurement and transfer pricing, even exporters' and consumers' benefits are not warranted.

We also examine how an FTA formation affects the total welfare of countries inside the FTA. In the absence of ROO, FTA formation can negatively impact FTA countries. This is because the MNE shifts more of its tax base to an outside FTA country, and the host country collects a small or no tax revenue from the MNE. In this situation, ROO can transform a welfare-worsening FTA into a welfare-improving one because the host country can collect tax revenue from the MNE if it induces input relocation.

1.1 Relationship to the literature

Some studies have analyzed the welfare effects of FTAs with ROO, but they have mainly focused on intermediate goods markets. Krishna and Krueger (1995) showed that ROO may work as a hidden protection against the input suppliers outside the FTA. Ju and Krishna (2005) showed that ROO increase the price of FTA-made inputs and reduce the total output if the ROO are not overly stringent such that all firms comply with them. However, ROO have the opposite effects if they are sufficiently stringent such that some firms choose not to comply with them. In Ju and Krishna (2005), the price of the output is fixed, and they did not consider how ROO affect consumers. Demidova and Krishna (2008) extended Ju and Krishna

(2005) to include heterogeneity in productivity among final-good producers and showed that productivity sorting ensures a negative relationship between the stringency of ROO and the demand for FTA-made inputs. Ishikawa et al. (2007) focused on final good markets and showed that ROO have a role in segmenting markets within the FTA; both inside and outside firms producing final goods may benefit from ROO at the cost of consumers. Mukunoki (2017) showed that FTAs with ROO may hurt consumers if they change the outside firms' location decisions. Mukunoki and Okoshi (2021a) investigated a firm's manipulation of the output price for complying with a value-added criterion of ROO. They showed that the imposition of ROO can benefit all exporters because the value-added criterion works as a price floor and weakens market competition.

None of these studies, however, have considered the effects of FTA formation when a vertically integrated MNE manipulates its transfer price. The most closely-related study is Mukunoki and Okoshi (2021b), which explores the impact of a value-added criterion of ROO on a monopolistic MNE's transfer pricing. However, the focus of this article is different in the sense that it considers strategic interactions between firms and explores how FTA formation affects the MNE's delegation of decision rights to its downstream affiliate, while Mukunoki and Okoshi (2021b) focused on a role of ROO in preventing tax avoidance. In particular, this article suggests that input relocation and the decentralization of decision-makings induced by ROO intensifies market competition. A notable result of this study is that FTA formation can hurt both the MNE and the local firm despite the tariff elimination, whereas FTA formation never hurts the MNE as per Mukunoki and Okoshi (2021b).

Another strand of literature related to this article is the analysis of the use of transfer pricing for managerial purposes. For instance, Elitzur and Mintz (1996) derived the optimal transfer price when it is used for saving tax payments and increasing the effort level of the local manager of a foreign affiliate. Schjelderup and Sorgard (1997) considered a decentralized MNE and calculated the optimal transfer pricing when there is a trade-off between saving tax payments and shifting rents from rival firms. Hyde and Choe (2005) also considered two international tax schemes and focused on the use of two books for transfer pricing, namely an MNE setting two internal prices: one for saving tax payments and the other for providing appropriate incentives to local managers. Some articles considered an MNE's decision between centralization and decentralization. For instance, Nielsen et al. (2008) showed that an MNE chooses centralization when the tax gap between countries is large but chooses decentraliza-

tion when it is small. Dürr and Göx (2011) showed that using one transfer price for both tax and managerial purposes, rather than two transfer prices for each purpose, may increase an MNE's profit. Our article also considers the endogenous choice of an MNE between centralization and decentralization, and the decision is linked to the formation of an FTA with ROO and the MNE's location choice.

The rest of the article is organized as follows. Section 2 sets up a model. Section 3 derives the equilibrium without ROO and with ROO separately, and compares them. Section 4 investigates the effects of FTA formation on firms' profits and consumer surplus to show the main results. It also explores the effect on the total welfare inside an FTA and how ROO affect the feasibility of FTA formation. Section 5 concludes the article.

2 Model

We consider a three-country model with two firms, an MNE (firm M) and a local firm (firm L). The model is illustrated in Figure 1. Two of the three countries are potential FTA member countries, whereas the third is the outside, non-member country (country O). The headquarters of the MNE is located in country O and is owned by residents in country O. The MNE has a downstream affiliate (firm M_D) in one of the member countries to supply final goods to consumers in the FTA region.[8] We assume the two downstream firms, firm M_D and firm L, are located in one of the member countries, which is referred to as the host country (country H). Country H is chosen because it has location advantages to attract firms, such as low factor prices and a large pool of skilled workers. The two downstream firms produce homogeneous goods and serve them to consumers in another member country (country F). Countries H and F are potential members of an FTA. To simplify the analysis, the baseline model does not consider the output market in country H. As is discussed in Online Appendix B.4, this assumption does not qualitatively change our main results.

The representative consumer's utility in country F is given by $U = a(x_L + x_M) - \frac{(x_L + x_M)^2}{2}$, where x_i is the consumption of the final good produced by firm i ($i \in \{L, M\}$). By utility maximization, the inverse demand function is given by $p = a - (x_L + x_M)$, where p is the

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[8]This type of foreign direct investment (FDI) is known as export-platform FDI, by which FDI firms export their products from the host country to other countries. For example, see Tekin-Koru and Waldkirch (2010) for evidence from Mexico of an increasing role of export-platform FDI. Tintelnot (2017) also shows that the share of U.S. MNEs' outputs exported to countries outside the host country increases. For instance, the share in Belgium was 63% in 2004, which was the third highest share.
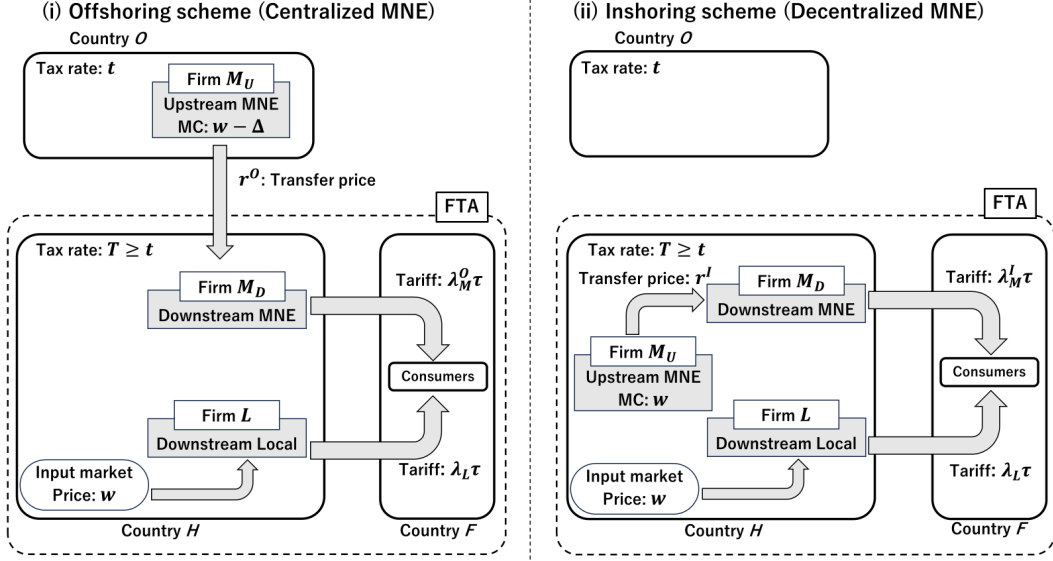
Figure 1: Model

price of the final good. As policy instruments, we consider both a corporate tax and an import tariff. The governments in countries O and H, respectively, impose t and T as a corporate tax on reported profits.[9],[10] Hereafter, we focus on the case of $T \geq t$, with which our main findings are obtained.[11]

In addition, country F imposes a specific tariff, τ, on imports of the final good. An FTA between countries H and F eliminates this tariff. To focus on the impact of FTA formation on competition in the final-goods market, tariffs on inputs are assumed away. In the presence of ROO, the downstream firms need to meet the ROO to be eligible for the non-application of τ. We assume that the inputs imported from country O cannot satisfy any criteria of ROO.[12] Therefore, the only way to meet the ROO is to produce inputs in the FTA countries or procure inputs from the local markets in these countries.[13]

The downstream firms use the same production technology, where one unit of inputs is transformed into one unit of final products. Other production costs are constant and normal-

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[9]Note that we use the terms "tax rate" and "tax revenue" to represent the corporate tax rate and corporate tax revenue, respectively. The tax rate and tax revenue are distinguished from tariff rate and tariff revenue.

[10]In this model, we postulate that both governments in countries O and H adopt a territorial tax system rather than a worldwide one. After the U.S. moved from a worldwide tax system to a territorial tax system, most OECD countries have adopted a territorial tax system.

[11]This situation is consistent with real-world observations. For instance, Mexico and Belgium have higher corporate taxes than other countries, and these countries are major host countries of export-platform FDIs. See also footnote 8.

[12]For instance, the ROO of the US-Mexico-Canada Agreement (USMCA) requires exporters of automobiles to produce some core inputs, such as engines and shafts, inside USMCA.

[13]If a value-added criterion of ROO is employed, the multinational firm has an option to adjust the transfer price to meet the ROO without changing the location of its input procurement. This possibility is analyzed in discussion paper of ours, Mukunoki and Okoshi (2019), and the results qualitatively remains.

ized to zero.[14] Firm L is always eligible for the FTA tariff because it always procures inputs with the input price w from the perfectly competitive input market in country H.

Meanwhile, firm M produces inputs by itself that are to be used for the production of firm M_D. It establishes an upstream affiliate (firm M_U), either in country H or O. Firm M_U produces inputs more efficiently in country O than in H because country O has location advantage of input production. Specifically, if firm M_U produces inputs in country H, its marginal cost is given by w. If inputs are produced in country O, firm M_U's marginal cost is given by $w - \Delta$. This implies that locating firm M_U in country O gives firm M not only a cost advantage over local input suppliers but also a tax-saving opportunity. In this case, firm M_U exports the produced inputs to its downstream affiliate by charging an intra-firm transfer price denoted by r^O. However, firm M cannot meet the requirement of ROO, and it does not enjoy tariff-free access to the market even after the formation of an FTA.[15] We call this case scheme O (Offshoring).

To utilize the FTA tariff, firm M must comply with ROO by procuring inputs in the host country. We call this case scheme I (Inshoring).[16] Let λ_M^s denote a state variable that takes zero if firm M is qualified for zero tariff and takes unity otherwise. The same rule is applied to λ_L for firm L. To distinguish the equilibrium variables in the three regimes, we use asterisk "$*$" for pre-FTA equilibrium, hat "$\hat{}$" for the post-FTA equilibrium without ROO, and tilde "$\sim$" as a circumflex for the post-FTA equilibrium with ROO.

The MNE chooses its organization structure, and it depends on the location of the upstream affiliate. When the decision-making is decentralized, firm M_D becomes more aggressive in the product market if the input cost, that is, the level of the transfer price, is lower. This implies that the MNE can shift rents from the local firm by lowering the transfer price, r^I. This strategic motive of transfer pricing is the reason why the MNE always chooses decentralization when the two affiliates are located in the same country. In this case, firm M_D sets the quantity to maximize its own profits, although the objective of the upstream affiliate

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[14]We assume that only the MNE has an option to procure inputs from country O, even though both firms share the same production technology. Empirical evidence, such as Tomiura (2007), suggests that some firms engage in global production such as outsourcing and FDI whereas the others do not, even if they have similar productivity.

[15]Some empirical evidence shows that not all firms can use FTA tariffs because of the existence of ROO, which means the impacts of FTA formation are heterogeneous across firms. See, for example, Takahashi and Urata (2010) and Hayakawa et al. (2013).

[16]Under inshoring, all operations of firm M are conducted in country H, which may lead one to question whether it is still accurate to classify firm M as a "multinational" entity. However, the headquarters of firm M is still in country O irrespective of the location of the MNE's production. Therefore, firm M retains a multinational characteristic.

is to maximize the total profits.

Alternatively, when the locations of the two affiliates are separate, the MNE may prefer centralized decisions to the decentralized decisions under $T \geq t$ because of the tax-avoidance motive of transfer pricing. To avoid the high tax of the host country, the MNE sets a transfer price that is higher than the marginal cost of input production. The MNE chooses centralization in most cases, so as not to discourage the downstream firm's decision in quantity setting.[17] As our main results are obtained when an FTA formation changes the MNE's allocation of decision rights from centralization to decentralization, hereafter, we focus on the case where the MNE chooses centralization when it locates the upstream affiliate in country O. In Online Appendix B.2, we discuss how the MNE decides the allocation of the decision rights. Thus, the MNE faces a trade-off in the location of its input production: the MNE is able to use the transfer price to save tax payments in producing inputs in country O, whereas it can use the transfer price to take advantage of a strategic effect of decentralization in producing them in country H.

We solve the following three-stage game. In the first stage, the headquarters of the MNE decides the location of firm M_U. In the second stage, the headquarters determines the optimal input price. In the third stage, the MNE and firm L compete à la Cournot in country F.[18]

3 The equilibrium

This section derives the equilibrium outcomes in each scheme and investigates how ROO influences the MNE's location of its input production.

3.1 Market equilibrium

Let us first derive the market equilibrium determined in the last stage. The unit cost of the local firm, firm L, in producing a final good and exporting it to country F is given by $c_L = w + \lambda_L \tau$. Then, firm L maximizes the following (pre-tax) profit:

$$\pi_L = (p - c_L)x_L. \tag{1}$$

As described in the previous section, there are two schemes for the MNE's input sourcing:

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[17]Nielsen et al. (2008) demonstrates that centralization is more profitable than decentralization when $T \geq t$ and the tax gap is large. When the tax gap is small, decentralization realizes higher profits for the MNE.

[18]In Online Appendix B.3, we discuss the condition under which this timing is optimal for the MNE.

(i) an offshoring scheme in which the MNE produces inputs in country O and (ii) an inshoring scheme in which the MNE produces inputs in country H. Below, we subsequently derive the equilibrium in each scheme.

Offshoring scheme When the MNE locates its input production in country O, the MNE centralizes its decision-making and determines the amount of supply to maximize the following global post-tax profit:

$$\Pi_M^O = (1 - t)(r^O - (w - \Delta))x_M^O + (1 - T)(p - r^O - \lambda_M \tau)x_M^O$$
$$= (1 - T)(p - c_M^O)x_M^O, \tag{2}$$

where
$$c_M^O = \frac{(1 - t)(w - \Delta) + (1 - T)\lambda_M^O \tau - (T - t)r^O}{1 - T} \tag{3}$$

is the *perceived marginal cost*. The centralized MNE's decision in the product market is based on the perceived marginal cost, which is different from the sum of the input production cost and trade cost, $w - \Delta + \lambda_M^O \tau$.[19] In this cross-border production, the MNE's unit cost is adjusted by the tax differential. As a marginal increase in the transfer price, r^O, saves per-unit tax payments as much as $(T - t) > 0$, it reduces the effective marginal cost of firm M_D in the production of the final good. This is because the per-unit, post-tax profit is larger with tax avoidance, and it gives the MNE an incentive to increase the quantity of sales. Therefore, the "perceived marginal cost" becomes lower, and the MNE supplies more as r^O becomes higher. Note that the perceived marginal cost under an offshoring scheme c_M^O is equivalent to $w - \Delta + \lambda_M^O \tau$ only if $T = t$ holds and is decreasing in T and increasing in t. This means that the perceived marginal cost is less than the true marginal cost, $c_M^O \leq w - \Delta + \lambda_M^O \tau$, when $T > t$ holds. In other words, transfer pricing makes the MNE more aggressive in the product market under an offshoring scheme.

Inshoring scheme When the MNE locates its input production in country H, the MNE's decision-making is decentralized. Thus, how much to produce of the final good is delegated to the manager of the downstream affiliate (i.e., firm M_D), who only takes into account the

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[19]The terminology "perceived marginal cost" is often used in the analysis of a vertically related industry in the context of industrial organization. See Choi et al. (2020) for an application of this terminology in tax avoidance literature.

profit of firm D, which is given by

$$\pi_D = \{p - \underbrace{(r^I + \lambda_M^I \tau)}_{c_M^I}\} x_M. \tag{4}$$

For expositional convenience, we denote c_M^I as the perceived marginal cost under the in-shoring scheme. Firm M_D's decision is based on c_M^I, whereas the true marginal cost of the MNE is $w + \lambda_M \tau$.

By maximizing (1), (2), and (4) with respect to each firm's quantity, we have the equilibrium outputs of the firms as:

$$x_M^s = \frac{a - 2c_M^s + c_L}{3}, \quad \text{and} \quad x_L^s = \frac{a - 2c_L + c_M^s}{3}, \quad s \in \{O, I\}. \tag{5}$$

3.2 Manipulation of the transfer price

Next, we consider how the MNE sets the transfer price in the second stage. As described above, depending on the MNE's location choices in input production, there are two motives for which the MNE manipulates the transfer price. We derive the optimal transfer prices separately in these cases.

Offshoring scheme Given (2) and (5), the first derivative of Π_M^O with respect to r^O is always positive. Therefore, the optimal transfer price is set as high as possible. This means that $p - r^O - \lambda_M^O \tau = 0$ holds.[20] We have

$$r^O = w - \Delta + \underbrace{\frac{(1 - T)\{a - w + 2\Delta - (2\lambda_M^O - \lambda_L)\tau\}}{1 - t + 2(1 - T)}}_{\text{Tax avoidance motive}}. \tag{6}$$

By substituting (6) into (3), the perceived marginal cost that reflects the equilibrium transfer price becomes

$$c_M^O = w - \Delta + \lambda_M \tau - \frac{(T - t)\{a - w + 2\Delta - (2\lambda_M^O - \lambda_L)\tau\}}{1 - t + 2(1 - T)}, \tag{7}$$

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[20]We assume away an additional cost for manipulating the transfer price. We relax this assumption by introducing a concealment cost in Online Appendix B.1.

which is decreasing in T. The corresponding equilibrium output and profits, respectively, become

$$x_M^O = \frac{(1-t)\{a - w + 2\Delta - (2\lambda_M^O - \lambda_L)\tau\}}{1 - t + 2(1 - T)} \quad \text{and} \quad \Pi_M^O = (1 - T)(x_M^O)^2. \tag{8}$$

x_M^O is the smallest when $\lambda_M^O = 1$ and $\lambda_L = 0$, and it is positive if and only if $\tau < \frac{a-w+2\Delta}{2}$. The equilibrium output and profits of the local firm, respectively, become

$$x_L^O = \frac{(1-T)(a - w - \lambda_L\tau) - (1-t)\{\Delta + (\lambda_L - \lambda_M^O)\}\tau}{1 - t + 2(1 - T)} \quad \text{and} \quad \Pi_L^O = (1 - T)(x_L^O)^2. \tag{9}$$

In the offshoring scheme, x_L^O is smaller in the pre-FTA equilibrium ($\lambda_M^O = \lambda_L = 1$). It is positive if and only if $\tau < a - w - \left(\frac{1-t}{1-T}\right)\Delta$.

The optimal transfer price is higher than the marginal cost of producing inputs. The transfer price is set to shift profits from a high-tax country H to a low-tax country O. The second term of (6) represents a *tax-avoidance motive*, whose sign is always positive. Moreover, (8) indicates that the MNE's output expands as the corporate tax in country H, T, is higher. This is because the perceived marginal cost is decreasing in T. As the induced increase in the output lowers the equilibrium price of the final good, p, the transfer price that realizes zero profits of firm M_D also becomes lower.

Inshoring scheme Given (5), the overall profit of the MNE is

$$\Pi_M^I = (1 - T)\left[\{r^I - w + p - (r^I + \lambda_M^I\tau)\}\left(\frac{a + w - 2r^I - (2\lambda_M^I - \lambda_L)\tau}{3}\right)\right]. \tag{10}$$

By differentiating (10) with respect to r^I, the optimal transfer price becomes

$$r^I = w - \underbrace{\frac{a - w - (2\lambda_M^I - \lambda_L)\tau}{4}}_{\text{Strategic motive}}. \tag{11}$$

The corresponding equilibrium output and profits of the MNE are given by

$$x_M^I = \frac{a - w - (2\lambda_M^I - \lambda_L)\tau}{2}, \quad \text{and} \quad \Pi_M^I = \frac{(1 - T)}{2}(x_M^I)^2. \tag{12}$$

The equilibrium output and profits of the local firm are given by

$$x_L^I = \frac{a - w - (3\lambda_L - 2\lambda_M^I)\tau}{4}, \quad \text{and} \quad \Pi_L^I = (1 - T)(x_L^I)^2. \tag{13}$$

We have either $\lambda_M^I = \lambda_L = 1$ or $\lambda_M^I = \lambda_L = 0$ in the inshoring scheme, and the equilibrium outputs are smaller in the former case. Therefore, x_M^I and x_L^I are positive if and only if $\tau < a - w$ holds.

In the inshoring scheme, the production and export decisions in the final-goods market are delegated to firm M_D. Then, the MNE uses the transfer price to make firm M_D behave more aggressively in the product market by setting a low transfer price. In other words, lowering the transfer price works as a "strategic intra-firm subsidy" and shifts rents from firm L to firm M. This is captured by the second term in (11), which is always negative. Unlike the offshoring scheme, the optimal transfer price under inshoring is independent of T.

3.3 Location choice of the input production

In the first stage, the MNE chooses between country O or H for the location of firm M_U. We focus on the situation where $\tau < \min\left[\frac{a - w + 2\Delta}{2}, a - w - \left(\frac{1 - t}{1 - T}\right)\Delta\right]$ holds, such that exports of both firms are positive. Rearranging this inequality, we have the maximum level of T, $T^{max} \equiv 1 - \frac{(1 - t)\Delta}{a - w - \tau}(< 1)$, below which the equilibrium exports of both firms are positive given $\tau < \frac{a - w + 2\Delta}{2}$.

By comparing the profits between the two schemes, we have

$$\Pi_M^O \geq \Pi_M^I \iff T \geq \frac{3 - t}{2} - (1 - t)\left(\frac{a - w + 2\Delta - (2\lambda_M^O - \lambda_L)\tau}{a - w - (2\lambda_M^I - \lambda_L)\tau}\right)\sqrt{2}, \tag{14}$$

The MNE chooses the offshoring scheme and shifts profits for the tax-avoidance motive when the corporate tax in country H is sufficiently high. Otherwise, it chooses the inshoring scheme and enjoys the strategic effect of transfer pricing. Specifically, the MNE prefers the offshoring scheme to the inshoring scheme if and only if $T > T^* \equiv \frac{3 - t}{2} - \frac{(1 - t)(a - w + 2\Delta - \tau)\sqrt{2}}{a - w - \tau}$ holds before formation of an FTA, $T > \widehat{T} \equiv \frac{3 - t}{2} - \frac{(1 - t)(a - w + 2\Delta)\sqrt{2}}{a - w}$ holds after formation of an FTA without ROO, and $\widetilde{T} \equiv \frac{3 - t}{2} - \frac{(1 - t)\{a - w + 2(\Delta - \tau)\}\sqrt{2}}{a - w}$ holds after formation of an FTA with ROO. We can easily confirm that $T^* < \widehat{T} < \widetilde{T}$ hold.

The elimination of the tariff increases the equilibrium sales of the MNE, magnifying the strategic motive of transfer pricing. If $T > \widehat{T}$ holds, however, the tax-avoidance motive still dominates the strategic motive even after FTA formation. Thus, by formation of an FTA without ROO, the MNE that initially chooses the offshoring scheme ($T^* < T$) changes its scheme to the inshoring scheme if $T^* < T < \widehat{T}$ holds.

The result also indicates that FTA formation causes efficiency loss, similar to the conventional, trade-diversion effect. The trade-diversion effect is caused by the substitution of imports from less efficient member countries for those from more efficient non-member countries. In our model, input production is relocated from a more efficient country whose production cost of the input is $w - \Delta$ to a less inefficient country whose production cost is w.

In the absence of ROO, the location of input production is unrelated to tariff elimination. In the presence of ROO, however, the MNE complies with the ROO, and the tariff on the final good is eliminated only if the MNE locates input production within FTA countries. Thus, firm M faces a trade-off between tax avoidance and tariff elimination. Because the MNE needs to incur tariff under scheme O, the threshold of T is larger than that of the case without ROO, $\widehat{T} < \widetilde{T}$. This implies that ROO expand the range of T such that input relocation occurs. Moreover, as a higher tariff discourages the MNE to choose scheme O, $\frac{\partial \widetilde{T}}{\partial \tau} > 0$ holds.[21]

The equilibrium choice of the MNE is depicted in Figure 2. We summarize the equilibrium outcomes in the following proposition.

Proposition 1. *FTA formation induces the MNE to relocate its input production from an outside country to an inside FTA country if $T^* < T < \widehat{T}$ holds in the absence of ROO and if $T^* < T < \widetilde{T}$ holds in the presence of ROO, where $\widehat{T} < \widetilde{T}$ holds. In the presence of ROO, the MNE produces inputs in an outside country and does not comply with ROO if $\widetilde{T} \leq T$ holds.*

4 The effects of FTA formation on firms and consumers

In this section, we explore the effects of FTA formation on the MNE and the local firm to show the condition that an FTA hurts both exporters. After that, we also investigate the effects on consumers and the total welfare of inside countries. To avoid unnecessary complexity,

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[21]We assume that there is no fixed cost of input relocation, for simplicity. If the input relocation incurs the fixed cost, both $\widehat{T}$ and $\widetilde{T}$ become smaller and the range of T that induces the input relocation becomes narrower. However, the qualitative nature of the results remain unchanged as long as the fixed cost is not so large such that both $\widehat{T}$ and $\widetilde{T}$ are larger than T^*.
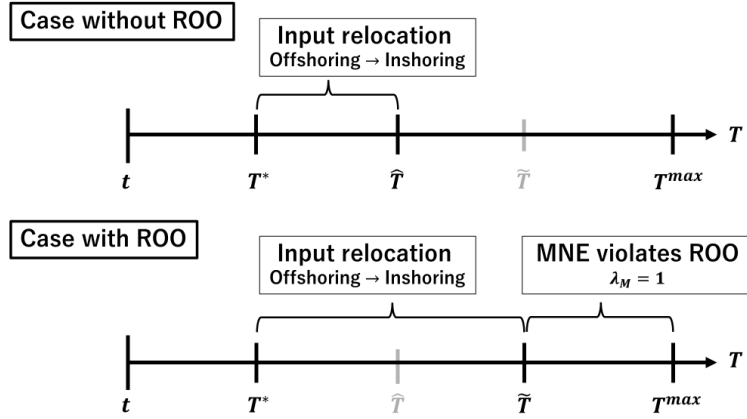
Figure 2: The MNE's input production

this section focuses on the impact of FTA formation with ROO. The welfare effects of FTA formation without ROO are discussed in Appendix A.4.

4.1 The effect on the MNE

In the presence of ROO, FTA formation can hurt the MNE. There are three cases, depending on the level of T. First, when the MNE chooses the inshoring scheme both before and after the formation of an FTA (i.e., $T < T^*$), the FTA always benefits the MNE because the MNE does not engage in tax avoidance and only the gains from tariff elimination exist. Second, when the MNE chooses the offshoring scheme both before and after the formation of an FTA (i.e., $\widetilde{T} < T$ holds), the FTA formation necessarily reduces the profits of the MNE because the MNE incurs the tariff whereas firm L takes advantage of tariff elimination.

Third, when FTA formation induces the MNE to shift from the offshoring scheme to the inshoring scheme (i.e., $T^* < T < \widetilde{T}$), it can either benefit or hurt the MNE. FTA formation with ROO decreases the MNE's profits if the tax difference is large enough. Specifically, there exists a unique threshold of T, T_M, such that $\widetilde{\Pi}^I_M = \Pi^{O*}_M$ holds, which is given by

$$T_M \equiv \frac{3-t}{2} - \frac{(1-t)(a-w+2\Delta-\tau)\sqrt{2}}{(a-w)}. \tag{15}$$

Note that $\widehat{T} < T_M < \widetilde{T}$ always holds, implying that only FTA formation with ROO can hurt the MNE.[22] As the corporate tax rate in country H gets higher, the loss from the missed opportunity of tax avoidance gets larger. Therefore, FTA formation with ROO hurts the MNE

---

[22]Because $\widehat{T} < T_M$ holds, FTA formation without ROO never hurts the MNE even if the FTA induces input relocation.

if $T > T_M$ holds and benefits the MNE otherwise. The following lemma summarizes the effects of FTA formation on the MNE's profits (see Appendix A.1 for the proof).

Lemma 1. *FTA formation with ROO hurts the MNE if the post-FTA MNE's choice is (i) not complying with ROO by choosing the offshoring scheme or (ii) complying with ROO by choosing the inshoring scheme and $T > T_M$ holds. Otherwise, it benefits the MNE.*

It is noteworthy that the MNE becomes worse off by FTA formation even if it complies with ROO and the tariff imposed on the MNE's product is eliminated. Nevertheless, the MNE prefers to comply with ROO because the tariff is also eliminated for the local firm, which is its rival in the product market. If the MNE chooses the offshoring scheme and does not comply with ROO in this situation, the MNE's profits further reduce. Therefore, the elimination of tariff on the rival firm forces the MNE to give up using transfer pricing for tax purposes, and the negative effect from paying more corporate taxes outweighs the positive effect from tariff elimination.

4.2 The effect on the local firm

When an FTA with ROO does not affect the MNE's procurement strategy (i.e., $T \leq T^*$ or $T \geq \widehat{T}$), it benefits the local firm. When it changes the MNE's location of input production (i.e., $T^* < T < \widehat{T}$), however, firm L can be negatively influenced by the FTA. This is because input relocation makes the MNE more aggressive in the product market.

The equilibrium profit of firm L is increasing in its equilibrium output. By comparing the post-FTA output ($\widehat{x}_L^I$) with the pre-FTA output (x_L^{O*}) of firm L, we have

$$\widehat{x}_L^I \leq x_L^{O*} \iff T \leq T_L \equiv 1 - \frac{(1-t)(a-w+4\Delta)}{2(a-w-2\tau)}. \tag{16}$$

We can easily confirm that $\frac{\partial T_L}{\partial \tau} < 0$ holds. As the tariff becomes lower, the positive effect from the tariff elimination becomes lower, and FTA formation that induces input relocation is more likely to hurt firm L. If the tariff is sufficiently small such that $\widetilde{T} < T_L$ holds, an FTA with ROO that induces input relocation always hurts firm L because the negative effect from the intensified competition dominates the positive effect from the tariff elimination. On the other extreme, if the tariff is high enough such that $T_L \leq T^*$ holds, an FTA with ROO always benefits firm L irrespective of the MNE's input relocation.

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In the intermediate tariff level, it depends on the level of T whether an FTA with ROO inducing input relocation benefits or hurts the local firm. If $T^* < T_L \leq \widetilde{T}$ holds, an FTA with ROO hurts the local firm if $T^* < T < T_L$ holds.[23] Otherwise, it benefits the local firm. The following lemma summarizes the effects of FTA formation with ROO on the local firm (see Appendix A.2 for the proof).

Lemma 2. *FTA formation with ROO hurts the local firm if $T^* < T < \min[\widetilde{T}, T_L]$ holds. Otherwise, it benefits the local firm.*

It is counterintuitive that FTA formation may hurt the local firm despite the presence of ROO because ROO only restrict the MNE's actions. It contrasts with previous arguments, such as those of Krishna and Krueger (1995), who state that ROO work as a "hidden protection" policy for both the domestic upstream and downstream industries. In our model, although ROO induce the MNE to procure inputs inside an FTA country where the production cost of inputs is higher, they also provoke the MNE to delegate its decision right of final good production to the downstream affiliate. Then, the MNE uses its transfer price as a commitment device to make the downstream MNE more aggressive in the product market. In other words, our model indicates that ROO magnify the pro-competitive effect of an FTA by changing the MNE's allocation of the decision rights from centralization to decentralization. Note also that the tax difference is a key to this result. If the tax difference is small, the MNE chooses the inshoring in the pre-FTA equilibrium and the change from centralization to decentralization does not occur.

Another intriguing result is that FTA formation with ROO may hurt the MNE and firm L at the same time, even though both comply with ROO and qualify for zero-tariff exports. As explained, an FTA with ROO hurts the MNE if $T > T_M$ holds, whereas it hurts the local firm if $T^* < T < \min[T_L, \widehat{T}]$ holds. Thus, an FTA with ROO hurts both firms at the same time if $T_M < T < \min[T_L, \widehat{T}]$ holds. Because an increase in τ increases T_M and decreases T_L, we have $T_M < T_L$ for a sufficiently low level of the initial tariff. Specifically, by (15) and (16), we have

$$T_L > T_M \iff \tau < \frac{(2 - \sqrt{2})(a - w)}{4}. \tag{17}$$

Figure 3 illustrates the effects of FTA formation with ROO on the firms' post-tax profits

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[23]We can derive the two cutoff levels of the tariff, $\widehat{\tau}_L$ and τ_L^*, such that $T^* < T_L \leq \widehat{T}$ holds for $\widehat{\tau}_L \leq \tau < \tau^*$. Similarly, we can derive $\widetilde{\tau}_L$ such that $T^* < T_L \leq \widetilde{T}$ holds for $\widetilde{\tau}_L \leq \tau < \tau^*$.
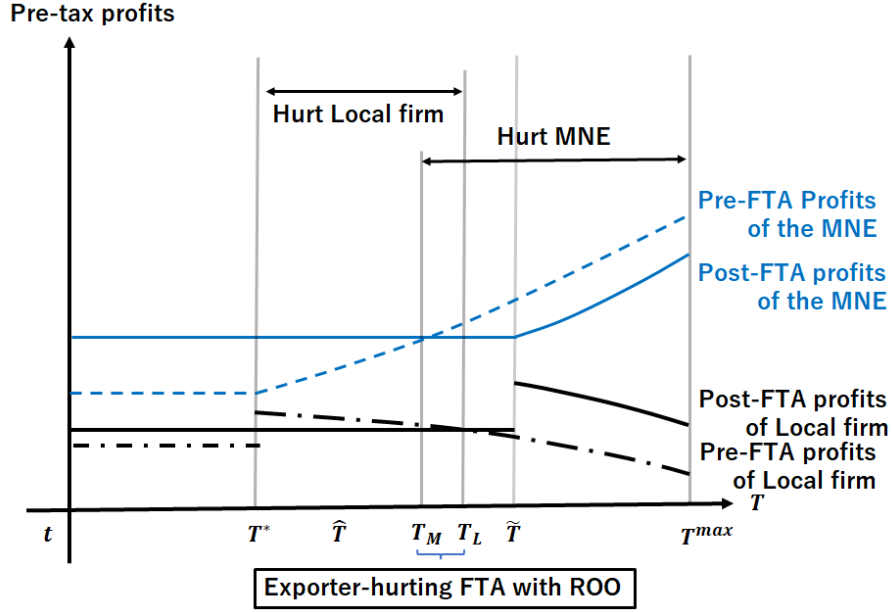
Figure 3: The effects of FTA formation with ROO on the firms' profits

when $\tau < \frac{(2-\sqrt{2})(a-w)}{4}$ holds. The blue curves represent the equilibrium profits of the MNE whereas the black curves represent those of the local firm. The solid curves depict the post-FTA profits whereas the dashed curves depict the pre-FTA profits. We can confirm that an FTA with ROO hurts both firms when $T_M < T < T_L$ holds.

Proposition 2. *FTA formation with ROO hurts both the MNE and the local firm if* $\tau < \frac{(a-w)(2-\sqrt{2})}{4}$ *and* $T_M < T < T_L$ *hold.*

This result is novel because existing studies on FTAs suggest that FTA formation benefits at least some exporting firms producing within the FTA. If we take into account the MNE's location choice and its manipulation of the transfer price, then FTA formation with ROO decreases the post-tax profits of all exporting firms, even though they comply with ROO and all tariffs are eliminated.

4.3   The effect on consumers

Here, we investigate the effect on consumers in country F where the final good is imported and consumed. For $T \leq T^*$, firm M chooses inshoring before FTA formation, and the formation of an FTA with ROO does not affect the location choice of firm M. In this case, the FTA formation always benefits consumers in country F.

For $T^* < T < \widetilde{T}$, however, the formation of an FTA with ROO induce the MNE's input

relocation, which increases the MNE's production cost of the final good. In this case, it is not obvious whether the FTA formation benefits consumers in country F. On the one hand, input relocation induced by ROO increases the MNE's marginal cost and has a negative impact on the volume of exports of the MNE. On the other hand, input relocation is accompanied by the MNE's decentralization decision, which makes the MNE more aggressive in the product market and has a positive impact on the volume of its exports. Note that the perceived marginal cost of the MNE is lower and the outputs of the MNE in the pre-FTA equilibrium are larger as the corporate tax in country H is higher. Larger total exports in the pre-FTA equilibrium implies that consumer surplus is higher, which increases the likelihood of a consumer-hurting FTA formation. Thus, we can derive a threshold denoted by $\widetilde{T}_{CS}$, such that FTA formation with ROO decreases total exports when $T > \widetilde{T}_{CS}$ holds. If the initial tariff is sufficiently low, we have $\widetilde{T} < \widetilde{T}_{CS}$ and FTA formation benefits consumers for all T in $T \in (\widehat{T}, \widetilde{T})$. We can derive the threshold of the initial tariff, $\widetilde{\tau}_{CS}$, such that $\widetilde{T} < \widetilde{T}_{CS}$ holds if $\tau < \widetilde{\tau}_{CS}$. Otherwise, $\widetilde{T} > \widetilde{T}_{CS}$ holds, and FTA formation with ROO reduces total exports and hurts consumers when $\widetilde{T}_{CS} < T < \widetilde{T}$ holds.

For $\widetilde{T} \leq T$, the MNE produces inputs in country O both before and after the formation of an FTA with ROO. In this case, the MNE does not comply with ROO, and the tariff is applied only to the MNE. Although a part of the MNE's exports are replaced by exports of the local firm that is less efficient in output production, total exports always increase and the FTA benefits consumers. The following proposition summarizes the results (see Appendix A.3 for the proof).

Proposition 3. *An FTA with ROO hurts consumers if $\tau \geq \widetilde{\tau}_{CS}$ and $\widetilde{T}_{CS} < T < \widetilde{T}$ hold. Otherwise, an FTA with ROO benefits consumers.*

Note that consumers may lose from FTA formation, even though all the exporters are eligible for tariff-free exports. The result is surprising because this happens when the initial tariff is large and the gains from tariff elimination are large. Owing to ROO, a larger tariff induces the MNE's input relocation. Input relocation increases the production cost of the MNE, because input production is less efficient in country H and the perceived marginal cost of the MNE in the pre-FTA situation is relatively large when the tax gap is in the middle range satisfying $\widetilde{T}_{CS} < T < \widetilde{T}$. Therefore, the negative effect of the increase in the marginal cost outweighs the positive effect from the tariff elimination in this case.[24]

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[24]We can confirm that an FTA with ROO never hurts consumers and all exporters at the same time. It hurts

4.4 The effect on the welfare of inside countries

This study focuses on the harmful effects of an FTA on firms and consumers. However, it is important to explore welfare effects inside countries. Even if an FTA formation negatively impacts the local firm or consumers, it can still improve the welfare of inside countries because of an increase in tax revenues. This subsection examines how an FTA changes the total welfare of inside countries and discusses whether possible negative effects on firms and consumers are consistent with countries' incentives to form an FTA.

Let W_H^s and W_F^s be the equilibrium welfare of country H and country F, respectively, in scheme s ($s \in \{I, O\}$). We exclude the MNE's profits from the welfare because the MNE is owned by residents in country O. The total welfare of the member countries is given by $W_{FTA}^s \equiv W_H^s + W_F^s$. An FTA formation is feasible if it improves W_{FTA}^s.[25]

We denote the MNE's taxable profits in country H in scheme s ($s \in \{I, O\}$) as

$$
\pi_M^s = \begin{cases} (p^O - r^O - \lambda_M^O \tau) x_M^O = 0, \\ (p^I - w - \lambda_M^I \tau) x_M^I = \frac{\{a - w - (2\lambda_M^I - \lambda_L)\tau\}^2}{8}. \end{cases}
$$

Then, the equilibrium welfare of country H in scheme s is given by $W_H^s = \pi_L^s + T\pi_M^s$ whereas that of country F is $W_F^s = CS_F^s + TR_F^s$, where $CS_F^s \equiv \frac{(x_L^s + x_M^s)^2}{2}$ is the consumer surplus in country F and $TR_F^s \equiv \tau (\lambda_L x_L^s + \lambda_M^s x_M^s)$ is the tariff revenue in country F.

There are three notable cases regarding the welfare effects of an FTA with ROO. Online Appendix C.2 provides the detailed computation. First, when $T \leq T^*$ holds, firm M always procures inputs from country H. In this case, FTA formation may worsen the total welfare inside the FTA. This happens when tariff is low $\left(\tau < \frac{2(a-w)}{13}\right)$ and the corporate tax gap is small $\left(T < \min[T_W^I, T^*]\right)$. When τ is high, consumers' and firm L's gains from tariff elimination are huge, and these gains dominate the welfare loss from not collecting tariff revenues. When τ is low, however, these gains are relatively small compared to the tariff revenue losses. Government H can collect more tax revenues from the MNE and cover the decline in tariff revenues by an increase in tax revenues only when the corporate tax rate in H is high.

Second, when $T > \tilde{T}$ holds, firm M prefers offshoring before and after the formation of an

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consumers when τ is sufficiently large but hurts exporters when τ is sufficiently small and these ranges of τ do not overlap. Thus, our model predicts that an FTA with ROO is more likely to hurt exporters as the initial tariff becomes lower and hurt consumers as it becomes higher.

[25]We suppose that member countries can arrange transfers of welfare with the FTA formation, which can be done by making mutual concessions in other sectors.

FTA, the total welfare inside the FTA necessarily increases. In this case, country F can collect tariff revenues from firm M even after the FTA is in effect because firm M cannot comply with ROO under offshoring. Besides that, the local firm earns more profits with the FTA because it faces no tariff while the rival firm faces it. In other words, the FTA has the rent-shifting effect from firm M to firm L. Due to these effects, an FTA with ROO improves the total welfare inside the FTA under a wide corporate tax rate gap. The following proposition summarizes the welfare effect without input relocation.

Proposition 4. *When $t < T \leq T^*$ or $\tilde{T} < T < T^{max}$ holds, with which an FTA formation with ROO does not change the location of the MNE, the FTA formation worsens total welfare of the member countries if $\tau < \frac{2(a-w)}{13}$ and $T < \min[T_W^I, T^*]$ hold. Otherwise, it increases the total welfare inside the FTA.*

Third, when $T^* < T \leq \tilde{T}$ holds, an FTA formation with ROO induces the MNE to relocate its input production from an outside country to an inside FTA country. In this case, the FTA formation increases the tax revenues inside the FTA because the MNE no longer uses its transfer price to avoid the high tax. Since all firms comply with ROO, the FTA countries lose tariff revenues. Concerning consumers and the local firm, the FTA formation either benefits or hurts them, as Propositions 2 and 3 suggest. Therefore, the welfare effect with input relocation is compliated.[26] We can show, however, that an FTA with ROO improves the total welfare of the member countries if $T^* < T \leq \hat{T}$ holds. In this range of T, an FTA formation induces the MNE's input relocation irrespective of the presence of ROO and ensures the consumers' and the local firm's gains from the FTA formation. The following proposition summarizes the welfare effect with input relocation.

Proposition 5. *When $T^* < T \leq \tilde{T}$ holds, with which an FTA formation with ROO changes the location of the MNE , the FTA formation improves total welfare of the member countries if $T^* < T \leq \hat{T}$ holds.*

Although our welfare analysis focused on the case with ROO, it is notable to compare the cases with and without ROO to understand the role of ROO for the feasibility of an FTA. As Lemma 4 of Appendix A.4 suggested, an FTA formation without ROO can reduce the total welfare if the gap of corporate tax rates is wide enough and firm M choose offshoring after the formation of an FTA. The reason why an FTA formation without ROO worsens welfare is

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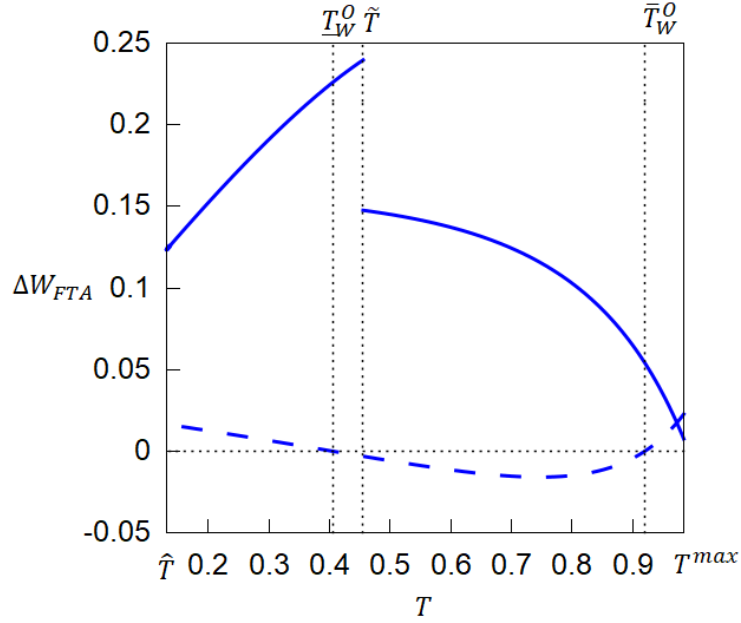[26]See Online Appendix C.2 for detailed calculation.

Figure 4: The effect of FTA formation on the welfare of FTA countries

a certain extent of welfare gains is accrued by firm M. Since firm M is more aggressive than firm L in supplying its goods due to lower input procurement costs and/or a lower perceived marginal cost, the welfare gains of FTA are transmited largerly to the MNE under a wide gap of corporate tax rates and a large technological advantage of input production in country O. We can show that ROO make an infeasible FTA without ROO a feasible one.

Figure 4 provides a numerical example illustrating an FTA's welfare impacts with and without ROO.[27] The figure focuses on the case with $\widehat{T} < T < T^{Max}$, where, in the absence of ROO, firm M chooses offshoring irrespective of an FTA formation.[28] The dotted curve depicts the change in total welfare without ROO whereas the solid curves represent changes with ROO. In this range of T, the MNE always shifts all the taxable profits in country H to country O, and a higher T increases the profits of the MNE due to a decrease in the perceived marginal cost. The resulting increase in the MNE's sales is more likely to reduce the total welfare inside the FTA as T approaches $\widetilde{T}$. However, with a sufficiently large T, the negative effect can be covered by a large increase in total exports because part of the output supplies is shifted from the less productive local firm to the more productive MNE.

ROO transform an infeasible FTA into a feasible one. First, when $\widehat{T} < T \leq \widetilde{T}$ holds, the

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[27]In Figure 4, the parameters are set at $a = 3$, $w = 1$, $t = 0.1$, $\Delta = 1/32$ and $\tau = 1/4$.

[28]ROO do not change the equilibrium outcome nor the welfare property of FTA formation when $T \leq \widehat{T}$ holds, but ROO change them when $\widehat{T} < T$ holds.

MNE relocates input production with ROO, whereas it does not without ROO. As the entire tax base of the MNE remains in country H, the total welfare increases because of the increased tax revenues from the MNE. Second, when $\widetilde{T} < T$ holds, the MNE produces inputs outside the FTA, and it does not use an FTA tariff with ROO. The profit of the local firm increases because only the local firm enjoys tariff-free exports. Besides that, country F collects tariff revenues from the MNE. Because of these positive effects, an FTA formation with ROO increases the total welfare even if an FTA formation without ROO decreases it. Therefore, ROO can make an infeasible FTA feasible.[29]

5 Conclusion

Trade liberalization usually benefits exporting firms and consumers. However, the effects of FTAs are much more complicated than they seem when ROO affect location choices of exporting firms for input production. This study considered a situation where a vertically integrated MNE manipulates its transfer price either to avoid a high corporate tax or to increase the downstream affiliate's competitiveness in the product market. The decision rights of the MNE are centralized in the former case and decentralized in the latter case.

FTA formation can induce the MNE to relocate input production to inside an FTA country and delegate its output decisions to the downstream affiliate because the strategic motive of transfer pricing becomes more important than the tax-avoidance motive. In this case, both the local firm and MNE can lose from FTA formation, even if the tariffs imposed on them are eliminated. The local firm suffers from the FTA formation because the MNE becomes more aggressive in the product market. The MNE suffers from the FTA because it pays a high tax.

FTA formation with ROO can also decrease total exports within the FTA and hurt consumers of the importing country, even though all firms comply with ROO and all tariffs are eliminated. This is because input relocation increases the MNE's production cost and the negative effect from the increased marginal cost can outweigh the positive effect from the tariff elimination.

These results provide important policy implications amid the real-world prevalence of

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[29]Mukunoki and Okoshi (2021b) also shows that ROO argument tax revenues from the MNE and make an infeasible FTA feasible. In addition to the increased tax revenues, this study suggests that the ROO has a role in recovering the local firm's profit by preventing the MNE from using a preferential tariff. In other words, the presence of the local firm in the current model makes the negative welfare effect of an FTA formation without ROO more likely.

intra-firm trade and export-platform FDIs. Policymakers should note that, even if firms comply with ROO and make tariff-free exports, an FTA does not always benefit these firms or consumers when the MNEs manipulate their transfer prices. Besides that, although Felbermayr et al. (2019) conclude that there is no rationale for having ROO because tariff circumvention is usually not profitable, our model suggests that ROO work as a tool to prevent *tax* circumvention, if not *tariff* circumvention.

We showed some novel results concerning the effects of an FTA formation with ROO, but there remains scope for further research. We assumed that tax rates are exogenously given. It is intriguing to investigate how tax competition among countries affects the welfare effects of an FTA formation. The MNE's home country outside an FTA region has no incentive to impose a positive cooperate tax, because the tax is pure transfer from the MNE to the government and a lower tax reduces the perceived marginal costs of the MNE. In contrast, a host country in the FTA region has an incentive to collect tax revenues from the MNE or block the MNE's relocation by imposing a positive tax. An FTA formation gives member countries a location advantage, increasing the host country's incentive to collect tax revenues from the MNE. Therefore, the equilibrium tax rates will still be higher in FTA countries, even if countries endogenously set corporate taxes. However, the welfare effects will become more complicated than the current study. Besides that, examining the effects of regulations on transfer pricing, such as the arm's length principle, in this setting will also be a possible extension. Furthermore, empirical investigations into the relationship between ROO and transfer pricing will be essential to strengthen the real-world relevance of our results.

Appendix

A.1 Proof of Lemma 1

The comparison of supplies is equivalent to that of post-tax profits if the MNE's input location is unaffected by FTA formation. The equilibrium supplies of firms are given by

$$
x_M^s = \begin{cases} \frac{a - w - (2\lambda_M - \lambda_L)\tau}{2} & \text{when inshoring} \\[2mm] \frac{(1-t)\{a - w + 2\Delta - (2\lambda_M - \lambda_L)\tau\}}{3 - 2T - t} & \text{when offshoring} \end{cases},
\tag{a1}
$$

$$
x_L^s = \begin{cases} \frac{a - w - (3\lambda_L - 2\lambda_M)\tau}{4}, & \text{when inshoring} \\[2mm] \frac{(1-T)(a-w) - (1-t)\Delta - \{(1-T)\lambda_L - (1-t)(\lambda_L - \lambda_M)\}\tau}{3 - 2T - t} & \text{when offshoring} \end{cases}.
\tag{a2}
$$

When an FTA does not affect the MNE's location of input production, tariff elimination clearly increases these supplies, and equivalently, the post-tax profits of both firms. This means that the total supply also increases. When $T^* \leq T \leq \widehat{T}$ holds, the MNE changes the country of input production from country O to country H. The change in the MNE's post-tax profits is computed by using (a1), which is given by

$$
\widehat{\Pi}_M^I - \Pi_M^{O*} \propto \widehat{x}_M^I - \sqrt{2} x_M^{O*} = \frac{a-w}{2} - \frac{(1-t)(a-w+2\Delta-\tau)\sqrt{2}}{3-2T-t} \gtreqless 0
$$

$$
\iff T \lesseqgtr \frac{3-t}{2} - \frac{(1-t)(a-w+2\Delta-\tau)\sqrt{2}}{a-w} \equiv T_M.
$$

A.2 Proof of Lemma 2

When an FTA formation induces firm M to change its input procurement schemes from offshoring to inshoring, the amount of supplies by the local firm decreases if and only if

$$
\widehat{x}_L^I = \frac{a-w}{4} > \frac{(1-T)(a-w-\tau) - (1-t)\Delta}{3-2T-t} = x_L^{O*} \iff T > 1 - \frac{(1-t)(a-w+4\Delta)}{2(a-w-2\tau)} \equiv T_L
$$

holds.

By subtracting T_L from $\widetilde{T}$, we have

$$
\widetilde{T} - T_L \propto \frac{a - w - \tau + 2\Delta}{a - w - 2\tau} - \frac{(a - w - 2\tau + 2\Delta)\sqrt{2}}{a - w} \geq 0 \iff \tau \geq \widetilde{\tau}_L,
$$

where $\quad \widetilde{\tau}_L \equiv \dfrac{\left(4\sqrt{2} - 1\right)(a-w) + 4\Delta\sqrt{2} - \sqrt{\left(8\sqrt{2}+1\right)(a-w)^2 + 8\left(4+3\sqrt{2}\right)(a-w)\Delta + 32\Delta^2}}{8\sqrt{2}}.$

Therefore, $\widetilde{T} \geq T_L$ holds if and only if $\tau \geq \widetilde{\tau}_L$ holds. An FTA formation with ROO hurts firm L when $T^* < T < \min[\widetilde{T}, T_L]$ holds.

A.3 Proof of Proposition 3

As ROO are redundant when $T < \widehat{T}$ holds and it is obvious that an FTA formation increases consumer surplus, we investigate the case of $\widehat{T} < T < \widetilde{T}$ and that of $\widetilde{T} < T$, respectively. When an FTA formation changes the MNE's production location, we have

$$\left(\widehat{x}_M^I + \widehat{x}_L^I\right) - \left(x_M^{O*} + x_L^{O*}\right) = \frac{3(a-w)}{4} - \frac{(2-T-t)(a-w-\tau) + (1-t)\Delta}{3-2T-t} > 0$$

$$\Longleftrightarrow \quad T < 1 - \frac{(1-t)\{a-w-4(\tau-\Delta)\}}{2(a-w+2\tau)} \equiv \widetilde{T}_{CS}.$$

Therefore, when $\widehat{T} < T < \widetilde{T}$ holds, the FTA increases total exports under regime I if and only if $T < \widetilde{T}_{CS}$ holds. We have

$$\widetilde{T} - T_{CS} = \frac{a-w-\tau+2\Delta}{a-w+2\tau} - \frac{(a-w+2\Delta-2\tau)\sqrt{2}}{a-w}$$

$$\propto -(\sqrt{2}-1)(a-w)(a-w+2\Delta) - \left(a-w+4\Delta\sqrt{2}\right)\tau + 4\tau^2\sqrt{2}.$$

$\widetilde{T} - T_{CS}$ takes the minimum value at $\tau = \frac{a-w+4\Delta\sqrt{2}}{8\sqrt{2}}$, which is negative. Furthermore, $\widetilde{T} - T_{CS}$ is maximized at either $\tau = 0$ or $\tau = \min\left\{\frac{a-w+2\Delta}{2}, a-w-\left(\frac{1-t}{1-T}\right)\Delta\right\}$. It is negative at $\tau = 0$. Besides that, we have

$$\frac{a-w-4\Delta\sqrt{2}}{8\sqrt{2}} < \min\left\{\frac{a-w+2\Delta}{2}, a-w-\left(\frac{1-t}{1-T}\right)\Delta\right\} \equiv \tau^{max}.$$

When $T \leq \frac{a-w-2(2-t)\Delta}{a-w-\Delta}$ holds, we have $\tau^{max} = \frac{a-w+2\Delta}{2}$, at which

$$\left(\widetilde{T} - \widetilde{T}_{CS}\right)\Big|_{\tau=\frac{a-w+2\Delta}{2}} = \frac{(a-w)(a-w+2\Delta)}{2} > 0.$$

This implies that there exists a unique threshold, $\widetilde{\tau}_{CS}$, such that $\widetilde{T} - \widetilde{T}_{CS} > 0$ holds for $\tau > \widetilde{\tau}_{CS}$. By definition, $\frac{a-w+2\Delta}{2} = a-w-\left(\frac{1-t}{1-T}\right)\Delta$ holds at $T = \frac{a-w-2(2-t)\Delta}{a-w-\Delta}$, and thus $\widetilde{T} - \widetilde{T}_{CS}\Big|_{\tau=a-w-\left(\frac{1-t}{1-T}\right)\Delta} > 0$ also holds when T is close to $T = \frac{a-w-2(2-t)\Delta}{a-w-\Delta}$. Specifically, the

threshold is calculated as

$$\widetilde{T} > \widetilde{T}_{CS} > 0 \iff \tau > \widetilde{\tau}_{CS},$$

$$\text{where} \quad \widetilde{\tau}_{CS} = \frac{a - w + 4\Delta\sqrt{2} + \sqrt{(33 - 8\sqrt{2})(a - w)^2 + 8(8 - 3\sqrt{2})(a - w)\Delta + 32\Delta^2}}{8\sqrt{2}}.$$

Therefore, an FTA with ROO hurts consumers when $\widetilde{T}_{CS} < T < \widetilde{T}$ holds, which is the case when $\tau > \widetilde{\tau}_{CS}$ holds. When $\widetilde{T} < T$ holds, tariff elimination is applied only to the local firm. Then, FTA formation benefits consumers because it increases the total supply.

$$\left(\widetilde{x}_M^O + \widetilde{x}_L^O\right) - \left(x_M^{O*} + x_L^{O*}\right) = \frac{(1 - T)\tau}{3 - 2T - t} > 0.$$

A.4 The welfare effect on inside countries without ROO

In this appendix, we summarize the welfare effects of an FTA without ROO. We explore the effects on firm M, firm L, and consumers in the first part of this appendix. Then, we examine the effect on the total welfare in the second part. The following lemma summarizes the first part.

Lemma 3. *FTA formation without ROO always benefits the MNE and consumers in a foreign country. FTA formation hurts the local firm if $T^* < T < \min[\widehat{T}, T_L]$ holds without ROO and if $T^* < T < \min[\widetilde{T}, T_L]$ holds with ROO. Otherwise, it benefits the local firm.*

In the absence of ROO, FTA formation always benefits the MNE. It is obvious that an FTA favors the MNE when it does not change the MNE's procurement strategy because only the gains from tariff elimination exist. When the MNE relocates its input production, it loses an opportunity to save on tax payments. Nevertheless, we have $\widehat{T} < T_M$, implying that an FTA formation always benefits the MNE without ROO. Therefore, the gains from the magnified strategic effect exceed the loss of the tax-saving opportunity in the absence of ROO.

It is ambiguous whether FTA formation benefits firm L. When an FTA without ROO does not affect the MNE's procurement strategy (i.e., $T \leq T^*$ or $T \geq \widehat{T}$), it benefits the local firm. When it changes the MNE's location of input production (i.e., $T^* < T < \widehat{T}$), however, firm L can be negatively influenced by the FTA. This is because input relocation makes the MNE more aggressive in the product market.

The equilibrium profit of firm L is increasing in its equilibrium output. Similarly to the

computation in Appendix A.2, we have $\widehat{x}_L^I \leq x_L^{O*}$ if and only if $T \leq T_L$. By comparing T_L with T^* and $\widehat{T}$, we have

$$\widehat{T} - T_L = (1-t)\left\{\frac{a - w - \tau + 2\Delta}{a - w - 2\tau} - \frac{(a - w + 2\Delta)\sqrt{2}}{a - w}\right\} \gtreqless 0$$

$$\iff \tau \gtreqless \frac{(\sqrt{2}-1)(a-w)(a-w+2\Delta)}{(2\sqrt{2}-1)(a-w)-4\Delta} \equiv \widehat{\tau}_L, \quad \text{and}$$

$$T^* - T_L = (1-t)\left\{\frac{a - w - \tau + 2\Delta}{a - w - 2\tau} - \frac{(a - w + 2\Delta - \tau)\sqrt{2}}{a - w - \tau}\right\} \gtreqless 0$$

$$\iff \tau \gtreqless \left(\frac{\sqrt{2}-1}{2\sqrt{2}-1}\right)(a-w) \equiv \tau_L^*.$$

We can confirm that $\widehat{\tau}_L < \tau_L^*$ holds. Therefore, FTA formation hurts firm L when $T^* \leq T \leq T_L$ holds with $\widehat{\tau}_L < \tau < \tau^*$, or when $T^* \leq T \leq \widehat{T}$ holds with $\tau \leq \widehat{\tau}_L$.

Let us consider the effects on consumers hereafter. From (a1) and (a2), it is obvious that total exports increase when an FTA does not change the MNE's location of input production. Moreover, as shown in Appendix A.3, if an FTA formation changes the MNE's production location of inputs, $\left(\widehat{x}_M^I + \widehat{x}_L^I\right) - \left(x_M^{O*} + x_L^{O*}\right) > 0$ holds if and only if $T < \widetilde{T}_{CS}$ holds. By subtracting $\widetilde{T}_{CS}$ from $\widehat{T}$, we have

$$\widetilde{T}_{CS} - \widehat{T} = (1-t)\left(\frac{(a - w + 2\Delta)\sqrt{2}}{a - w} - \frac{a - w - \tau + 2\Delta}{a - w + 2\tau}\right).$$

Because the second term in the above equation is decreasing in τ, $\widetilde{T}_{CS} - \widehat{T}$ is minimized at $\tau = 0$. At $\tau = 0$, we have $\widetilde{T}_{CS} - \widehat{T} = (1-t)(\sqrt{2}-1)\left(\frac{a-w+2\Delta}{a-w}\right) > 0$. Therefore, $\widehat{T} < T_{CS}$ always holds, which means that an FTA formation always benefits consumers in country F in the absence of ROO.

A.4.1 Total welfare inside member countries

First, we show that FTA formation without ROO can worsen the total welfare of the member countries. When $T < T^*$ holds, the MNE produces inputs in country H, regardless of FTA formation. In this case, although FTA formation increases the consumer surplus and profit of the local firm, the loss of tariff revenues exceeds these benefits if $\tau < \frac{2(a-w)}{13}$ holds. This is because, under imperfect competition, a tariff has a strategic role to shift profits from the foreign firm to the welfare of the importing country as tariff revenue. The strategic effect

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tends to be relatively larger as the tariff becomes smaller. As the MNE pays a corporate tax in country H, the net negative effect on $\pi_L^I + CS_F^I + TR_F^I$ is covered by increases in tax payments, $T\pi_M^I$ when T is large. Thus, under $T < T^*$, FTA formation without ROO decreases the total welfare of the member countries if $\tau < \frac{2(a-w)}{13}$ and $T < T_W^I$ hold, where $T_W^I \equiv \frac{2(a-w)-13\tau}{4\{2(a-w)-\tau\}}$ is the threshold level of T. Note that T_W^I can be higher or lower than T^*. If $\tau < \frac{2(a-w)}{13}$ and $T^* \leq T_W^I$ hold, FTA formation without ROO always worsens the welfare of the FTA countries.

Another possible effect of a welfare-reducing FTA occurs when $\widehat{T} < T$ holds and the MNE produces inputs in country O before and after FTA formation. In this case, the MNE always shifts all the taxable profits in country H to country O, and a higher T increases the profits of the MNE due to a decrease in the perceived marginal cost. The resulting increase in the MNE's sales is more likely to reduce the total welfare inside the FTA as T approaches $\widetilde{T}$. However, with a sufficiently large T, the negative effect can be covered by a large increase in total exports because a part of the output supplies is shifted from the less productive local firm to the more productive MNE. Given that $\tau < (a-w) + 2\Delta - \sqrt{\frac{2(a-w)^2 + 10(a-w)\Delta + 11\Delta^2}{3}}$ holds such that consumer gains from tariff elimination are not large, we can derive the two thresholds, $\underline{T}_W^O$ and $\overline{T}_W^O$, such that FTA formation without ROO decreases the total welfare of the member countries if $\underline{T}_W^O < T < \overline{T}_W^O$ holds. We can confirm that $\widehat{T} < \overline{T}_W^O$ always holds, but it is ambiguous whether $\underline{T}_W^O$ is higher or lower than $\widehat{T}$.

When $T^* < T < \widehat{T}$ holds, FTA formation induces the input relocation of the MNE. It seems that FTA formation can be welfare-reducing because of the loss of tariff revenue and possible loss of the local firm. In the absence of ROO, however, we confirm that an FTA with input relocation improves the total welfare because country H collects tax revenue from the MNE, and this positive revenue effect outweighs possible negative effects. The following lemma summarizes the welfare effect for FTA countries in the absence of ROO (see Online Appendix C.1 for the proof).

Lemma 4. *In the absence of ROO, FTA formation worsens the total welfare of member countries when (i) $\tau < \frac{2(a-w)}{13}$ and $T < \min[T_W^I, T^*]$ hold or (ii) $\tau < (a-w) + 2\Delta - \sqrt{\frac{2(a-w)^2 + 10(a-w)\Delta + 11\Delta^2}{3}}$ and $\max[\underline{T}_W^O, \widehat{T}] < T < \overline{T}_W^O$ hold. Otherwise, an FTA improves the total welfare.*

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