Online Appendix for "Wake Not a Sleeping Lion: Free Trade Agreements and Decision Rights in Multinationals"

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B Discussion

Our analysis has provided new results that have not been explored in the extant literature. In this section, we argue the robustness of these results by relaxing the assumption on the transfer pricing costs made in the benchmark model. We also provide the proof of Lemma 4 and Propositions 4 and 5.

B.1 Concealment costs for transfer price manipulation

In the benchmark model, there is no cost of manipulating the transfer price. In practice, MNEs need to explain the plausibility of transfer pricing in order to shift profits across country. This concealment cost should increase as MNEs shift more profits because explaining the reasons for the greater deviation from the "appropriate price" (or arm's length price) becomes more difficult. Here, we show that introducing a concealment cost of transfer pricing does not change the main results.

Following the literature on transfer pricing, we introduce the following quadratic concealment cost in the case of offshoring:

$$C(r^O) = \frac{\delta\{r^O - (w - \Delta)\}^2}{2},$$

where δ is a parameter that captures the difficulty of concealing tax avoidance. A higher δ corresponds to a more difficult environment of profit shifting owing to, for example, a well-enforced tax code by authorities. In the case of inshoring, the MNE does not incur the cost of profit shifting. The introduction of the concealment cost does not influence the MNE's actions under the inshoring scheme. Therefore, we can focus on the effect of introducing a concealment cost under the offshoring scheme. The modified post-tax profits are given by

$$\begin{aligned}\Pi_M^O &= (1-t)[\{r^O - (w - \Delta)\}x_M^O] + (1-T)[(p - r^O - \lambda_M \tau)x_M^O] - C(r^O) \\ &= (1-T)(p - c_M^O)x_M^O - C(r^O). \qquad (1)\end{aligned}$$

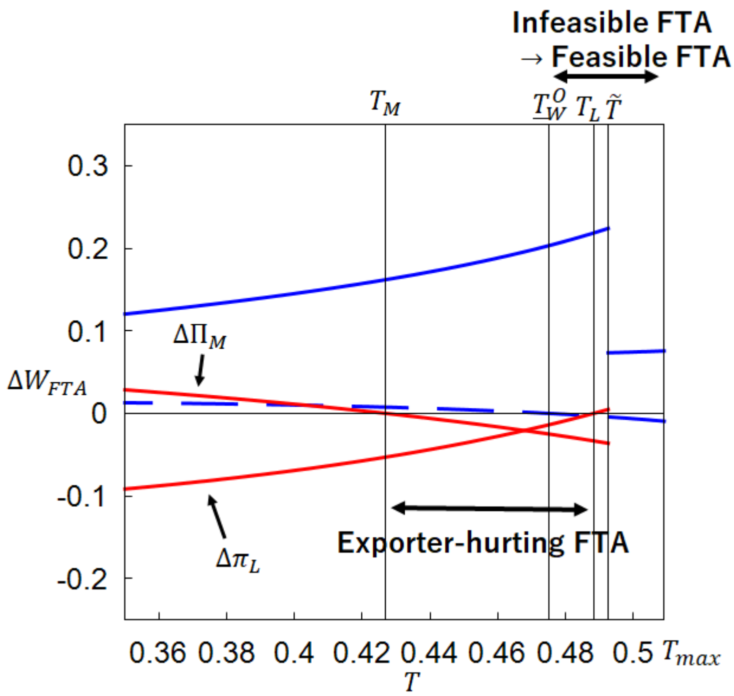

Figure B.1: The effects of FTA formation with a concealment cost

Unlike the benchmark case, the cost of profit shifting may prevent the MNE from shifting all the profits.[1]

Figure B.1 illustrates a numerical example of the case with the concealment cost, where the dotted curve depicts the change in total welfare without ROO and the solid curves represent the ones with ROO.[2] We can obtain qualitatively the same results as the benchmark analysis, though the upper bound of the thresholds, $\overline{T}_W^O$, disappears in this extended analysis. Therefore, the main findings in the benchmark analysis remain unchanged even if we consider the cost of profit shifting.

B.2 The allocation of decision rights

In the baseline model, we suppose that the MNE chooses the centralization of its decision rights when it chooses the offshoring scheme, while the MNE chooses the decentralization when it chooses the inshoring scheme. Here, we explain the reason why the MNE makes these choices.

In the inshoring scheme, the MNE cannot use the transfer price to avoid a high tax in

[1] As the amount of shifted profits depends on the parameter δ, a partial profit shifting occurs with the concealment cost if the tax in country H, T, is less than the level that either makes the local firm's supplies to be zero ($x_L^O = 0$) or shifts the entire tax base of the MNE to country O ($\pi_M^O = 0$).

[2] The parameters are set at $a = 3$, $w = 1$, $t = 0.1$, $\Delta = 1/32$, $\tau = 1/8$, and $\delta = 1$ in Figure B.1.

country H. The MNE's overall profit under the decentralized decision-makings is always larger than that under the centralized decision-making because the MNE is able to manipulate the transfer price for the strategic motive in the former case. Therefore, the MNE always chooses the decentralization whenever it chooses the inshoring scheme.

In the offshoring scheme, if the MNE chooses the decentralization, it can use the transfer price for both the tax-avoidance motive and the strategic motive. Then, the MNE strikes the balance between the two motives and sets the transfer price as

$$r^{OD} = w - \Delta + \{a - w + 2\Delta - (2\lambda_M^I - \lambda_L)\tau\}\left[\frac{3(T-t)}{2\{3(1-t) - 2(1-T)\}} - \frac{1}{4}\right]. \tag{B1}$$

The first-term of the last parenthesis reflects the tax-avoidance motive, while the second-term reflects the strategic motive. By using (B1), we can calculate the overall profit of the MNE under the offshoring scheme with decentralization, which is denoted by Π_M^{OD}. If the MNE chooses the centralization under the offshoring scheme as in the benchmark model, it manipulates the transfer price solely for the tax-avoidance motive, and its overall profit is given by Π_M^O. By comparing Π_M^O with Π_M^{OD}, we have

$$\Pi_M^O \geq \Pi_M^{OD} \iff T \geq T^{OD} \equiv \frac{5(1+t) - 2(1-t)\sqrt{5}}{10}.$$

The MNE chooses the centralization in the offshoring scheme unless the tax gap is small enough. We can confirm that there are a range of parameter values under which T^{OD} is smaller than T^M, $\tilde{T}_{CS}$, and $\underline{T}_W^O$. Therefore, the main results of the baseline model, such as an exporter-hurting FTA and a consumer-hurting FTA, remain unchanged even if we consider a possibility that the MNE can choose the decentralization under the offshoring scheme.

B.3 The timing of setting transfer price

In the benchmark model, we assumed that the MNE's decision to set the input price is earlier than that of quantity setting. The pre-commitment of the input price along with the delegation of decision rights to the downstream affiliate generates more profits for the MNE under the inshoring scheme because of the strategic effect. Under the offshoring scheme, however, the MNE may earn more profits by setting quantity first and then adjusting its transfer price to avoid a high tax.

If the timing of setting the transfer price and that of setting quantity are reversed, the post-tax profit is a standard duopoly profit taxed with a corporate tax rate in country O, $\Pi_M^{O,NC} = (1-t)\left(\frac{a+c_L-2(w-\Delta+\lambda_M^O\tau)}{3}\right)^2$. Therefore, we can derive the condition under which price commitment is more profitable than quantity commitment for the MNE:

$$\Pi_M^O - \Pi_M^{O,NC} \geq 0 \iff T \leq \frac{3-t}{4}.$$

Hence, as long as the tax rate in the high-tax country, T, is sufficiently low, the MNE chooses the timing of the game in the benchmark model, even if the timing of moves is endogenously determined.

B.4 Home market

We assumed that the final product is consumed only in country F in the benchmark model. Here, we discuss how the results are affected by considering the market in country H. For simplicity, suppose that the market size of country H is the same as that of country F. We keep the other assumptions that the MNE establishes a single plant in either country O or H and cannot report negative profits in each country.

We also assume that the production process in one plant cannot be separated depending on the destination of the products. This is because it is highly costly for the MNE to adjust production processes depending on the destination of the goods. Therefore, it is impossible for the MNE to procure local inputs to comply with ROO and at the same time use the inputs produced outside the FTA only for the domestic supply of the product.

The optimal transfer price under offshoring is the one such that $(p_H - r)x_{MH}^O + (p_F - r - \lambda_M^O\tau)x_{MF}^O = 0$ holds, whereas the first-order condition of profit maximization provides the optimal internal price under inshoring. We put the subscript HM in the presence of the home market. No subscript corresponds to the benchmark case. We have the following rankings of the input prices.

$$\tilde{r}_{HM}^I = \tilde{r}^I < r_{HM}^{I*} < r^{I*},$$
$$\hat{r}^O < \tilde{r}_{HM}^O < r^{O*} < r_{HM}^{O*} < \hat{r}_{HM}^O = \hat{r}^O,$$

In the inshoring scheme, the pre-FTA level of the input price is lower in the presence of the home market ($r_{HM}^{I*} < r^{I*}$). Because a tariff is incurred in supplying to country H, the strategic effect of the input-price adjustment is larger in the market of country H than that of country F. If the MNE could discriminate its input prices across the markets, the input price set for the market of country H would be lower in the presence of the home market. Therefore, the uniform input price is lower with the home market. After the FTA formation, tariff is eliminated, and the market size of both countries becomes the same. Therefore, the input price with the home market is the same as that without it ($\tilde{r}^I = \tilde{r}^I_{HM}$).

In the offshoring scheme, the input price with the home market is the same as the benchmark case after FTA formation without ROO ($\tilde{r}^O_{HM} = \tilde{r}^O$). Because the effective market size is the same in the two countries, the transfer price realizing zero profit in country H remains unchanged. After FTA formation with ROO, the MNE faces a tariff in country F, and the effective market size is larger in country H. Therefore, even if the MNE's profit from exporting to country F is zero at $r = \tilde{r}^O$, the overall profits of the downstream affiliate of the MNE are still positive because the MNE earns a positive profit from the home market in country H. Then, the MNE sets a higher transfer price ($\tilde{r}^O < \tilde{r}^O_{HM}$), such that a positive profit in country just covers a negative profit in country H. For the same reason, the MNE sets a higher transfer price before FTA formation ($r^{O*} < r^{O*}_{HM}$).

Thus, if we introduce home market competition, the MNE's incentive to manipulate the input price gets stronger in both the inshoring and offshoring schemes. Still, the main results of the benchmark hold. Because of the analytical complication, we present a numerical example to confirm the robustness of the main results. Figure B.2 shows that we have the same welfare property as the benchmark case shown in Figure **??**. The dotted curve depicts the change in total welfare without ROO and the solid curves represent that with ROO. As in the benchmark model, ROO transform an infeasible FTA into a feasible one for $T \in [\underline{T}^O_W, \overline{T}^O_W]$.[3] Furthermore, two additional curves are depicted in Figure B.2. The downward curve represents how FTA formation with ROO changes the post-tax profits of the MNE, whereas the upward curve illustrates how it changes the pre-tax profits of the local firm. Therefore, even if we consider the home market, FTA formation with ROO can hurt both the MNE and the local firm.

[3]In Figure B.2, the parameters are set at $a = 3$, $w = 1$, $t = 0.05$, $\Delta = 1/32$, and $\tau = 1/4$.

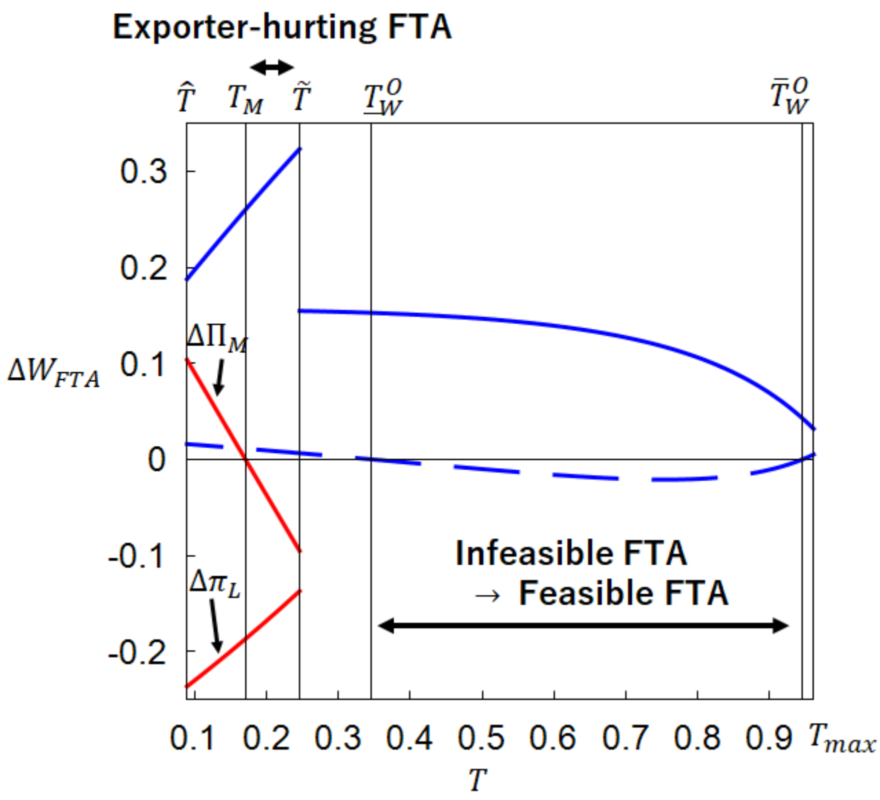

Figure B.2: The effects of FTA formation with home market competition

C Proofs of Lemma 4 and Proposition 4

Here, we provide the proofs of Lemma 4 and Proposition 4.

C.1 Proof of Lemma 4

Suppose that ROO are absent. When $T < T^*$ holds, the effect of FTA formation on the total welfare of member countries is given by

$$\widehat{W}^I_{FTA} - W^{I*}_{FTA} = \frac{\tau}{32}\left((11+4T)(2(a-w)-\tau) - 24(a-w-\tau)\right).$$

If $\tau \geq \frac{2(a-w)}{13}$ holds, we have $\widehat{W}^I_{FTA} \geq W^{I*}_{FTA}$ irrespective of the level of T. If $\tau < \frac{2(a-w)}{13}$ holds, however, the sign of $\widehat{W}^I_{FTA} - W^{I*}_{FTA}$ depends on T. We can calculate that

$$\widehat{W}^I_{FTA} \gtreqless W^{I*}_{FTA} \iff T \gtreqless T^I_W \equiv \frac{2(a-w)-13\tau}{4\{2(a-w)-\tau\}}$$

holds. Because T^I_W can be either higher or lower than T^*, FTA formation worsens the total welfare if $\tau < \frac{2(a-w)}{13}$ and $T < \min[T_W^I, T^*]$ hold.

When $\widehat{T} < T$ holds, the welfare effect of FTA formation becomes

$$\widehat{W}_{FTA}^O - W_{FTA}^{O*} = \frac{\tau\left\{-2(1-T)\{(T-t)(a-w)+3\Delta(1-t)\} + (t^2+T^2+4Tt-6t-6T+6)\tau\right\}}{2\{1-t+2(1-T)\}^2}.$$

We can obtain the threshold level of T, $\underline{T}_W^O$ and $\overline{T}_W^O$, by solving $\widehat{W}_{FTA}^O = W_{FTA}^{O*}$. We have $\widehat{W}_{FTA}^O < W_{FTA}^{O*}$ if

$$\underline{T}_W^O \equiv 1 - \frac{(1-t)\{a-w+3\Delta-2\tau+\sqrt{\theta}\}}{2(a-w)+\tau} < T < 1 - \frac{(1-t)\{a-w+3\Delta-2\tau-\sqrt{\theta}\}}{2(a-w)+\tau} \equiv \overline{T}_W^O$$

holds, where $\theta \equiv (a-w)^2 - 6(\tau-\Delta)(a-w) + 3(\tau-\Delta)(\tau-3\Delta)$. If $\tau < (a-w) + 2\Delta - \sqrt{\frac{2(a-w)^2+10(a-w)\Delta+11\Delta^2}{3}}$ holds, there is a real solution of $\underline{T}_W^O$ and $\overline{T}_W^O$ and we have a welfare-reducing FTA if $\underline{T}_W^O < T < \overline{T}_W^O$ holds. Otherwise, there is no real solution of $\underline{T}_W^O$ and $\overline{T}_W^O$ and $\widehat{W}_{FTA}^O \geq W_{FTA}^{O*}$ always holds. We can calculate that $\underline{T}_W^O$ can be either higher or lower than $\widehat{T}$ whereas $\widehat{T} < \overline{T}_W^O$ always holds. Therefore, FTA formation worsens the total welfare if $\tau < (a-w) + 2\Delta - \sqrt{\frac{2(a-w)^2+10(a-w)\Delta+11\Delta^2}{3}}$ and $\max[\underline{T}_W^O, \widehat{T}] < T < \overline{T}_W^O$ hold.

When $T^* < T < \widehat{T}$ holds, the second derivative of the welfare effect of FTA formation is given by

$$\frac{\partial^2(\widehat{W}_{FTA}^I - W_{FTA}^{O*})}{\partial T^2} = -\left[\frac{a-w+3\tau}{\{1-t+2(1-T)\}^3} + \frac{6\{(T-t)(a-w-\tau)+3(1-t)\Delta\}}{\{1-t+2(1-T)\}^4}\right] < 0,$$

which implies that $\widehat{W}_{FTA}^I - W_{FTA}^{O*}$ takes the minimum value at either $T = T^*$ or $T = \widehat{T}$. Furthermore, at $T = T^*$, we obtain

$$\left(\widehat{W}_{FTA}^I - W_{FTA}^{O*}\right)\Big|_{T=T^*} = \frac{(8-5\sqrt{2})(a-w)^2 - 2(16-11\sqrt{2})(a-w)\tau + (5\sqrt{2}+24)\tau^2}{64\sqrt{2}} + \frac{T^*(a-w)^2}{8},$$

whose first term takes the minimum value $\frac{(1187\sqrt{2}-1456)(a-w)^2}{16\sqrt{2}(5\sqrt{2}+24)^2} > 0$ at $\tau = \frac{(16-11\sqrt{2})(a-w)}{5\sqrt{2}+24}$. This means that $\left(\widehat{W}_{FTA}^I - W_{FTA}^{O*}\right)\Big|_{T=T^*} > 0$ holds.

At the other edge, we have

$$\left(\widehat{W}_{FTA}^I - W_{FTA}^{O*}\right)\Big|_{T=\widehat{T}} = \frac{(8-5\sqrt{2})(a-w)^2(a-w+2\Delta)^2 - 2(a-w)\Gamma_1\tau + \Gamma_2\tau^2}{64\sqrt{2}(a-w+2\Delta)^2} + \frac{\widehat{T}(a-w)^2}{8},$$

where $\Gamma_1 \equiv \{(16-11\sqrt{2})(a-w)^2 + (56-38\sqrt{2})(a-w)\Delta + (48-32\sqrt{2})\Delta^2 > 0$ and $\Gamma_2 \equiv$

$\{(5\sqrt{2}+24)(a-w)^2+(48+32\sqrt{2})(a-w)\Delta+32\sqrt{2}\Delta^2\}>0$. It takes the minimum value at $\tau=\frac{(a-w)\Gamma_1}{\Gamma_2}$, which is given by

$$\left(\widehat{W}^{I}_{FTA}-W^{O*}_{FTA}\right)\Big|_{T=\widehat{T},\tau=\frac{\Gamma_1}{\Gamma_2}}=\frac{\widehat{T}(a-w)^2}{8}+\frac{4(a-w)^2\Gamma_3}{64\sqrt{2}(a-w+2\Delta)^2\Gamma_2}>0.$$

where $\Gamma_3\equiv(68\sqrt{2}-89)(a-w)^4+(536\sqrt{2}-708)(a-w)^3\Delta+4(396\sqrt{2}-529)(a-w)^2\Delta^2+2^5(65-88)(a-w)\Delta^3+2^7(8\sqrt{2}-11)\Delta^4>0$. Therefore, in the absence of ROO, FTA formation that induces input relocation always improves the total welfare of member countries.

C.2 Proof of Propositions 4 and 5

Because ROO have no impacts under $T\in(t,\widehat{T}]$, Online Appendix C.1 proves the ambiguous effects of an FTA formation under $T\in(t,T^*)$ in Proposition 4. Online Appnendix C.1 also proves the positive effects of an FTA formation under $T\in(T^*,\widehat{T})$ in Proposition 5. Therefore, in the following, we examine the effects under $T\in(\widehat{T},T^{Max})$.

First, consider the case with $\widetilde{T}<T<T^{max}$, In this case, the MNE procures inputs from country O both before and after FTA formation. Let $\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA}$ be the welfare gains from an FTA with ROO. We obtain

$$\begin{aligned}\frac{\partial(\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA})}{\partial T}&=\frac{(1-t)\tau\{2(a-w-\tau)+5\Delta)t-(2(a-w+\Delta)-5\tau)T-3(\tau+\Delta)\}}{\{1-t+2(1-T)\}^3}\\&<\frac{(1-t)\tau\{2(a-w-\tau)+5\Delta)T-(2(a-w+\Delta)-5\tau)T-3(\tau+\Delta)\}}{\{1-t+2(1-T)\}^3}\\&=\frac{-3(1-T)(\tau+\Delta)}{\{1-t+2(1-T)\}^3}<0.\end{aligned}$$

Therefore, $\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA}$ takes the minimum value at $T=T^{max}$, which is given by

$$\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA}\Big|_{T=T^{max}}=\frac{\Delta\tau\{2(a-w-\tau)^2+\Delta(4(a-w)-\tau)\}}{2(a-w+2\Delta-\tau)^2}>0.$$

Therefore, we have

$$\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA}\Big|_{T=\widetilde{T}}>\widetilde{W}^{O}_{FTA}-W^{O*}_{FTA}\Big|_{T=T^{max}}>0.$$

This proves Proposition 4.

Next, consider the case with $\widehat{T}<T<\widetilde{T}$, where input relocation occurs. As indicated in Online Appendix C.1, $\widehat{W}^I - W^{O*}$ may take the minimum value at $T = \widetilde{T}$, which can be negative. Considering this possibility, we compare it with $\widetilde{W}^O - W^{O*}$ at $T = \widetilde{T}$, which is given by

$$\widehat{W}^I - W^{O*}\Big|_{T=\widetilde{T}} = \frac{\widetilde{T}(a-w)^2}{8} + \frac{(4\sqrt{2}-5)(a-w)^2(a-w+2\Delta)^2 - 2(a-w)\Gamma_4\tau + \Gamma_5\tau^2 - 8\Gamma_6\tau^3 + 32\tau^4}{64(a-w+2\Delta-2\tau)^2}$$

$$\begin{aligned}
\text{where}\quad & \Gamma_4 \equiv (12\sqrt{2}-15)(a-w)^2 + (18\sqrt{2}-23)(a-w)\Delta + 8(3\sqrt{2}-4)\Delta^2 > 0 \\
& \Gamma_5 \equiv -(67-44\sqrt{2})(a-w)^2 + 24(3\sqrt{2}-4)(a-w)\Delta + 32\Delta^2 > 0 \\
& \Gamma_6 \equiv (3\sqrt{2}-4)(a-w) + 8\Delta > 0.
\end{aligned}$$

Although the sign of the second term can be negative, it is positive when τ is sufficiently small.