Transfer Pricing and the Arm's Length Principle under Imperfect Competition*

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Abstract

This paper analyzes incentives of a multinational enterprise to manipulate an internal transfer price to take advantage of tax differences across countries. We consider "cost plus" and "comparable uncontrollable price" as two alternative implementations of the so-called arm's length principle (ALP) to mitigate this problem. We show that tax-induced foreign direct investment (FDI) can entail inefficient internal production and how the mechanisms behind such inefficient FDI differ between alternative implementation schemes of the ALP. In addition, we develop a novel theory of vertical foreclosure as an equilibrium outcome of strategic transfer pricing. We also explore import tariffs as countermeasures against tax-motivated transfer pricing.

JEL Codes: D4, F12, F23, L4, L12, L43, L51, L52, H26

Key Words: Foreign Direct Investment; Multinational Enterprise; Transfer Pricing; Arm's Length Principle; Vertical Foreclosure; Tariffs

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1 Introduction

This paper analyzes incentives of multinational enterprises (MNEs) to manipulate internal transfer prices to take advantage of tax differences among countries. We first consider a monopoly case and derive conditions under which foreign direct investment (FDI) takes place, showing that tax-induced FDI can entail inefficient internal production. In an oligopoly case, the internal transfer price has an additional strategic effect that further strengthens the incentive to inflate the transfer price at the expense of the rival firm's profits. The tax-induced FDI by an MNE has spillover effects that reduce tax revenues from other domestic firms as well as the MNE. We also explore implications of the arm's length principle (ALP) and import tariffs to mitigate this problem.

It has been well documented that MNEs engage in tax manipulation to reduce their tax obligations by shifting their profits from high tax countries to low tax jurisdictions (see Hines and Rice, 1994 and Bauer and Langenmayr, 2013). For instance, inspections by the Vietnamese tax authorities found that "the most common trick played by FDI enterprises to evade taxes was hiking up prices of input materials and lowering export prices to make losses or reduce profits in books."[1] In addition, Egger *et al.* (2010) find that an average subsidiary of an MNE pays about 32% less tax in a high tax country than a similar domestically-owned firms.

To analyze tax-induced FDI and its welfare implications, we consider a very stylized simple set-up of two countries with different corporate tax rates. To fix the scenario, we first consider a setting in which the monopolistic final-good producer is located in Home (country H) with a higher tax rate whereas its input can be more cheaply produced in Foreign (country F) with a lower tax rate. For instance, the input is labor-intensive and country F has a lower wage. Alternatively, the necessary input is a natural resource that is available only in country F. In this scenario, the input is needed to be procured from country F, but there are two channels. It can be outsourced from outside firms in country F, or can be produced internally with FDI by setting up a foreign subsidiary. Not surprisingly, we show that FDI can be used even if it is less efficient to produce the input internally, because it can be used as a vehicle to lessen its tax burden with an inflated internal price.

If governments overlook internal exchanges within the firm, the MNE will shift all profits to the country with a lower tax rate via the transfer price. Governments thus impose

[1] http://vietnamlawmagazine.vn/transfer-pricing-unbridled-at-fdi-enterprises-4608.html

transfer pricing rules (TPRs) to control tax manipulation. The standard practice is to stipulate that internal transfer prices follow the so-called "Arm's Length Principle", which requires intrafirm transfer prices to meet the arm's length standard, that is, the transfer price should not deviate from the price two independent firms would trade at. Currently, the ALP is the international transfer pricing principle that OECD member countries have agreed should be used for tax purposes by MNE groups and tax administrations.

The basic approach of the ALP is that the members of an MNE group should be treated "as operating as separate entities rather than as inseparable parts of a single unified business" and the controlled internal transfer price should mimic the market price that would be obtained in comparable uncontrolled transactions at arm's length. This kind of "comparability analysis", is at the heart of the application of the ALP. For instance, the 2010 *OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* 2010 states that the comparable uncontrolled price (hereafter, CUP) method

> "compares the price charged for property or services transferred in a controlled transaction to the price charged for property or services transferred in a comparable uncontrolled transaction in comparable circumstances. If there is any difference between the two prices, this may indicate that the conditions of the commercial and financial relations of the associated enterprises are not arm's length, and that the price in the uncontrolled transaction may need to be substituted for the price in the controlled transaction." (p. 63)

As the CUP method is the most direct and reliable, it is the preferred method when applying the ALP. In practice, however, it may be difficult to find a transaction between independent enterprises that is similar enough. This would be particularly so in the monopoly context where the required input is demanded only by the monopolist and there is no comparable input market available. In such a case, there are other methods suggested to apply the ALP. In our theoretical set-up, we assume that the "cost plus method" (hereafter, CP method) which mandates that the transfer price should reflect the production cost of the internally-transacted input.[2] However, the true production cost is typically non-observable by tax authorities and hard to ascertain. As a result, it can be manipulated at certain costs.

To analyze the incentive to engage in FDI and the determination of the internal price when the CP method is used due to the absence of comparable transactions in the market,

[2] Other methods suggested include the resale price method, the transactional net margin method, and the transactional profit split method. See OECD (2010) for more details.

we introduce "concealment costs." More specifically, when an MNE's internal price deviates from its true marginal cost (MC) in the presence of the ALP with the CP method, there are some costs to avoid such institutional constraints on the internal transfer price. These costs can be literally *concealment costs* to keep two separate books or can reflect expected punishment for the deviation as in Allingham and Sandmo (1972) and Kant (1988). The MNE thus trades off potential tax benefits against concealment costs in its choice of the optimal transfer price. We show that the optimal transfer price is equivalent to the minimization of what we call "perceived marginal cost" (PMC) and this characterization provides a very simple condition for the optimality of FDI vis-a-vis outsourcing if the concealment cost is linear in the quantity of internally-transferred inputs.

If the concealment costs are convex instead, there may be incentives for the MNE to engage in dual sourcing, that is, a part of the required input is produced by the foreign subsidiary whereas the rest is outsourced. As a result, a dual sourcing strategy may provide the tax authority with the ability to identify a comparable market price and adopt the CUP method as an application of the ALP. In such a case, we demonstrate the imposition of the CUP method with dual sourcing can have unintended consequences and detrimental effects if it triggers the MNE's sourcing decision from the dual sourcing to the internal sourcing alone.

We also analyze import tariffs as countermeasures against the potential tax shifting. An import tariff can completely offset the incentive to engage in inflated transfer price for the tax manipulation purpose. However, we show that some tax manipulation still arises with the optimal tariff. The reason is that the tax manipulation by the MNE leads to more production in the domestic market which can alleviate allocative inefficiency due to monopoly power.

We then extend our analysis to an oligopolistic market structure in the domestic market. As the MNE has an incentive to produce more from profit-shifting motives, it may have strategic effects vis-a-vis its rival firms in the final-good market. As a result, the rival firms reduce their outputs and lose. This implies that tax-induced FDI by the MNE has spillover effects that reduce tax revenues from other domestic firms as well as the MNE.

We also consider implications of the ALP when the input supplier in country F has market power. If the input purchased by the rival firm is considered as a comparable input used by the MNE and the CUP method is applied by the regulator, the price set by the foreign supplier can affect the internal price of the MNE. Thus, the imposition of the

ALP in this case may have implications of strategic price setting of the monopolistic input supplier in country F. We show that the CUP method also has implications for the MNE's incentives to supply to its downstream rivals. As is standard in the vertical-integration literature, there are trade-offs between raising rival's costs against lost profits for the upstream firm when the MNE engages in input foreclosure to the rival downstream firm. In out set-up, there are additional benefits in terms of tax benefits, because the input foreclosure increases the rival firm's input acquisition costs, which the tax authorities regard as the benchmark transfer price in the CUP regime. As a result, we find that the MNE may refrain from supplying to the rival downstream firm even if it is more efficient than other input suppliers.

Our paper is at the intersection of international trade and public economics. Horst (1971) initiated the theory of multinational firms in the presence of different tariff and tax rates across countries and explored the profit-maximizing strategy for a monopolistic firm selling to two national markets, that is, how much it should produce in each country and what the optimal transfer price for goods exported from the parent to the subsidiary would be. Horst (1971) and subsequent papers (such as Batra and Hadar (1979) and Itagaki (1979, 1981)) show that MNE's optimum price would be either the highest or the lowest possible allowed by the limits of government rules and regulations, depending on tax and tariff schedules among countries.[3] Kant (1988) shows how an interior transfer price can be derived endogenously in the presence of so-called "concealment cost."

There is another strand of literature on transfer pricing with "decentralized" decision making process inside the firm. In this framework, transfer prices are instruments used by headquarters to control separate divisions from pursuing their own interests. For instance, Hirshleifer (1956) assumes that decision-making across branches is decentralized and the transfer prices in his model are chosen to align the production decisions of the various divisions. Bond (1980) extends the analysis of optimal transfer pricing to a case where branches of a vertically integrated enterprise are located in multiple jurisdictions with different tax rates. With imperfect competition, this literature further considers strategic effects of transfer pricing in an instrument of strategic delegation. Alles and Datar (1998) show how cost-based transfer prices can be manipulated to dampen competition and sustain higher market prices. Kato and Okoshi (2017) also adopt a decentralized decision

[3] In contrast to Horst (1971) who assumes that output decisions are centralized, Bond (1980) considers a situation in which decision making is decentralized. He shows that the optimal transfer prices trade off the gain from tax avoidance against the efficiency losses associated from resource misallocation.

structure and consider the optimal location of production facilities in the presence of tax differences between countries, and the effect of the ALP on the location choice. Their paper is closely related to ours in the sense that their model also consider both strategic and tax-manipulation effects of transfer pricing.[4] However, both set-up and focus of their paper are very different from ours. They consider a setting in which an MNE faces competition in the downstream market but the MNE is a single input supplier for both its downstream subsidiary and its rival. In their model, the imposition of the ALP is equivalent to the prohibition of price discrimination for the MNE's upstream monopoly. The present study assumes that the decision making process is centralized. In addition, we consider other upstream suppliers and analyze the outsourcing vs. FDI decision, whereas their focus is on the *location choice* of upstream monopoly production facility.

Samuelson (1982) is the first study to point out that for an MNE subject to the ALP principle, the arm's length reference price itself can be partially determined by the firm's activities. In a similar vein, Gresik and Osmundsen (2008) consider transfer pricing in a vertically integrated industries in the absence of transactions between independent entities. More specifically, they examine the implications of the ALP as a transfer price regulation when all firms are vertically integrated and the only source of comparable data may be from transactions between affiliated firms. In our framework with imperfect competition in both upstream and downstream markets, the reference price for an MNE is determined by an outsider firm which recognizes the strategic effects of its price decision on its input demand via the transfer price of the MNE. It is shown that the outsider has an incentive to set a lower price compared to the case without linkage via the transfer price.

The rest of the paper is organized in the following way. Section 2 introduces the basic set-up of the monopoly model with transfer pricing. We first analyze the incentive to engage in FDI due to tax differential between the source and destination countries and the optimal transfer price with the ALP. We then explore implications of such FDI for the efficiency of global sourcing and identify the wedge between the efficient outcome and the market equilibrium. Section 3 considers import tariffs as countermeasures against profit-shifting. We derive the optimal tariff in the presence of transfer pricing. Section 4 extends the analysis to a duopoly setting to examine implications of strategic interactions in the final-good market. We show that profit-shifting strategy of the MNE has further

[4] See also Schjelderup and Sorgard (1997) as one of the first papers that analyze transfer pricing for decentralize MNEs.

consequences for tax revenues from other firms due to strategic effects. We also show how the input market price can be endogenized with the imposition of the CP method and uncover an additional motive for foreclosure arising from tax concerns. Section 5 concludes the paper.

2 The Monopoly Model of FDI and Transfer Pricing

2.1 Basic Set-up

There are two countries, Home and Foreign, with different tax rates with t and $\widetilde{t}$, respectively. There is a monopolistic final-good producer. We assume that Home (denoted as H) is a high tax rate country. The headquarters that produces the final good is immobile and tied to consumer markets in H while its input can be more cheaply produced in Foreign (denoted as F) with a lower tax rate, that is, $t > \widetilde{t}$. The monopolist located in H has two possible channels to procure its essential input from F. There is a competitive open market from which the input can be procured at the price of ϖ (later we consider the external sourcing with market power and endogenize ϖ). Alternatively, it can be an MNE by setting up its own input production plant in F with FDI. Without loss of generality, we assume that one unit of the input is converted to one unit of the final good without incurring any additional costs. We further assume a constant returns technology. The subsidiary's input production cost is given by c. The MNE can choose an internal transfer price (γ) when its foreign subsidiary supply its input to the headquarter firm that produces the final good. Without any tax rate differential between the two countries, the MNE's optimal internal transaction price for the input γ is simply its marginal production cost of c in order to eliminate any double marginalization problem. However, with different tax rates between H and F, the MNE can choose an internal transfer price (γ) as a mechanism to shift profits to minimize its tax burden. Figure 1 describes the basic set-up.

2.2 Benchmark Case: No Regulation (NR)

As a benchmark case, we first consider the choice of internal price by the MNE when there is no regulation and the MNE can set any internal price. In this case, the monopolistic

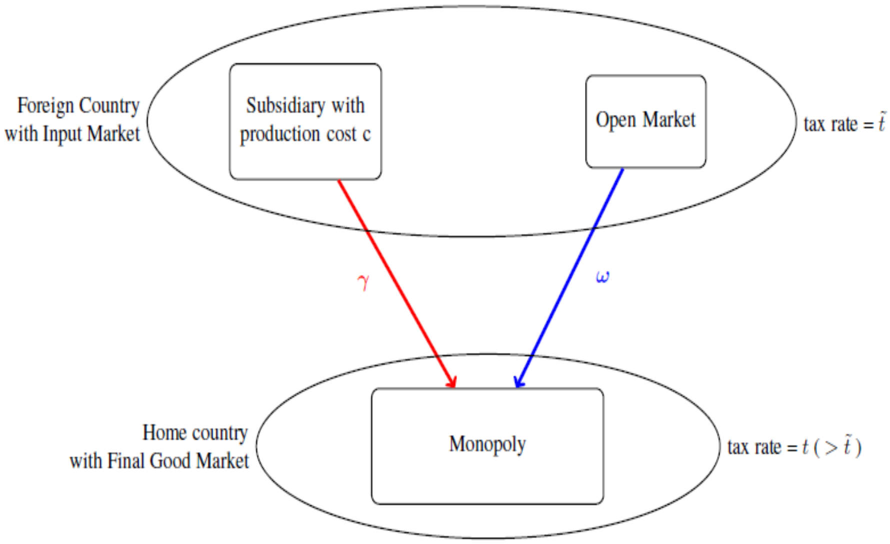

Figure 1: Monopolistic MNE with Transfer Price

MNE solves the following problem when it sets its internal price at γ.

$$\underset{q}{Max}\ \Pi^{NR} = (1-t)\underbrace{[P(q)-\gamma]q}_{\text{Downstream Profits}} + (1-\tilde{t})\underbrace{(\gamma-c)q}_{\text{Upstream Profits}} \tag{1}$$

where $P(q)$ is the downward sloping inverse demand function the monopolist faces. We should mention that with the objective function of the MNE (1), we implicitly assume that the headquarters that produces the final good makes an output decision that would maximize the overall firm profit, not just the downstream division profit.[5]

Note that the objective function of the monopolist can be rewritten as

$$\Pi^{NR} = (1-t)[P(q)-\xi^{NR}]q,$$

where

$$\xi^{NR} = \frac{(1-\tilde{t})c-(t-\tilde{t})\gamma}{1-t} \tag{2}$$

That is, the MNE facing different tax rates across countries behaves as if its marginal

[5]There is another strand of literature on internal pricing that assumes decentralized decision making. Hirshleifer (1956) initiated this literature that analyzes how transfer prices can be used to align incentives across divisions that pursue their own interests. In contrast, we assume away such incentive issues within the firm.

production cost were ξ^{NR}, which can be considered as the MNE's perceived marginal cost (PMC) of production *adjusted for transfer price induced by the differential tax rates across countries.* As the MNE's profit decreases with increase in ξ^{NR}, the monopolist's optimal choice of γ is equivalent to the choice of γ that minimizes ξ^{NR}. Note that ξ^{NR} is decreasing in its internal transfer price γ because it can be used as a vehicle to shift profit from the high tax country H to the low tax rate country F. As pointed out by Horst (1971), it immediately follows that the optimal choice is to set γ as high as possible potentially subject to the constraint that the downstream profit cannot be negative. This implies that all profits from a higher tax country will be shifted towards to a lower tax country in the absence of any regulation.[6] This simple model illustrates the need for regulations to counter such profit-shifting motives to reduce a tax burden by MNEs.

2.3 Arm's Length Principle (ALP)

In reality, there are regulations that would prevent the choice from being a corner solution and limit the MNE's profit shifting motives. The most-widely adopted and agreed-upon standard practice is the "Arm's Length Principle" (ALP), which requires intrafirm transfer prices to mimic the market price that would be obtained in comparable uncontrolled transactions at arm's length, as discussed in the Introduction. Even though this principle is conceptually sound and straightforward, the implementation of it as a regulatory policy can be difficult and subject to different interpretations. For instance, in the context of monopoly, such "comparability analysis" may not be feasible simply because there may be no comparable transactions as it is the only firm that produces the final good; no other firms acquire similar inputs. Even if similar inputs are transacted in the market by other firms for different purposes, the monopolist may argue that the available inputs are not suitable to meet its specifications and that is a reason why they are engaged in its own production in the first place. In other words, what constitutes a similar input may not be clear-cut and subject to disputes unless comparable inputs are identical.

We thus consider two alternative scenarios in which the ALP is implemented.

1. CUP Method with Comparable Input Available in the Market: We assume that if a comparable input is available in the market, the firm is required to use the

[6] Otherwise, this implies that H makes up any losses incurred by the headquarters with a subsidy up to the rate of t. If we consider a dynamic model, the headquarters' losses may be used as a tax offset against the future profits. However, it cannot be used as a tax offset if the headquarters makes losses all the time.

comparable market price as the internal transfer price.

2. Cost-Plus Method with Comparable Input *Not* Available in the Market: If a comparable input is not transacted in the market, then the CUP method cannot be applied and the lack of comparable inputs transacted by uncontrolled parties necessitates the use of other methods to regulate transfer pricing. In such a case, we assume that the regulator uses the "cost plus method" which mandates that the transfer price should reflect the production cost of the input internally transacted. However, the true production cost is typically non-observable to tax authorities and hard to ascertain. As a result, it can be manipulated at certain costs.

Our analysis proceeds in the following working assumptions. In the monopoly case, we consider the "cost plus" scenario as the main focus, which we believe is more realistic because the monopolistic downstream firm is the only firm that demands such an input.[7] In section 4 where we analyze the duopoly case, we consider both cases.

2.4 Profit-Shifting Transfer Pricing with "Cost Plus" and Concealment Costs

We analyze the choice of internal transfer price when the CP method is adopted as an application of the ALP for the monopoly case. As shown in the previous subsection, without any external or regulatory restriction on the transfer price, all profits would be shifted towards to a lower tax country with FDI being used as a vehicle. However, this type of behavior can be a violation of tax laws. We thus explore implications of institutional constraints on the internal transfer price.

To this end, we assume that a deviation of an MNE's internal price from its true MC entails costs of $\Psi(\gamma - c, q)$. This could be interpreted as *concealment costs* or can reflect expected punishment for the deviation as in Kant (1988). For analytical tractability, we assume the concealment costs are separable in the deviation of the internal price from its true MC and the amount of inputs transferred, that is, $\Psi(\gamma - c, q) = \phi(\gamma - c)q$ with $\phi' > 0, \phi'' > 0$, and $\phi'(0) = 0$, as in Egger and Seidel (2013). This specification states that concealment costs increase with the transfer price's deviation from its true cost and the amount of inputs transferred. In addition, concealment costs are convex in the degree of deviations with the usual Inada condition. The assumption of linear concealment costs

[7] The CUP case for the monopolist can also be analyzed in a straightforward manner.

in the MNE's output allows a very clean characterization concerning the MNE's optimal transfer price and its sourcing decision.[8]

2.4.1 Optimal Transfer Price with Concealment Costs

More specifically, with linear concealment costs in the output, the MNE's profit function is given by

$$\Pi = (1-t)\underbrace{[P(q)-\gamma]q}_{\text{Downstream Profits}} + (1-\widetilde{t})\underbrace{(\gamma-c)q}_{\text{Upstream Profits}} - \underbrace{\phi(\gamma-c)q}_{\text{Concealment Costs}} \quad (3)$$

$$= (1-t)[P(q)-\xi]q, \quad (4)$$

where

$$\xi = \gamma - \frac{(1-\widetilde{t})(\gamma-c)}{1-t} + \frac{\phi(\gamma-c)}{1-t} = \frac{(1-\widetilde{t})c-(t-\widetilde{t})\gamma+\phi(\gamma-c)}{1-t}$$
$$= \xi^{NR} + \frac{\phi(\gamma-c)}{1-t},$$

where $\xi^{NR} = \frac{(1-\widetilde{t})c-(t-\widetilde{t})\gamma}{1-t}$. Thus, the optimal choice of the transfer price γ^* is equivalent to minimize the MNE's "perceived marginal cost" (PMC), ξ, which is *adjusted for transfer price induced by differential tax rates and concealment costs*, and implicitly defined by

$$t-\widetilde{t} = \phi'(\gamma-c).$$

The optimal γ^* thus can be derived as

$$\gamma^* = c + \phi'^{-1}(t-\widetilde{t}) > c.$$

For instance, if we assume $\phi(\gamma-c) = \frac{k}{2}(\gamma-c)^2$, where a higher k represents better institutional monitoring which makes it more costly for the MNEs to engage in profit shifting. Then, we have $\widehat{\gamma}^* = c+\frac{t-\widetilde{t}}{k}$. The optimal choice of the transfer price is consistent with empirical findings. For instance, Clausing (2003) shows that as the counter-party tax rates are lower, US intrafirm import prices are higher (note that we have different predictions without concealment costs).

[8] In section 6, we consider a more general form of concealment costs: $\Psi(\gamma-c,q) = \phi(\gamma-c)\mu(q)$. When μ is convex in q, dual sourcing may be optimal and section 6 explores implications of the ALP in such a case.

2.4.2 FDI vs. Outsourcing

Let ξ^* be the minimized PMC with the choice of optimal transfer price γ^*. Then, the MNE's profit from FDI can be written as

$$\Pi^{FDI} = (1-t)[P(q) - \xi^*]q,$$

whereas the monopolist's profit from simply outsourcing can be written as

$$\Pi^{OS} = (1-t)[P(q) - \varpi]q$$

Thus, the monopolist's sourcing decision boils down to a simple comparison of ξ^* and ϖ; FDI takes place if and only if $\xi^* < \varpi$.

Proposition 1. $\xi^* < c$

Proof. Note that ξ^* can be written as

$$\xi^* = c - \lambda,$$

where $\lambda = \frac{(t-\widetilde{t})(\gamma^*-c)-\phi(\gamma^*-c)}{1-t}$. Using the first order condition that defines γ^*, we find that the numerator of λ is positive because

$$(t-\widetilde{t})(\gamma^*-c) - \phi(\gamma^*-c) = (\gamma^*-c)\left[\underbrace{\phi'(\gamma^*-c) - \frac{\phi(\gamma^*-c)}{(\gamma^*-c)}}_{>0 \text{ by the convexity of } \phi}\right] > 0$$

Therefore, $\xi^* < c$. ∎

Proposition 1 implies that the MNE's after-tax global profit is higher due to tax manipulation compared to the case where the firm transfers its input at its MC c. The MNE's profit is as if its cost were the PMC of ξ^* which is lower than its true MC of c. As a result, we have the following corollary.

Corollary 1. *Consumer surplus increases with profit shifting via transfer pricing.*

As the MNE uses transfer pricing to shift profits from the higher tax country to the lower tax country, it produces more with a lower PMC than its true MC. As a result, consumer surplus increases. This fact plays an important role when considering import tariffs as countermeasures against profit shifting in section 3.

In addition, Proposition 1 implies that the MNE's sourcing decision can be inefficient from the viewpoint of the global production efficiency (see Figure 2). The profit-shifting motives due to tax differences across countries create a wedge of $\lambda (= \frac{(t-\widetilde{t})(\gamma^* - c) - \phi(\gamma^* - c)}{1-t} > 0)$, which distorts the MNE's sourcing decision. We can also easily show that the wedge is increasing in the tax-rate differential across countries because of the following comparative statics results.

Lemma 1. $\frac{d\xi^*}{dt} < 0$ *and* $\frac{d\xi^*}{d\widetilde{t}} > 0$.

Proof. By the envelope theorem, we have

$$\frac{d\xi^*}{dt} = \frac{\partial \xi^*}{\partial t} = -\frac{(1-\widetilde{t})(\gamma^* - c) - \phi(\gamma - c)}{(1-t)^2}$$

which is negative because $(1-\widetilde{t})(\gamma^* - c) - \phi(\gamma - c) > (t - \widetilde{t})(\gamma^* - c) - \phi(\gamma^* - c) > 0$ as shown in the proof of Lemma 1. Similarly,

$$\frac{d\xi^*}{d\widetilde{t}} = \frac{\partial \xi^*}{\partial \widetilde{t}} = \frac{\gamma^* - c}{1-t} > 0$$

∎

Proposition 2. *(Inefficiency of Internal Sourcing) With tax differentials across countries, there can be excessive FDI. The global efficiency requires that FDI takes place iff* $c < \varpi$ *whereas FDI takes place in equilibrium iff* $\xi^* < \varpi$. *Thus, if* $c \in (\varpi, \varpi + \lambda)$*, where* $\lambda = \frac{(t-\widetilde{t})(\gamma^* - c) - \phi(\gamma^* - c)}{1-t} > 0$*, there is inefficient FDI. The wedge* λ *increases in* $(t - \widetilde{t})$*, i.e., the tax differential between* H *and* F.

2.4.3 Parametric Example

With $\phi(\gamma - c) = \frac{k}{2}(\gamma - c)^2$, we have

$$\gamma^* = c + \frac{t - \widetilde{t}}{k}.$$

By plugging this back into ξ, we can easily verify

$$\xi^* = c - \frac{(t-\widetilde{t})^2}{2k(1-t)}.$$

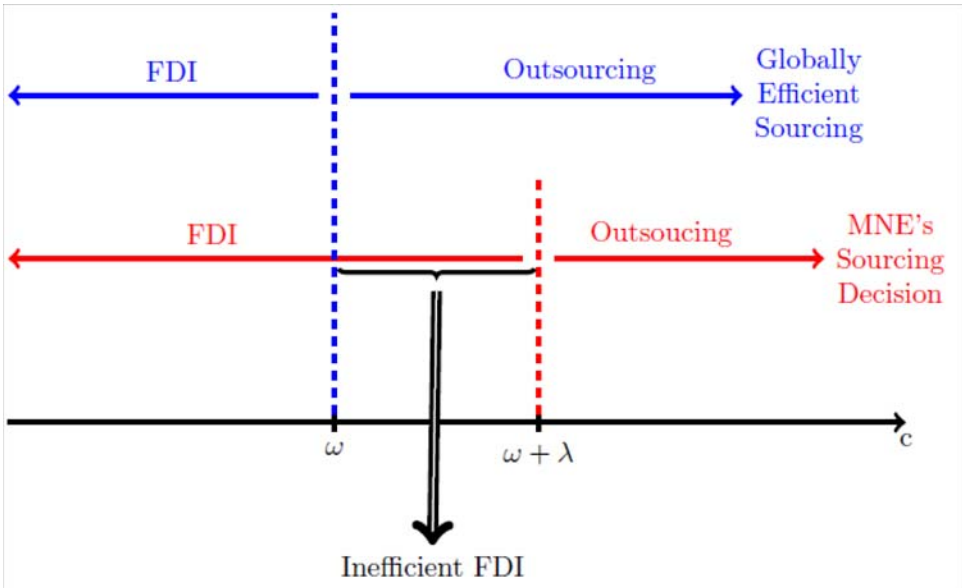

Figure 2: Globally Efficient Sourcing vs. MNE's Sourcing Decision

This implies that FDI takes place if and only if

$$c < \varpi + \frac{(t - \widetilde{t})^2}{2k(1-t)}.$$

That is, unless the MNE's internal production cost does not exceed the open market price by $\frac{(t-\widetilde{t})^2}{2k(1-t)}$, FDI takes place. In particular, if $c \in (\varpi, \varpi + \frac{(t-\widetilde{t})^2}{2k(1-t)})$, FDI is inefficient, but still optimal from the perspective of the MNE due to tax manipulation via transfer price.

3 Import Tariffs as Countermeasures against Profit-Shifting

We consider a specific industry in which the MNE is operating. Implicitly we assume that the overall corporate tax rate is determined by factors beyond the specific industry we consider. The overall corporate tax rate thus cannot be tailored for this particular industry and is considered exogenously given. However, in face of MNE's profit-shifting incentives, the government may impose *industry-specific* ad-valorem import tariffs to eliminate such incentives. We explore import tariffs adopted as countermeasures against profit shifting.

Let τ_m denote ad-valorem import tariff imposed by country H where the headquaters is located. Now the MNE's problem with FDI can be written as

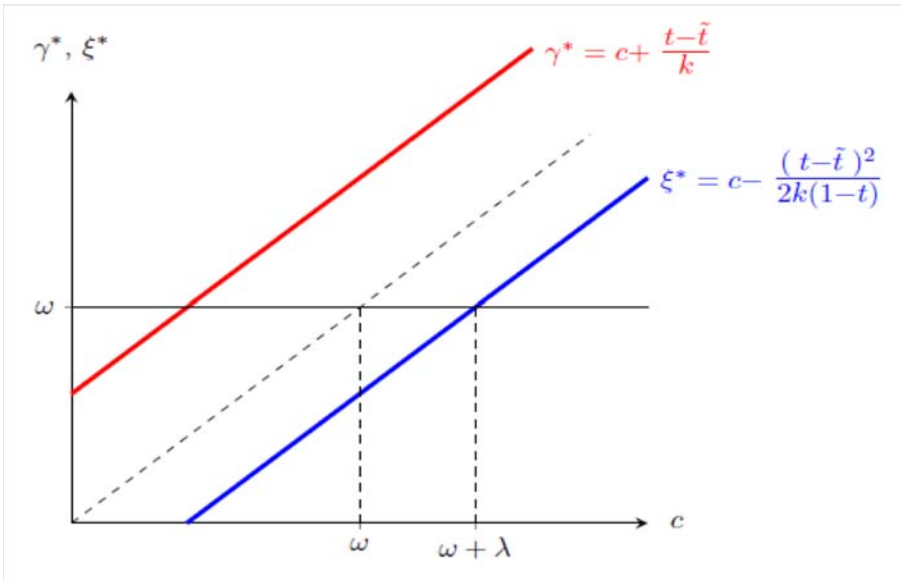

Figure 3: Optimal Transfer Price and "Virtual" MC

$$\widehat{\Pi} = (1-t)[P(q) - (1+\tau_m)\gamma]q + (1-\widetilde{t})(\gamma - c)q - \phi(\gamma - c)q \quad (5)$$
$$= (1-t)[P(q) - \widehat{\xi}]q, \quad (6)$$

where

$$\widehat{\xi} = \tau_m\gamma + \frac{(1-\widetilde{t})c - (t-\widetilde{t})\gamma + \phi(\gamma - c)}{1-t}$$
$$= \tau_m\gamma + \xi$$

with $\xi = \frac{(1-\widetilde{t})c-(t-\widetilde{t})\gamma+\phi(\gamma-c)}{1-t} = c - \frac{(t-\widetilde{t})(\gamma-c)-\phi(\gamma-c)}{1-t}$.[9]

In the presence of import tariffs, the optimal choice of the transfer price $\widehat{\gamma}^*$ is equivalent to minimize the MNE's "PMC cum tariffs", $\widehat{\xi}$, and implicitly defined by

$$\left(t - \widetilde{t}\right) - \tau_m(1-t) = \phi'(\widehat{\gamma} - c).$$

[9] We denote all variables in the presence of import tariffs with a hat ($\wedge$)

Totally differentiating the first order condition above, we obtain

$$-(1-t)d\tau_m = \phi''(\widehat{\gamma}^* - c)d\widehat{\gamma}^*.$$

Thus, we have

$$\frac{\partial\widehat{\gamma}^*}{\partial\tau_m} = -\frac{(1-t)}{\phi''(\widehat{\gamma}^* - c)} < 0$$

indicating that the incentives to inflate the internal price by the MNE can be mitigated by an import tariff. Note that the optimal $\widehat{\gamma}^*$ chosen by the MNE can be written as

$$\widehat{\gamma}^* = c + \phi'^{-1}\big((t-\widetilde{t}) - \tau_m(1-t)\big).$$

This implies that $\tau_m = \overline{\tau}_m (= \frac{t-\widetilde{t}}{1-t})$ completely offsets any incentives for profit shifting. In addition, with $\tau_m = \overline{\tau}_m$, $\widehat{\xi} = c$ holds and the MNE will engage in FDI only when its internal production is more efficient than the open market. However, consumer welfare goes down compared to the case without import tariffs. Thus, the optimal import tariff can be lower than $\overline{\tau}_m$ (i.e., the import tariff that eliminates any incentives for profit shifting) as shown below.

3.1 The Optimal Import Tariff

Let us analyze the government's optimal choice of import tariff given $(t, \widetilde{t})$ when it maximizes domestic social welfare, W, which is defined as the sum of producer surplus (i.e., profit), consumer surplus and tax revenue. We consider import tariffs as a second-best policy when the transfer price and output choices are left to the firm. Let $\widehat{\xi}^*$ be the minimized PMC with the choice of optimal transfer price $\widehat{\gamma}^*$, that is,

$$\widehat{\xi}^* = \tau_m\widehat{\gamma}^* + \frac{(1-\widetilde{t})c - (t-\widetilde{t})\widehat{\gamma}^* + \phi(\widehat{\gamma}^* - c)}{1-t}.$$

Let the corresponding output level be $q(\widehat{\xi}^*)$. Then, social welfare with FDI can be written as

$$\begin{aligned} W &= \underbrace{(1-t)[P(q(\widehat{\xi}^*)) - \widehat{\xi}^*]q(\widehat{\xi}^*)}_{\text{Producer Surplus}} + \underbrace{\left[\int_0^{q(\widehat{\xi}^*)} P(x)dx - P(q(\widehat{\xi}^*))q(\widehat{\xi}^*)\right]}_{\text{Consumer Surplus}} \\ &\quad + \underbrace{\left[t\ [P(q(\widehat{\xi}^*)) - (1+\tau_m)\widehat{\gamma}^*]q(\widehat{\xi}^*) + \tau_m\widehat{\gamma}^* q(\widehat{\xi}^*)\right]}_{\text{Tax and Tariff Revenues}} \\ &= (1-t)[P(q(\widehat{\xi}^*)) - (1+\tau_m)\widehat{\gamma}^*]q(\widehat{\xi}^*) + (1-\widetilde{t})(\widehat{\gamma}^* - c)q(\widehat{\xi}^*) - \phi(\widehat{\gamma}^* - c)q(\widehat{\xi}^*) \\ &\quad + \left[\int_0^{q(\widehat{\xi}^*)} P(x)dx - P(q(\widehat{\xi}^*))q(\widehat{\xi}^*)\right] + \left[t\ [P(q(\widehat{\xi}^*)) - (1+\tau_m)\widehat{\gamma}^*]q(\widehat{\xi}^*) + \tau_m\widehat{\gamma}^* q(\widehat{\xi}^*)\right] \end{aligned}$$

Collecting terms, we can write social welfare in a more compact form as follows:

$$W = \int_0^{q(\widehat{\xi}^*)} \left[P(x) - \widehat{\xi}^{SP}\right] dx$$

where $\widehat{\xi}^{SP} = c + \widetilde{t}(\widehat{\gamma}^* - c) + \phi(\widehat{\gamma}^* - c)$ and represents the MC of FDI production from the perspective of the social planner of country H. It consists of the physical production cost of c, tax transfer to the host country, and any concealment costs incurred by the MNE. Note that the MNE's production level is not determined by not the social planner's MC, $\widehat{\xi}^{SP}$, but by its PMC, $\widehat{\xi}^*$. This implies that the choice of τ_m that minimizes $\widehat{\xi}^{SP}$ is not necessarily the optimal import tariff.

It is instructive to investigate the relationship between PMC and social cost associated with transfer pricing as the import tariff changes. To this end, let us define the wedge between the MNE's PMC and the social planner's MC as $\delta = \widehat{\xi}(\gamma(\tau_m)) - \widehat{\xi}^{SP}(\gamma(\tau_m))$. Then, we have

$$\widehat{\xi}(\gamma(\tau_m)) - \widehat{\xi}^{SP}(\gamma(\tau_m)) = \tau_m\gamma + \frac{t}{1-t}\left[\phi(\gamma - c) - (1-\widetilde{t})(\gamma - c)\right],$$

where $\widehat{\gamma}^* = c + \phi'^{-1}((t-\widetilde{t}) - \tau_m(1-t))$.

Since $\gamma = c$ when $\tau_m = \frac{t-\widetilde{t}}{1-t}$, we have

$$\delta|_{\tau_m = \frac{t-\widetilde{t}}{1-t}} = \widehat{\xi}(\gamma) - \widehat{\xi}^{SP}(\gamma)|_{\tau_m = \frac{t-\widetilde{t}}{1-t}} = \frac{t-\widetilde{t}}{1-t}c > 0.$$

We can also easily verify that

$$\delta|_{\tau_m=0} = \widehat{\xi}(\gamma) - \widehat{\xi}^{SP}(\gamma)|_{\tau_m=0} = \frac{t}{1-t}\left[\phi(\gamma-c) - (1-\widetilde{t})(\gamma-c)\right]|_{\tau_m=0} < 0.$$

To see this, note that γ satisfies the first order condition $\left(t-\widetilde{t}\right) = \phi'(\gamma-c)$. Since ϕ is convex, we have

$$\frac{\phi(\gamma-c)}{\gamma-c} < \phi'(\gamma-c) = \left(t-\widetilde{t}\right) < 1-t.$$

Thus, $(1-\widetilde{t})(\gamma-c) > \phi(\gamma-c)$. We also know that

$$\frac{d\left[\widehat{\xi}(\gamma(\tau_m)) - \widehat{\xi}^{SP}(\gamma(\tau_m))\right]}{d\tau_m} = \gamma - \left[\widetilde{t} + \phi'(\gamma-c)\right]\frac{\partial\widehat{\gamma}}{\partial\tau_m} > 0$$

because $\phi'(\gamma-c) > 0$ and $\frac{\partial\widehat{\gamma}}{\partial\tau_m} < 0$. Thus, we obtain the following lemma.

Lemma 2. *There is a unique* $\tau_m^o \in (0, \frac{t-\widetilde{t}}{1-t})$ *such that*

$$\begin{cases} \widehat{\xi}(\gamma) > \widehat{\xi}^{SP}(\gamma) \text{ if } \tau_m < \tau_m^o \\ \widehat{\xi}(\gamma) = \widehat{\xi}^{SP}(\gamma) \text{ if } \tau_m = \tau_m^o \\ \widehat{\xi}(\gamma) < \widehat{\xi}^{SP}(\gamma) \text{ if } \tau_m > \tau_m^o \end{cases}$$

Lemma 2 implies that if $\tau_m \geq \tau_m^o$, the output level by the MNE is unambiguously too low from the social planner's viewpoint. When $\tau_m = \tau_m^o$,the PMC and social planner's cost coincide, but due to the exercise of monopoly power, the output is still too low. If $\tau_m > \tau_m^o$,the output is further restricted because PMC exceeds the social MC. This concern may induce the social planner to set an import tariff lower than τ_m^o and we derive such conditions below.

Now let us analyze the marginal effect of an import tariff on social welfare:

$$\frac{dW}{d\tau_m} = \left[P(q(\tau_m)) - \widehat{\xi}^{SP}(\tau_m)\right]\underbrace{\frac{dq(\tau_m)}{d\tau_m}}_{(-)} + \left[-q(\tau_m)\underbrace{\frac{d\widehat{\xi}^{SP}}{d\tau_m}}_{(-)}\right] \tag{7}$$

where

$$\frac{dq(\tau_m)}{d\tau_m} = \frac{dq}{d\widehat{\xi}}\left[\frac{\partial\widehat{\xi}^*}{\partial\tau_m} + \underbrace{\frac{\partial\widehat{\xi}^*}{\partial\widehat{\gamma}}\frac{\partial\widehat{\gamma}^*}{\partial\tau_m}}_{=0 \text{ by the envelope theorem}}\right] = \underbrace{\frac{dq}{d\widehat{\xi}}}_{(-)}\widehat{\gamma}^* < 0$$

$$\text{and } \frac{d\widehat{\xi}^{SP}}{d\tau_m} = \frac{\partial\widehat{\xi}^{SP}(\widehat{\gamma})}{\partial\widehat{\gamma}}\frac{\partial\widehat{\xi}^*}{\partial\tau_m} = \left[\underbrace{\widetilde{t} + \phi'(\widehat{\gamma}^* - c)}_{(+)}\right]\widehat{\gamma}^* > 0.$$

Equation (7) illustrates the trade-offs involved in setting an import tariff. The first term on the RHS represents the negative effect on consumer welfare as the imposition of import tariffs increases the MNE's PMC which induces the firm to reduce outputs in the domestic market. The second term on the RHS is the positive effect of reducing tax shifting to country F and concealment costs.

It is clearly not optimal to set an import tariff higher than $\overline{\tau}_m = \frac{t-\widetilde{t}}{1-t}$ because it is simply an overkill as countermeasures against profit shifting: an import tariff beyond $\overline{\tau}_m$ only reduces consumer welfare without any corresponding positive benefits in terms of social welfare. We thus consider only import tariffs with $\tau_m \leq \overline{\tau}_m$.

A sufficient condition for the optimal import tariff to be less than $\overline{\tau}_m$ is

$$\frac{dW}{d\tau_m}|_{\tau_m=\overline{\tau}_m} = \frac{d}{d\tau_m}\left[\int_0^{q(\widehat{\xi}(\gamma))} P(x) - \widehat{\xi}^{SP}(\gamma)dx\right]|_{\tau_m=\frac{t-\widetilde{t}}{1-t}} < 0.$$

The following proposition provides a sufficient condition for this.

Proposition 3. *Let $\rho = P'\frac{dq}{d\xi}$ denote the cost-price pass-through rate for the monopolist.* $\frac{dW}{d\tau_m}|_{\tau_m=\overline{\tau}_m} < 0$ *if* $\rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}}|_{\tau_m=\frac{t-\widetilde{t}}{1-t}}$.

Proof. We have

$$\begin{aligned}\frac{dW}{d\tau_m} &= \left[P(q(\tau_m)) - \widehat{\xi}^{SP}(\tau_m)\right]\underbrace{\frac{dq(\tau_m)}{d\tau_m}}_{(-)} - q(\tau_m)\underbrace{\frac{d\widehat{\xi}^{SP}}{d\tau_m}}_{(+)} \\ &= \left[P(q(\tau_m)) - \widehat{\xi}^* + (\widehat{\xi}^* - \widehat{\xi}^{SP}(\tau_m))\right]\frac{dq(\tau_m)}{d\tau_m} - q(\tau_m)\frac{d\widehat{\xi}^{SP}}{d\tau_m}\end{aligned}$$

By Lemma 3, we know $\widehat{\xi}^{*} - \widehat{\xi}^{SP} > 0$ at $\tau_m = \overline{\tau}_m$. In addition, we know that

$$P(q(\tau_m)) - \widehat{\xi}^{*} = -P'q$$

by the first order condition for the MNE's profit maximization and $\frac{dq(\tau_m)}{d\tau_m} < 0$. As a result, we have

$$\begin{aligned}\frac{dW}{d\tau_m}|_{\tau_m=\overline{\tau}_m} &< -P'q\frac{dq(\tau_m)}{d\tau_m} - q(\tau_m)\frac{d\widehat{\xi}^{SP}}{d\tau_m}|_{\tau_m=\frac{t-\widetilde{t}}{1-t}} \\ &= -q\left[P'\frac{dq}{d\xi}\frac{d\xi}{d\tau_m} + \frac{d\widehat{\xi}^{SP}}{d\tau_m}\right]|_{\tau_m=\frac{t-\widetilde{t}}{1-t}}.\end{aligned}$$

Therefore,

$$\frac{dW}{d\tau_m}|_{\tau_m=\overline{\tau}_m} < -q\left[P'\frac{dq}{d\xi}\frac{d\xi}{d\tau_m} + \frac{d\widehat{\xi}^{SP}}{d\tau_m}\right]|_{\tau_m=\frac{t-\widetilde{t}}{1-t}} < 0 \text{ if } \rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}}|_{\tau_m=\frac{t-\widetilde{t}}{1-t}}.$$

■

Thus, we can conclude that the optimal import tariff $\tau_m^* < \overline{\tau}_m = \frac{t-\widetilde{t}}{1-t}$, that is, the optimal import tariff mitigates incentives to engage in tax manipulation via transfer price, but does not completely eliminate it, if $\rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}}|_{\tau_m=\overline{\tau}_m}$. This is because the transfer price induces the MNE to produce more, which enhances consumer welfare. For instance, this condition is satisfied if $\widetilde{t}$ is sufficiently small because $\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|_{\tau_m=\overline{\tau}_m} = \widetilde{t}\frac{(1-t)}{\phi''(\widehat{\gamma}^*-c)} \simeq 0$ and $\frac{d\xi}{d\tau_m}|_{\tau_m=\overline{\tau}_m} = c$.

Without imposing further structures on the model, it is difficult to further characterize the optimal tariff. However, if we assume a constant cost pass-through rate and a quadratic function in the concealment cost specification, we can derive conditions under which the optimal import rate is lower than τ_m^o.[10]

Proposition 4. *Let ρ be the constant cost pass-through rate. If $\rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}}|_{\tau_m=\tau_m^o}$ and ϕ is quadratic, we have $\tau_m^* < \tau_m^o$.*

Proof. See the Appendix. ■

[10] For instance, constant elasticity demand curves and linear demand curves have a constant cost pass-through rate. See Bulow and Pfleiderer (1983) and Weyl and Fabinger (2013).

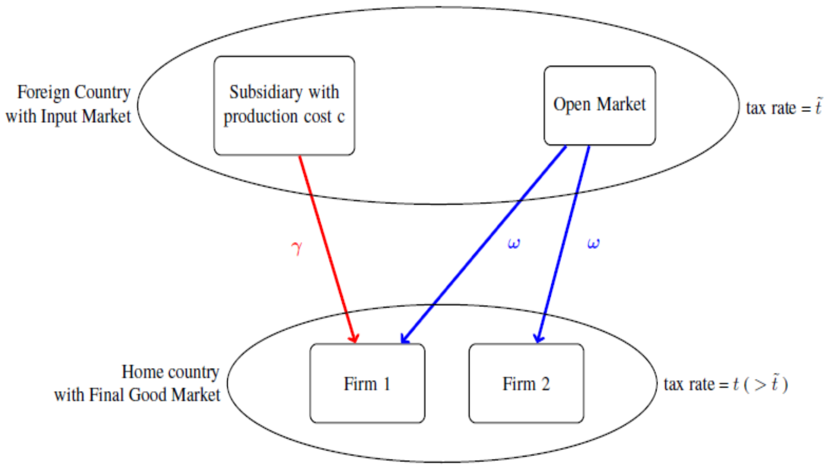

Figure 4: Duopoly Model with Strategic Interactions

The logic of the proof is similar to the one for Proposition 3. The condition that ϕ is quadratic ensures that $\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right| / \frac{d\xi}{d\tau_m}$ is decreasing in τ_m. Thus, when the pass-through rate is constant, the condition guarantees that $\frac{dW}{d\tau_m} < 0$ for all $\tau_m \geq \tau_m^o$.

4 The Duopoly Model with Strategic Interactions

In this section we consider a duopoly model in which an MNE competes with another firm in the domestic market in order to explore implications of strategic effects. The set-up is otherwise the same as in the monopoly model. More specifically, two final-good producers, firm 1 and firm 2, compete in H. Firm 2 is a domestic firm and simply procures its input from F with an exogenously given market price $\widetilde{\gamma} = \varpi$ (later we extend the model to endogenize $\widetilde{\gamma}$). Firm 1 has two choices as before. It can procure its input from F like firm 2. Or it can set up its own input production plant in F. In this case, its input production cost is given by c. The MNE chooses an internal transfer price (γ) when its foreign subsidiary supply its input to the headquarter firm that produces the final good. Figure 4 describes the duopoly model.

In the monopoly case, we assumed that the CUP method is not applicable because there is no comparable downstream firm and the input market simply does not exist in the case of FDI (unless the MNE is engaged in dual sourcing that also relies on outside suppliers). As a result, the ALP was based on the CP method and the MNE was assumed to operate with concealment costs when its transfer price deviates from its MC. In the case of duopoly, the applicability of the CUP method depends on whether the transactions between the rival downstream firm and its input suppliers can be regarded as "externally comparable" to internal transactions of the MNE (OECD 2010, p. 71). We present two sets of results depending on the comparability of the external transactions. In section 4.1, we first consider a scenario in which the external transactions are not considered as comparable. This would be the case if the two downstream firms produce differentiated products and use very different types of inputs. Then, the ALP should be based on the CP method and the MNE operates with concealment costs. In contrast, if the external transactions are considered as comparable, then the MNE is constrained to use the comparable market price as the internal transfer price. This second scenario is analyzed in section 4.2.

4.1 Profit Shifting in Duopoly Model with Concealment Costs

We first analyze the case in which the transactions between the rival downstream firm and its input suppliers are *not* comparable to the internal transactions of the MNE. In this case, the MNE's behavior can be described with the presence of concealment costs for transfer price that deviates from its true MC, as in the monopoly case. The case of comparable external transactions is analyzed in section 4.2. We maintain the assumption that concealment costs that is linear in output, that is, $\Phi(\gamma - c, q) = \phi(\gamma - c)q$ with $\phi' > 0, \phi'' > 0$ with $\phi'(0) = 0$.

To analyze implications of strategic interactions for the MNE's behavior, we assume that in the downstream market, the two firms compete in quantities with the standard assumption of strategic substitutes. More specifically, let $P_i(q_1, q_2)$ denote firm i's price when firm 1 and firm 2 produce q_1 and q_2, respectively.

Firm 1 solves the following problem:

$$\underset{q_1}{Max}\ \Pi_1 = (1-t)\underbrace{[P_1(q_1,q_2)-\gamma]q_1}_{\text{Downstream Profits}} + (1-\widetilde{t})\underbrace{(\gamma - c)q_1}_{\text{Upstream Profits}} - \underbrace{\phi(\gamma - c)q_1}_{\text{Concealment Costs}} \tag{8}$$

Once again, by collecting terms with q_1, we can rewrite it as

$$\Pi_1 = (1-t)[P_1(q_1,q_2) - \xi]q_1, \tag{9}$$

where

$$\xi = \frac{(1-\widetilde{t})c - (t-\widetilde{t})\gamma + \phi(\gamma - c)}{1-t}.$$

The first order condition for firm 1 is given by

$$\frac{1}{1-t}\frac{\partial \Pi_1}{\partial q_1} = \frac{\partial \pi_1(q_1, q_2; \xi)}{\partial q_1} = 0. \tag{10}$$

Firm 2 similarly makes its decision on q_2 to solve the following problem:

$$\underset{q_2}{Max} \pi_2(q_1, q_2; \varpi) = \; [P_2(q_1, q_2) - \varpi] q_2 \tag{11}$$

$\Rightarrow$

$$\frac{\partial \pi_2(q_1, q_2; \varpi)}{\partial q_2} = 0 \tag{12}$$

Given a transfer price γ, Eq (10) and (12) implicitly define reaction functions for firm 1 and firm 2, respectively. The equilibrium quantities for each firm, $q_1^*(\xi, \varpi)$ and $q_2^*(\xi, \varpi)$ are at the intersection of these two reaction functions, given the transfer price γ.

Assume $\left|\frac{\partial^2 \pi_i}{\partial q_i^2}\right| > \left|\frac{\partial^2 \pi_i}{\partial q_i \partial q_j}\right|$, where $i = 1, 2$ and $j \neq i$. Then, we have the following standard result.

Lemma 3. $\frac{\partial q_1^*(\xi, \varpi)}{\partial \xi} < 0$ *and* $\frac{\partial q_2^*(\xi, \varpi)}{\partial \xi} > 0$.

Proof. See the Appendix. ■

Let $\pi_i^*(\xi, \varpi)$ denote the equilibrium profit of firm i when their MCs for firm 1 and firm 2 are given by ξ and ϖ, respectively. Lemma 3 then immediately implies that

$$\begin{aligned}
\frac{d\pi_1^*(\xi, \varpi)}{d\xi} &= \frac{\partial \pi_1}{\partial \xi} + \frac{\partial \pi_1}{\partial q_2}\frac{\partial q_2^*(\xi, \varpi)}{\partial \xi} = -q_1^*(\xi, \varpi) + \frac{\partial P_1}{\partial q_2} q_1^*(\xi, \varpi) \frac{\partial q_2^*(\xi, \varpi)}{\partial \xi} < 0 \\
\frac{d\pi_2^*(\xi, \varpi)}{d\xi} &= \frac{\partial \pi_2}{\partial q_1}\frac{\partial q_1^*(\xi, \varpi)}{\partial \xi} = \frac{\partial P_2}{\partial q_1} q_2^*(\xi, \varpi) \frac{\partial q_1^*(\xi, \varpi)}{\partial \xi} > 0
\end{aligned}$$

That is, the equilibrium profit of each firm is decreasing in its own cost and increasing in the rival firm's cost.

Since we can write firm 1's equilibrium profit after tax as $\Pi_1 = (1-t)\pi_1^*(\xi, \varpi)$ and $\pi_1^*(\xi, \varpi)$ is decreasing in ξ, the optimal choice of transfer price is equivalent to the choice of γ that minimizes ξ, as in the monopoly case. When the rival firm's input is not considered comparable and the CP method is used as a regulatory policy, we replicate the same result as in the monopoly case. The use of artificially inflated internal price is used to shift its profit at the downstream stage to the upstream subsidiary in F (the low tax rate country). As a result, the tax revenue from the MNE is reduced in H. However, it is not the end of the story; there is a collateral damage due to spillover effects. The aggressive behavior of the MNE with the tax-induced transfer price also reduces the rival firm's profits. Thus, the tax revenue from the other firm that is not engaged in tax manipulation also decreases (even though consumer surplus increases). In other words, we uncover an additional tax-revenue loss from other firms in the presence of imperfect competition due to strategic effects.

It is also worthwhile to point out the crucial difference between the strategic effects driven by tax differences in our model and strategic transfer pricing in the IO and management literature (see Alles and Datar (1998)). The basic premise of strategic transfer pricing in oligopoly models is to assume decentralized decision making and each division maximizes its own profits, rather than the overall profits of the firm. Otherwise, the optimal decisions will be based on true MCs and the transfer prices would not matter and would not generate any strategic effects because internal transfer prices are just transfers among divisions within the firm and cancel out each other from the perspective of firm's overall profits. Only when the decision of each division is driven by its own profits, transfer price can have any meaningful effects. In contrast, our model assumes centralized decision making. If the decision is not centralized, when the transfer price is inflated to reduce the tax burden, the strategic effects will work the other way around.

4.2 Arm's Length Principle with the CUP Method

We now consider a scenario in which two downstream firms produce a homogeneous product and the transactions between the rival downstream firm and its input suppliers can be considered comparable. Let $P(Q)$ denote the market price, where $Q = q_1 + q_2$.In this case, the ALP can be applied as a requirement that the transfer price be equal to similar input price in the market, which is the input price paid by firm 2.[11]

If the input market for firm 2 is perfectly competitive with the price of ω and the same input can be used for firm 1, the analysis is trivial. As its transfer price is constrained to be at ϖ with the CUP method, it will engage in FDI if and only if FDI is efficient from the

[11] Gresik and Osmundsen (2008) analyzes the ALP when all firms are vertically integrated and comparable but independent transactions on which the application of the ALP can be based is not available. Such a issue does not arise in our model because the rival downstream firm acquires its input from an independent source.

global efficiency point, that is, $c < \varpi$. In this case, profit-shifting will take place to some extent, but it is limited by the competitive market price ϖ. If $c > \varpi$, there is no inefficient FDI for the profit-shifting purpose. However, if we assume that the input available in the open market is supplied by a firm with market power, strategic interactions between firm 1 and the foreign input supplier with market power restore various inefficient outcomes, as shown in the next section.

5 The CUP Method and "Imperfect" Input Market

We now consider a case where the foreign input market is *imperfect* and thus the external reference price under CUP cannot be treated as an exogenous parameter. More specifically, we assume that the supplier of input for downstream firms is monopolistic with market power. In this case, we can restore inefficient FDI with internal sourcing for tax manipulation. In addition, we also show that there could be an inefficient refusal to sell to the competing downstream firm when the MNE's subsidiary is more efficient than the foreign supplier. This outcome results from incentive for tax manipulation and departs from the standard rationale for market foreclosure based on raising rival's costs in the literature [Salop and Scheffman (1983) and Ordover, Salop, and Saloner (1990)].

To reflect the monopolistic input market structure, we now endogenize $\widetilde{\gamma}$, which is a choice variable by the monopolistic input supplier in F. More specifically, let us assume that the input supplier in F sets the input price $\widetilde{\gamma}$ given its MC, $\widetilde{c}$. We also allow the MNE's subsidiary can also supply its input to the downstream competitor if it chooses so. We assume the following timing for the analysis.

Given $(c, \widetilde{c})$, which is assumed to be common knowledge for industry participants, but unknown to the regulator, firm 1 decides whether to engage in FDI. If it sets up an upstream subsidiary, it procures its input internally and at the same time sets a price at which it commits to supply to its downstream rival, i,e" firm 2. The internal transfer price is determined by the input acquisition price of the downstream rival. Given the input price commitment by the MNE, the foreign input supplier sets its own price. The downstream rival acquires its input from the input supplier with the lower price. We should mention that this timing assumption is equivalent to a dynamic negotiating process in which the price stage game is modeled as a descending price auction in which the MNE's subsidiary and the foreign supplier are bidders (see Reiffen 1992 and Ordover, Saloner, and

Salop 1992).[12] The equilibrium outcomes in this setting have different characterizations depending on the relative efficiency of the MNE's subsidiary (c) and the foreign input supplier ($\widetilde{c}$).

Case 1. $c > \widetilde{c}$

In this case, the MNE is less efficient than the foreign supplier. As a result, for any input price ($\geq \widetilde{c}$) set by the MNE will be undercut by the foreign supplier. This means that it is a weakly dominant strategy for the MNE's subsidiary to set a price very high (which is equivalent to the MNE's refusal to sell to firm 2). Under CUP, firm 1 behaves as if its input cost were

$$\xi^{CUP}(\widetilde{\gamma}) = \frac{(1-\widetilde{t})c - (t-\widetilde{t})\widetilde{\gamma}}{1-t}$$

if the foreign supplier sets a price of $\widetilde{\gamma}$. Let $q(x, y)$ denote the equilibrium output level for a downstream firm when its input cost is x while the rival firm's cost is given by y.

If firm 1 sets up a subsidiary and does internal sourcing, firm 2's input demand at price $\widetilde{\gamma}$ can be written as

$$q_2^{CUP}(\widetilde{\gamma}) = q(\widetilde{\gamma}, \xi^{CUP}(\widetilde{\gamma})).$$

The input demand expression above indicates that there are two channels through which the monopolistic input suppliers' price affects firm 2's demand. First, firm 2's demand is directly affected by the price it pays to the input supplier. Second, there is an indirect effect through the PMC of firm 1 because firm 1's transfer price is determined by the price firm 2 pays to the input supplier under the CUP method. The foreign input supplier faces the following problem:

$$\underset{\widetilde{\gamma}}{Max} \pi_2^m = (\widetilde{\gamma} - \widetilde{c})q(\widetilde{\gamma}, \xi^{CUP}(\widetilde{\gamma})).$$

In contrast, if firm 1 does outsourcing from the monopolistic input supplier, the monopolist sets its input price to maximize

$$\pi_b^m = (\widetilde{\gamma} - \widetilde{c})\, 2q(\widetilde{\gamma}, \widetilde{\gamma}).$$

For analytical simplicity, let us assume that both $\pi_2^m = (\widetilde{\gamma} - \widetilde{c})\, q(\widetilde{\gamma}, \xi^{CUP}(\widetilde{\gamma}))$ and $\pi_b^m =$

[12] We adopt this particular assumption to facilitate comparison of our results to the standard IO foreclosure literature. We were able to derive a similar set of results with different timing assumptions. For instance, we can have similar results if the foreign supplier sets its input price first and firm 1 can decide whether or not to engage in FDI after observing the input price.

$(\widetilde{\gamma} - \widetilde{c})\, 2q(\widetilde{\gamma}, \widetilde{\gamma})$ are concave in $\widetilde{\gamma}$.

Let us consider the case of FDI by firm 1. Then, the first order condition on $\widetilde{\gamma}$ for the input monopolist is given by

$$\frac{\partial \pi_2^m}{\partial \widetilde{\gamma}} = q(\widetilde{\gamma}, \xi^{CUP}) + (\widetilde{\gamma} - \widetilde{c}) \left[\frac{\partial q}{\partial x} + \frac{\partial q}{\partial y} \frac{\partial \xi^{CUP}}{\partial \widetilde{\gamma}} \right] = 0. \tag{13}$$

Thus, the optimal price, $\widetilde{\gamma}^*$, is implicitly defined by

$$\widetilde{\gamma}^* = \widetilde{c} - \frac{q(\widetilde{\gamma}^*, \xi^{CUP})}{\left[\frac{\partial q}{\partial x} + \frac{\partial q}{\partial y} \frac{\partial \xi^{CUP}}{\partial \widetilde{\gamma}} \right]} > \widetilde{c}$$

With the CUP applied as the ALP, the input price of the foreign supplier, $\widetilde{\gamma}$, influences the MNE's transfer price and indirectly affects MNE's competitive behavior in the downstream market via its effect on ξ^{CUP}. Since $\frac{\partial \xi^{CUP}}{\partial \widetilde{\gamma}} = \frac{-(t - \widetilde{t})}{1-t} < 0$, a higher input price to firm 2 reduces firm 1's PMC ξ^{CUP} and indirectly reduces firm 2's output via strategic effects. Thus, under the CUP, the foreign supplier charges a lower input price compared to the case of its absence if firm 1 produces internally with FDI.

To reduce the number of cases to consider, we assume that the gap between $\widetilde{c}$ and c is not too large. More specifically, we assume

$$\left. \frac{\partial \pi_2^m}{\partial \widetilde{\gamma}} \right|_{\widetilde{\gamma}=c} = q(c, c) + (c - \widetilde{c}) \left(\frac{\partial q(c, c)}{\partial x} - \frac{\partial q(c, c)}{\partial y} \frac{(t - \widetilde{t})}{1 - t} \right) > 0,$$

that is,

$$(c - \widetilde{c}) < \frac{q(c, c)}{\left| \frac{\partial q(c,c)}{\partial x} - \frac{\partial q(c,c)}{\partial y} \frac{(t - \widetilde{t})}{1-t} \right|}. \tag{14}$$

This condition guarantees that the input price for the rival in the presence of FDI, denoted as $\widetilde{\gamma}^*$, is higher than c.

To analyze the incentive for firm 1 to set up a foreign subsidiary, let us analyze the input price in the absence of FDI. The first order condition for the optimal price in this case, denoted $\widetilde{\gamma}^{**}$, is given by

$$\frac{\partial \pi_b^m}{\partial \widetilde{\gamma}} = 2 \left[q(\widetilde{\gamma}, \widetilde{\gamma}) + (\widetilde{\gamma} - \widetilde{c}) \left(\frac{\partial q(\widetilde{\gamma}, \widetilde{\gamma})}{\partial x} + \frac{\partial q(\widetilde{\gamma}, \widetilde{\gamma})}{\partial y} \right) \right] = 0 \tag{15}$$

Lemma 4. *Under condition (14),* $\widetilde{\gamma}^{**} > \widetilde{\gamma}^*$.

Proof. Note that under condition (14) $\widetilde{\gamma}^* > c$ and we have

$$\xi^{CUP}(\widetilde{\gamma}^*) = \frac{(1-\widetilde{t})c - (t-\widetilde{t})\widetilde{\gamma}^*}{1-t} < c.$$

Thus, $\xi^{CUP}(\widetilde{\gamma}^*) < \widetilde{\gamma}^*$. This implies that $q(\widetilde{\gamma}^*, \widetilde{\gamma}^*) > q(\widetilde{\gamma}^*, \xi^{CUP}(\widetilde{\gamma}^*))$.We can evaluate the first condition for $\widetilde{\gamma}^{**}$ at $\widetilde{\gamma} = \widetilde{\gamma}^*$.

$$\begin{aligned} \frac{1}{2}\frac{\partial \pi_b^m}{\partial \widetilde{\gamma}}\bigg|_{\widetilde{\gamma}=\widetilde{\gamma}^*} &= q(\widetilde{\gamma}^*, \widetilde{\gamma}^*) + (\widetilde{\gamma}^* - \widetilde{c})\left(\frac{\partial q}{\partial x} + \frac{\partial q}{\partial y}\right) \\ &> q(\widetilde{\gamma}^*, \xi^{CUP}(\widetilde{\gamma}^*)) + (\widetilde{\gamma}^* - \widetilde{c})\left(\frac{\partial q}{\partial x} - \frac{\partial q}{\partial y}\frac{(t-\widetilde{t})}{1-t}\right) = 0 \end{aligned}$$

Thus, $\widetilde{\gamma}^{**} > \widetilde{\gamma}^*$. ■

The intuition for the lemma above can be explained by the dependence of the MNE's internal price on its price to firm 2. As the MNE's internal price is inversely related to its price, firm 2 refrains from increasing its price in the case of FDI when the internal price is regulated by CUP.

Proposition 5. *Under condition (14), firm 1 engages in FDI, which is inefficient from the viewpoint of the global production.*

Proof. We now consider firm 1's FDI decision. The equilibrium profit for firm 1 in the absence of FDI is given by $\pi^*(\widetilde{\gamma}^{**}, \widetilde{\gamma}^{**})$ whereas its profit under FDI is given by $\pi^*(\xi^{CUP}(\widetilde{\gamma}^*), \widetilde{\gamma}^*)$. By lemma 6, we have $\widetilde{\gamma}^{**} > \widetilde{\gamma}^* > c > \xi^{CUP}(\widetilde{\gamma}^*)$. As a result, we have

$$\underbrace{\pi^*(\xi^{CUP}(\widetilde{\gamma}^*), \widetilde{\gamma}^*)}_{\text{Profit with FDI}} > \pi^*(\widetilde{\gamma}^*, \widetilde{\gamma}^*) > \underbrace{\pi^*(\widetilde{\gamma}^{**}, \widetilde{\gamma}^{**})}_{\text{Profit without FDI}}$$

■

With imperfect input market, there are three channels that affect incentives for FDI. First, the profit-shifting incentive faciliates FDI. Second, there is incentive to protect the MNE from the exercise of market power by the foreign input supplier. Lastly, FDI results in a lower input price for the rival downstream firm under the CUP method, which weakens incentive for FDI. As Lemma 6 shows, . Taken together, the Proposition above shows that the first two effects dominate the third one unless the MNE is sufficiently inefficient compared to the foreign supplier.

Case 2. $c < \widetilde{c}$

In this case, the MNE's subsidiary is more efficient than the foreign input supplier and firm 1 always sets up its subsidiary. We now address the MNE's incentives to supply its input to the domestic final-good competitor, firm 2. With the timing assumption we have, the MNE has the following options. If it decides to supply to firm 2, it needs to set a price equal to the foreign supplier's MC to prevent undercutting, that is, $\gamma = \widetilde{c}(-\epsilon)$. With this choice, firm 1 and firm 2's equilibrium outputs can be written as $q(\xi^{CUP}(\widetilde{c}), \widetilde{c})$ and $q(\widetilde{c}, \xi^{CUP}(\widetilde{c}))$, respectively, where $\xi^{CUP}(\widetilde{c}) = \frac{(1-\widetilde{t})c-(t-\widetilde{t})\widetilde{c}}{1-t}$. The corresponding MNE's profit can be written as

$$\Pi = (1-t)\pi(\xi^{CUP}(\widetilde{c}), \widetilde{c}) + (1-\widetilde{t})(\widetilde{c}-c)q(\widetilde{c}, \xi^{CUP}(\widetilde{c})).$$

If the subsidiary refuses to sell to firm 2 and the foreign input supplier supplies to firm 2, the foreign input supplier will set a price of $\widetilde{\gamma}^*$ (characterized by condition (13) above), and the MNE's profit can be written as

$$\Pi^{Foreclosure} = (1-t)\pi(\xi^{CUP}(\widetilde{\gamma}^*), \widetilde{\gamma}^*).$$

As is standard in the vertical-integration literature, there are trade-offs between raising rival's costs against lost profits for the upstream firm when the MNE engages in input foreclosure to the rival downstream firm. In our set-up, it turns out that the raising rival's costs effect becomes weaker compared to the standard industrial organization model, as will be shown below. However, there is an additional benefit of foreclosure in terms of tax benefits because the input foreclosure leads to an increase in the rival firm's input acquisition costs (from $\widetilde{c}$ to $\widetilde{\gamma}^*$), which can be used as the benchmark transfer price in the CUP regime.

To be more specific, firm 1's subsidiary refuses to sell to firm 2 if $\Pi^{Foreclosure} > \Pi$. This condition can be decomposed as follows:

$$\Pi^{Foreclosure} - \Pi = (1-t) \underbrace{\left[\pi(\xi^{CUP}(\widetilde{\gamma}^*), \widetilde{\gamma}^*) - \pi(\xi^{CUP}(\widetilde{c}), \widetilde{c})\right]}_{\substack{\text{Beneficial Effects of Input Foreclosure} \\ \text{for Downstream Division}}} - (1-\widetilde{t})\underbrace{(\widetilde{c}-c)q(\widetilde{c}, \xi^{CUP}(\widetilde{c}))}_{\text{Loss of Upstream Profit}}$$

Note that the expression for the beneficial effects of input foreclosure for the downstream division can be further decomposed as

$$\begin{aligned}\left[\pi(\xi^{CUP}(\widetilde{\gamma}^*),\widetilde{\gamma}^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{c})\right] &= \underbrace{\left[\pi(\xi^{CUP}(\widetilde{\gamma}^*),\widetilde{\gamma}^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{\gamma}^*)\right]}_{\text{Tax Manipulation Motives}} \\ &+ \underbrace{\left[\pi(\xi^{CUP}(\widetilde{c}),\widetilde{\gamma}^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{c})\right]}_{\text{Weakened Raising Rival's Costs Effects (WRR)}}\end{aligned}$$

The first beneficial effect comes from the fact that a higher input price paid by firm 2 due to market foreclosure leads to a higher transfer price under CUP which allows more profit shifting resulting in a lower PMC for the MNE. Second, there is the standard raising rival's cost effect. However, the raising rival's cost in our set-up is weaker due to the dependence of firm 1's transfer price on the foreign supplier's price: the higher the foreign supplier sets its price to firm 2, firm 1's PMC is reduced, which invites a more aggressive response by firm 1 and reduce firm 2's demand for its input. This limits the foreign supplier's incentive to charge a higher price. To see this, let γ_s^* be the monopolist's optimal input price if there was no dependence of PMC on its price. Then, $\gamma_s^* > \widetilde{\gamma}^*$ and we can write

$$\begin{aligned}WRR &= \underbrace{\left[\pi(\xi^{CUP}(\widetilde{c}),\widetilde{\gamma}^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{c})\right]}_{\text{Weakened Raising Rival's Costs Effects}} = \{\underbrace{\left[\pi(\xi^{CUP}(\widetilde{c}),\gamma_s^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{c})\right]}_{\text{Standard Raising Rival's Costs Effects}} \\ &\quad -\underbrace{\left[\pi(\xi^{CUP}(\widetilde{c}),\gamma_s^*)-\pi(\xi^{CUP}(\widetilde{c}),\widetilde{\gamma}^*)\right]}_{\text{Weakening Factor due to Price Dependence}}\}\end{aligned}$$

Taken together, if these two beneficial effects are larger than the loss of upstream profit, the MNE may engage in input market foreclosure and commit not to supply to firm 2 even if it is more efficient provider of input. More precisely, let $\overline{\gamma}$ be the rival firm's input acquisition cost which will make the MNE indifferent between supplying the rival firm and not supplying, that is,

$$\Pi = \Pi^{Foreclosure}(\overline{\gamma}),$$

where $\Pi^{Foreclosure}(\overline{\gamma}) = (1-t)\pi(\xi^{CUP}(\overline{\gamma}),\overline{\gamma})$. Then, if $\widetilde{\gamma}^* > \overline{\gamma}$, the MNE decides not to supply the rival firm even though its production cost is lower than the foreign input supplier.

We thus provide a novel mechanism through which input foreclosure can takes place even in the absence of raising rival's costs. To isolate our mechanism, consider an extreme case in which firm 1 and firm 2 are not direct competitors, which eliminates any incentives to raise rival's costs. We assume symmetric market for both firms and let $q^m(c)$ denote each downstream firm's monopoly quantity when its cost is c and let $\pi^m(c)$ be the corresponding monopoly profits in each market. When the two firms are not direct competitors, each firm's profit is independent of the other firm's costs and we have $WRR = 0$. Then, we have

$$\Pi^{Foreclosure} - \Pi = (1-t)\underbrace{\left[\pi(\xi^{CUP}(\widetilde{\gamma}^*)) - \pi(\xi^{CUP}(\widetilde{c})\right]}_{\text{Tax Manipulation Motives}} - (1-\widetilde{t})\underbrace{(\widetilde{c}-c)q^m(\widetilde{c})}_{\text{Loss of Upstream Profit}}.$$

As the loss of upstream firm profit term disappears as $\widetilde{c}$ approaches c, we have $\Pi^{Foreclosure} - \Pi|_{\widetilde{c}=0} > 0$. Therefore, we can conclude that there always exists a range of foreclosure unless the MNE is sufficiently more efficient than the foreign supplier.

For instance, consider a linear demand $P(q) = A - q$, where A represents the market size. Let us normalize $c = 0 < \widetilde{c} < A$. When the MNE commits not to supply to firm 2, it can be easily verified that $\widetilde{\gamma}^* = \frac{A+\widetilde{c}}{2}$ and the loss of MNE's upstream profit from foreclosure is given by $\widetilde{c}\left(\frac{A-\widetilde{c}}{2}\right)$ whereas the tax manipulation motives term becomes

$$\pi(\xi^{CUP}(\widetilde{\gamma}^*)) - \pi(\xi^{CUP}(\widetilde{c}) = \left(\frac{A + \frac{(t-\widetilde{t})}{1-t}\frac{(A+\widetilde{c})}{2}}{2}\right)^2 - \left(\frac{A + \frac{(t-\widetilde{t})\widetilde{c}}{1-t}}{2}\right)^2$$

because $\xi^{CUP}(\widetilde{c}) = -\frac{(t-\widetilde{t})\widetilde{c}}{1-t}$ and $\xi^{CUP}(\widetilde{\gamma}^*) = -\frac{(t-\widetilde{t})\widetilde{\gamma}^*}{1-t} = -\frac{(t-\widetilde{t})}{1-t}\frac{(A+\widetilde{c})}{2}$. It can be easily verified that $\Pi^{Foreclosure} - \Pi|_{\widetilde{c}=0} > 0$ and we can always guarantee $\Pi^{Foreclosure} - \Pi > 0$ for any c sufficiently close to $\widetilde{c}$, which results in an inefficient outcome. The MNE's incentives for tax manipulation via transfer price induces the less efficient input supplier to supply input to firm 2. In addition, the exercise of market power leads to a higher consumer price in market 2 with additional welfare loss.

6 Extension: Non-Linear Concealment Costs and Dual Sourcing

With the concealment costs linear in the amount internally transferred q (with an inflated price γ), the MNE will procure its input only from a single source (i.e., either all from the internal source or all from the open market). However, if the concealment costs are convex in q, the MNE may source its inputs from both the internal and external sources.

To see this, let us assume that $\Psi(\gamma - c, q) = \phi(\gamma - c)\mu(q)$ with μ' and $\mu'' > 0$.

$$\begin{aligned}\Pi &= (1-t)[P(q)-\gamma]q + (1-\widetilde{t})(\gamma - c)q - \phi(\gamma - c)\mu(q) \\ &= (1-t)\left([P(q) - \frac{(1-\widetilde{t})c - (t-\widetilde{t})\gamma}{1-t}]q - \frac{\phi(\gamma - c)}{1-t}\mu(q)\right).\end{aligned}$$

Thus, given γ, the PMC, ξ, from internal sourcing via FDI is *not* constant and can be expressed as

$$\xi(q;\gamma) = \frac{[(1-\widetilde{t})c - (t-\widetilde{t})\gamma] + \phi(\gamma - c)\mu'(q)}{1-t}.$$

This also implies that depending on the production quantity, the optimal transfer price changes. For a given quantity q, the transfer price that minimizes the total production cost $[(1-\widetilde{t})c - (t-\widetilde{t})\gamma]q + \phi(\gamma - c)\mu(q)$ is given by the following first order condition:

$$(t-\widetilde{t})q = \phi'(\gamma - c)\mu(q).$$

Totally differentiating the condition above, we can easily verify that the optimal internal price $\gamma^*(q)$ is decreasing in q:

$$(t-\widetilde{t})dq = \phi''(\gamma - c)\mu(q)d\gamma + \phi'(\gamma - c)\mu'(q)dq.$$

Thus, we have

$$\frac{d\gamma}{dq} = \frac{[(t-\widetilde{t}) - \phi'(\gamma - c)\mu'(q)]}{\phi''(\gamma - c)\mu(q)} < 0$$

because $\phi'(\gamma - c)\mu'(q) > \phi'(\gamma - c)\frac{\mu(q)}{q} = (t-\widetilde{t})$ by the convexity of ϕ and the first order condition for γ

Let q_I and q_O denote the amount of inputs from internal (i.e., FDI) and outside sources, respectively. Then, the fully optimal sourcing decision can be derived from the following optimization program:

$$\underset{q_I, q_O, \gamma}{Min} \frac{[(1-\widetilde{t})c - (t-\widetilde{t})\gamma]q_I + \phi(\gamma - c)\mu(q_I)}{1-t} + \varpi q_O$$

subject to

$$\begin{aligned} q_I + q_O &= q \\ q_I, q_O &\geq 0 \end{aligned}$$

The Lagrangian for this problem can be written as

$$\pounds = \frac{[(1-\widetilde{t})c - (t-\widetilde{t})\gamma]q_I + \phi(\gamma - c)\mu(q_I)}{1-t} + \varpi q_O + \eta[q - (q_I + q_O)],$$

where η is the Lagrangian multiplier associated with the constraint $q_I + q_O = q$.

The first order conditions can be written as

$$\begin{aligned}
\frac{\partial \pounds}{\partial q_I} &= \xi(q_I;\gamma) - \eta \geq 0, \frac{\partial \pounds}{\partial q_I} q_I = 0, \\
\frac{\partial \pounds}{\partial q_O} &= \varpi - \eta \geq 0, \frac{\partial \pounds}{\partial q_O} q_O = 0, \\
\frac{\partial \pounds}{\partial \gamma} &= \frac{-(t-\widetilde{t})q + \phi'(\gamma - c)\mu(q)}{1-t} = 0.
\end{aligned}$$

Let $\widehat{q}$ be the unique output level such that

$$\begin{aligned}
(t-\widetilde{t})q &= \phi'(\gamma - c)\mu(q), \\
\xi(q;\gamma) &= \frac{[(1-\widetilde{t})c - (t-\widetilde{t})\gamma] + \phi(\gamma - c)\mu'(q)}{1-t} = \varpi.
\end{aligned}$$

Then, the internal production is optimal up to $\widehat{q}$, but beyond which, outsourcing is optimal. Therefore, there can be two types of sourcing behavior.

(i) Dual Sourcing with $q_I > 0, q_O > 0$.

In this solution, $\xi(q_I;\gamma) = \varpi$. This would be the case when $q > \widehat{q}$. Then, the amount of internal sourcing is given by $q_I = \widehat{q}$, and the rest is outsourced, that is, $q_O = (q - \widehat{q})$.

(ii) Internal Sourcing with $q_O = 0$.

In this case, we have $\xi(q_I;\gamma) = \eta < \varpi$. This would be the case when $q < \widehat{q}$.

Which sourcing will be adopted depends on the size of the market. Let $MR(q)$ be the marginal revenue curve corresponding to the inverse market demand $P(q)$. Then, if $MR(\widehat{q}) > \varpi$, the dual sourcing arises. If not, then only internal sourcing arises. In this case, the MNE solves

$$\underset{q_I,\gamma}{Min} \frac{[(1-\widetilde{t})c - (t-\widetilde{t})\gamma]q_I + \phi(\gamma - c)\mu(q_I)}{1-t}$$

which defines $\gamma(q)$.Thus, the cost function up to $\widehat{q}$ is given by

$$\begin{aligned}
C(q) &= \frac{[(1-\widetilde{t})c-(t-\widetilde{t})\gamma(q)]q+\phi(\gamma(q)-c)\mu(q)}{1-t}, \\
C'(q) &= \frac{\partial C}{\partial q}+\frac{\partial C}{\partial \gamma}\frac{\partial \gamma}{\partial q}=\frac{[(1-\widetilde{t})c-(t-\widetilde{t})\gamma(q)]+\phi(\gamma(q)-c)\mu'(q)}{1-t}=\xi(q;\gamma)<\varpi,
\end{aligned}$$

which is described by ξ curve in Figure 4.

As Figure 4 illustrates, with convex concealment costs, there will be internal sourcing alone with small market demand, but as market size grows, the MNE relies on dual sourcing. Note that in our model, we abstract away from fixed costs of setting up a subsidiary by FDI. If there are any fixed costs associated with FDI, then our model would predict that for a very small market size, the sourcing will be done by pure outsourcing, but once the market size grows enough to justify fixed set-up costs, then the monopolist will switch to internal sourcing, and the market size becomes sufficiently large, it will also use outside sourcing. That is, the use of outsourcing is not monotonic with the market size if there are fixed costs of FDI.

To illustrate this, let us work with a parametric example of $\Psi(\gamma-c,q)=k\phi(\gamma-c)\mu(q)$, where $\phi(\gamma-c)=(\gamma-c)^{\alpha}$ with $\alpha>1$, and $\mu(q)=q^{\beta}$, that is, $\Psi(\gamma-c,q)=k(\gamma-c)^{\alpha}q^{\beta}$. Thus, $\phi'(\gamma-c)=\alpha k(\gamma-c)^{\alpha-1}$. As a result, the optimal γ and q satisfies

$$\begin{aligned}
(t-\widetilde{t})q &= k\alpha(\gamma-c)^{\alpha-1}q^{\beta}, \\
[(1-\widetilde{t})c-(t-\widetilde{t})\gamma]+k\beta(\gamma-c)^{\alpha}q^{\beta-1} &= (1-t)\varpi.
\end{aligned}$$

From the first equation, we have $\gamma(q)=c+\left(\frac{t-\widetilde{t}}{k\alpha}\right)^{\frac{1}{\alpha-1}}q^{-\frac{\beta-1}{\alpha-1}}$. By substituting this for γ in the second equation, we have

$$(1-t)c-(t-\widetilde{t})\left(\frac{t-\widetilde{t}}{k\alpha}\right)^{\frac{1}{\alpha-1}}q^{-\frac{\beta-1}{\alpha-1}}+k\beta\left[\left(\frac{t-\widetilde{t}}{k\alpha}\right)^{\frac{1}{\alpha-1}}q^{-\frac{\beta-1}{\alpha-1}}\right]^{\alpha}q^{\beta-1}=(1-t)\varpi.$$

$\Longrightarrow$

$$(1-t)(c-\varpi)=\left[(\frac{\alpha-\beta}{\alpha})(\alpha k)^{-\frac{1}{\alpha-1}}\left(t-\widetilde{t}\right)^{\frac{\alpha}{\alpha-1}}\right]q^{-\frac{\beta-1}{\alpha-1}}.$$

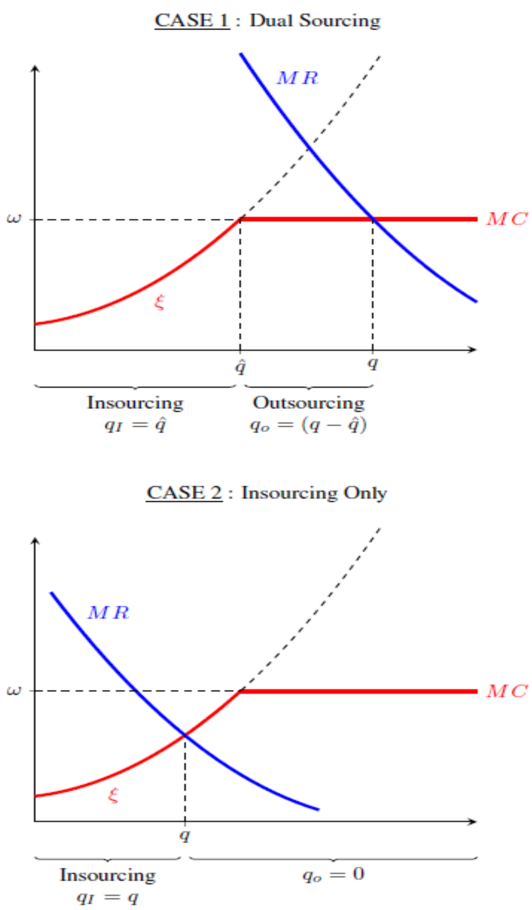

Figure 5: Internal vs. Dual Sourcing

Thus, q^* is given by

$$q^{\frac{\beta-1}{\alpha-1}} = \frac{\Omega}{(1-t)(c-\varpi)},$$

where $\Omega = \left[(\frac{\alpha-\beta}{\alpha})(\alpha k)^{-\frac{1}{\alpha-1}} \left(t-\widetilde{t}\right)^{\frac{\alpha}{\alpha-1}} \right]$
$\Longrightarrow$

$$\widehat{q} = \left[\frac{\Omega}{(1-t)(c-\varpi)} \right]^{\frac{\alpha-1}{\beta-1}} = \left[\frac{\alpha-\beta}{\alpha(1-t)(c-\varpi)} \right]^{\frac{\alpha-1}{\beta-1}} (\alpha k)^{-\frac{1}{\beta-1}} \left(t-\widetilde{t}\right)^{\frac{\alpha}{\beta-1}}.$$

To illustrate the idea, let us assume that $P(q) = A - q$, where A represents the market size. Then, $MR = A - 2q$ and the MR curve intersects with ω (the outsourcing MC) at $q = \frac{A-\omega}{2}$. Thus, dual sourcing takes place if and only if $\frac{A-\omega}{2} > \widehat{q}$, i.e.,

$$A > 2\widehat{q} + \varpi = 2 \left[\frac{\alpha-\beta}{\alpha(1-t)(c-\varpi)} \right]^{\frac{\alpha-1}{\beta-1}} (\alpha k)^{-\frac{1}{\beta-1}} \left(t-\widetilde{t}\right)^{\frac{\alpha}{\beta-1}} + \varpi.$$

6.1 Dual Sourcing and Invocation of the CUP Method

In the previous section, we analyzed the MNE's sourcing behavior in the presence of concealment costs. The basic premise of the analysis was that for the monopoly case we have considered the applicability of the ALP with the CUP method can be limited if there is only one firm that produces the product and there are no similar transactions that can be observed and used as a benchmark. This is especially so when all input acquisitions are done internally via FDI. Even if an alternative input is available at the price of ϖ, the MNE may argue that the input available in the open market is not suitable for specific purposes of the MNE and the unavailability of suitable input is the reason for FDI and internal sourcing to begin with. This allowed the MNE to use an internal transfer price that is different from ϖ and its true MC by incurring concealment costs.

However, such an argument loses appeal once the MNE engages in dual sourcing and acquires some of their input requirements from outsourcing because it is an implicit admission that the open market input is suitable for its final product. This implies that dual sourcing may entail a risk that it may induce the government to adopt the CUP method instead of the CP method.

In such a scenario, the MNE may respond by engaging in internal sourcing only to avoid the CUP method. Alternatively, it can do outsourcing in which case the CUP method will be imposed, and the internal price should be set at ϖ if internal sourcing is also used. However, the next Proposition shows that if dual sourcing invokes the use of the CUP method as an application of the ALP, the MNE never engages in dual sourcing when $c > \varpi$.

Proposition 6. *If dual sourcing triggers the CUP method, the monopolistic firm never engages in dual sourcing when $c > \varpi$ because it is dominated by outside sourcing alone.*

Proof. Suppose that the monopolistic firm engages in dual sourcing when $c > \varpi$, with $q_I > 0$ and $q_O > 0$, where $q = q_I + q_O$. Then, its internal price should be $\gamma = \varpi$. Thus, the monopolist's profit is with dual sourcing that triggers the CUP method is given by

$$\begin{aligned}\Pi^D &= (1-t)[P(q_I+q_O)-\varpi](q_I+q_O)+(1-\widetilde{t})(\varpi-c)q_I \\ &= (1-t)[P(q)-\varpi]q+(1-\widetilde{t})(\varpi-c)q_I\end{aligned}$$

Alternatively, if the monopolistic firm procures its input from only the outside source at the price of ϖ, its profits is

$$\begin{aligned}\Pi^{OS} &= (1-t)[P(q)-\varpi]q \\ &> (1-t)[P(q)-\varpi]q+(1-\widetilde{t})\underbrace{(\varpi-c)}_{(-)}q_I=\Pi^D\end{aligned}$$

Thus, the profit from dual sourcing is less than the one under outsourcing simply because the foreign subsidiary that produces internally makes loss due to CUP. ■

Proposition 6 shows that if dual sourcing triggers CUP, such an application of the ALP rule may fundamentally change the firm's sourcing behavior. Note that Proposition 6 does not imply that the monopolistic firm always do outsourcing when its own production cost is higher than ϖ. If internal sourcing makes the CUP method inapplicable, it may instead engage in internal sourcing just to avoid the imposition of CUP. Such a possibility is illustrated in Figure 6. The profit from outsourcing at the price of ϖ can be represented by the area $(B+C)$ whereas the profit from insourcing with concealment costs can be represented by the area $(A+B)$. Thus, if area A is bigger than area C, the insourcing will be chosen. In this case, the output changes from q to q^{CUP}.

We now show that when the imposition of CUP with dual sourcing changes sourcing behavior, the effects can be very different depending on which single sourcing method the monopolist employs. More specifically, if the imposition of CUP with dual sourcing

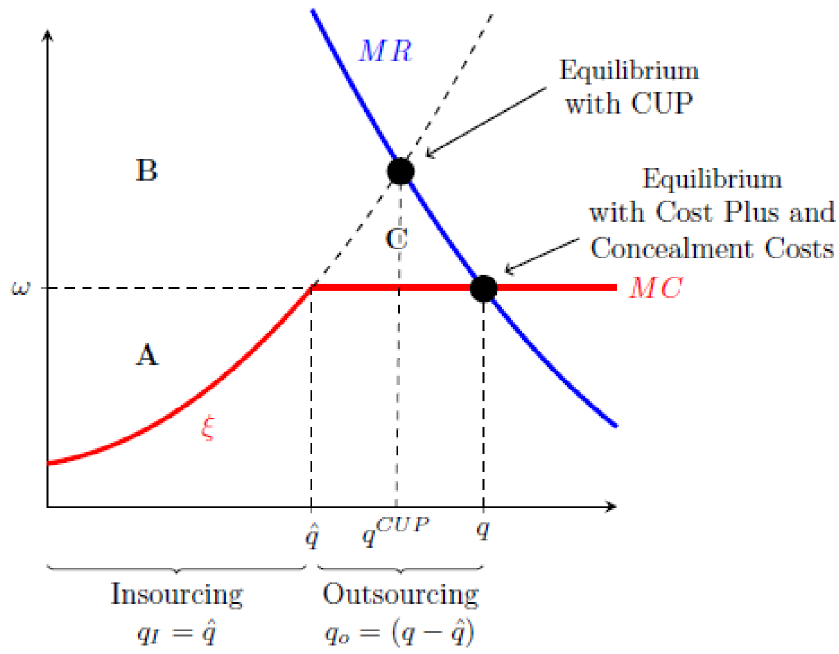

Figure 6: Sourcing Decision Change with CUP Method

induces only outsourcing, it limits tax manipulation and increases tax revenues without affecting consumer surplus. However, if the imposition of CUP with dual sourcing induces insourcing only, it actually reduces both tax revenue and consumer surplus. As a result, such a policy may backfire.

Proposition 7. *Suppose that $c > w$. If the imposition of CUP with dual sourcing induces outsourcing, the policy increases tax revenue with consumer surplus unchanged. However, if the policy induces insourcing, it reduces both tax revenue and consumer surplus.*

Proof. If the monopolist does outsourcing, its $MC = \varpi$. Therefore, the output level does not change from the dual sourcing case with the CP method. The tax revenue also increases because

$$P(q)q - \varpi q > P(q)q - \gamma q_I - \varpi q_O$$

Now suppose that the monopolist engages in only internal sourcing. Then, its output is given by q^{CUP}, which is less than the output level q with dual sourcing under the CP regime. In addition,

$$\begin{aligned} P(q)q - \gamma q_I - \varpi q_O &= [P(q) - w]\, q - (\gamma - \varpi) q_I \\ &\geq \left[P(q^{CUP}) - w\right] q^{CUP} - (\gamma - \varpi) q_I \\ &\geq \left[P(q^{CUP}) - \gamma\right] q^{CUP} + (\gamma - \varpi)\left(q^{CUP} - q_I\right) \\ &\geq \left[P(q^{CUP}) - \gamma\right] q^{CUP}. \end{aligned}$$

■

7 Concluding Remarks

We have analyzed MNE's incentives to manipulate an internal transfer price to take advantage of tax differences across countries. Our analysis of the monopoly case derives conditions under which FDI takes place and shows that tax-induced FDI can entail inefficient internal production. We also analyzed implications of the ALP and it can have the opposite effect to the one intended if it induces the MNE's sourcing decisions from dual sourcing to internal sourcing alone to avoid the application of the ALP. With imperfect competition, we show that the internal transfer price has additional strategic effects that further strengthen incentives to inflate the transfer price at the expense of the rival firm's profit. The tax-induced FDI by the MNE has spillover effects that reduce tax revenue from other domestic firms as well as the MNE.

We have analyzed FDI decision of only one firm in isolation in the oligopoly case assuming that other firms engage in outsourcing. However, each firm's FDI decision may also depend on other firm's FDI decision. This is an area of future research.

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Appendix

Proof of Proposition 3:

By Lemma 3, we know $\widehat{\xi}^* - \widehat{\xi}^{SP} \geq 0$ for all $\tau_m \geq \tau_m^o$. As in the proof of Proposition 2, for all $\tau_m \geq \tau_m^o$, we thus have

$$\begin{aligned} \frac{dW}{d\tau_m} &< -P' q \frac{dq(\tau_m)}{d\tau_m} - q(\tau_m) \frac{d\widehat{\xi}^{SP}}{d\tau_m} \\ &= -q \left[P' \frac{dq}{d\xi} \frac{d\xi}{d\tau_m} + \frac{d\widehat{\xi}^{SP}}{d\tau_m} \right]. \end{aligned}$$

A sufficient condition for $\frac{dW}{d\tau_m} < 0$ to be true for all $\tau_m \geq \tau_m^o$ is $\rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}} = \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\widehat{\gamma}^*} < 0$. When ϕ is quadratic with $\phi''' = 0$, it can be easily verified that

$$\frac{d \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}}}{d\tau_m} = \frac{(1-t)}{(\widehat{\gamma}^*)^2} \left[\widehat{\gamma}^* + \frac{\widetilde{t} + \phi'}{\phi''} \right] \underbrace{\frac{d\widehat{\gamma}^*}{d\tau_m}}_{(-)} < 0.$$

Thus, if $\rho > \frac{\left|\frac{d\widehat{\xi}^{SP}}{d\tau_m}\right|}{\frac{d\xi}{d\tau_m}} |_{\tau_m = \tau_m^o}$,the sufficient condition is satisfied for all $\tau_m \geq \tau_m^o$.

Proof of Lemma 4:

Totally differentiating the two equilibrium conditions for $q_1^*(\xi, \varpi)$ and $q_2^*(\xi, \varpi)$, we have

$$\begin{aligned} \frac{\partial^2 \pi_1(q_1, q_2; \xi)}{\partial q_1^2} dq_1 + \frac{\partial^2 \pi_1(q_1, q_2; \xi)}{\partial q_1 \partial q_2} dq_2 + \frac{\partial^2 \pi_1(q_1, q_2; \xi)}{\partial q_1 \partial \xi} d\xi &= 0, \\ \frac{\partial^2 \pi_2(q_1, q_2)}{\partial q_1 \partial q_2} dq_1 + \frac{\partial^2 \pi_2(q_1, q)}{\partial q_2^2} dq_2 + 0 d\xi &= 0. \end{aligned}$$

To conduct a comparative static analysis on ξ, we can rewrite the equations above as

$$\begin{bmatrix} \frac{\partial^2 \pi_1(q_1,q_2;\xi)}{\partial q_1^2} & \frac{\partial^2 \pi_1(q_1,q_2;\xi)}{\partial q_1 \partial q_2} \\ \frac{\partial^2 \pi_2(q_1,q_2)}{\partial q_1 \partial q_2} & \frac{\partial^2 \pi_2(q_1,q)}{\partial q_2^2} \end{bmatrix} \begin{bmatrix} \frac{dq_1}{d\xi} \\ \frac{dq_2}{d\xi} \end{bmatrix} = - \begin{bmatrix} \frac{\partial^2 \pi_1(q_1,q_2;\xi)}{\partial q_1 \partial \xi} \\ 0 \end{bmatrix}.$$

Note that $\frac{\partial \pi_1(q_1,q_2;\xi)}{\partial \xi} = -q_1$ by the envelope theorem. This implies that $\frac{\partial^2 \pi_1(q_1,q_2;\xi)}{\partial q_1 \partial \xi} = -1$.

Applying the Cramer's rule, we obtain

$$\frac{dq_1}{d\xi} = \frac{\begin{vmatrix} 1 & \frac{\partial^2\pi_1(q_1,q_2;\gamma)}{\partial q_1 \partial q_2} \\ 0 & \frac{\partial^2\pi_2(q_1,q)}{\partial q_2^2} \end{vmatrix}}{D} = \frac{\frac{\partial^2\pi_2(q_1,q_2)}{\partial q_2^2}}{D} < 0,$$

$$\frac{dq_2}{d\xi} = \frac{\begin{vmatrix} \frac{\partial^2\pi_1(q_1,q_2;\gamma)}{\partial q_1^2} & 1 \\ \frac{\partial^2\pi_2(q_1,q_2)}{\partial q_1 \partial q_2} & 0 \end{vmatrix}}{D} = -\frac{\frac{\partial^2\pi_2(q_1,q_2)}{\partial q_1 \partial q_2}}{D} > 0,$$

.where $D = \left[\frac{\partial^2\pi_1(q_1,q_2;\gamma)}{\partial q_1^2}\frac{\partial^2\pi_2(q_1,q)}{\partial q_2^2} - \frac{\partial^2\pi_1(q_1,q_2;\gamma)}{\partial q_1 \partial q_2}\frac{\partial^2\pi_2(q_1,q_2)}{\partial q_1 \partial q_2}\right] > 0$. We obtain the desired result, because we have $\frac{\partial^2\pi_2(q_1,q_2)}{\partial q_2^2} < 0$ by the second order condition and $\frac{\partial^2\pi_2(q_1,q_2)}{\partial q_1 \partial q_2} < 0$ by the assumption of strategic substitutes.