DISCUSSION PAPER SERIES

Discussion paper No. 190

Trade Intermediaries, the Choice of Export Mode, and the "Learning-By-Exporting" Hypothesis

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April 2019

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Abstract

Focusing on the role of an intermediary, we consider the choice of export mode (i.e., direct vs. indirect exports) by a manufacturer. We also examine the effect of "learning-by-exporting," which implies that a manufacturer using an intermediary in a previous period is likely to export directly in a subsequent period.

Keywords: export mode; trade costs; intermediary firms; Nash bargaining; self-selection hypothesis; learning-by-exporting hypothesis

JEL Classification: D21; F1; L81

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1. Introduction

The recent development of micro databases at the firm- and plant-level has provided empirical evidence that all manufacturers in an industry do not necessarily export their products to foreign markets.[1] Indeed, the evidence suggests that firms with high productivities often export directly to foreign markets, whereas those with low productivities tend to sell their products only to domestic markets or exit the industry entirely. For this, seminal work by Melitz (2003), Helpman et al. (2004), Antràs and Helpman (2004), and Helpman (2006) provide a thorough theoretical grounding by constructing models featuring heterogeneous firms with differentiated products, various levels of productivity, and sunk and/or fixed export costs.

For the most part, these studies demonstrate the sorting of firms by their level of productivity and thus consider the organization of firms according to their international behavior, including exporting, foreign investment, multinational cooperation, and offshoring. It is also worth noting that both the theoretical and empirical literature supports the so-called “self-selection” hypothesis, whereby exporters need a productive advantage before they commerce exporting.

[1] In a representative survey of existing theoretical and empirical research, Bernard et al. (2007) consider “old” and “new” trade theories and their supporting empirical evidence.

Recently, empirical studies have begun to focus on the role of intermediaries in international trade, i.e., trading (nonmanufacturing) companies such as wholesalers and retailers (e.g., *Sogo Shosha* in Japan).[2] In particular, an important hypothesis in this body of research is that smaller firms prefer to export their products via trade intermediaries (i.e., as an indirect export), while larger firms prefer to sell their product directly abroad (i.e., as a direct export). For instance, using data from the World Bank Enterprise Survey conducted in Turkey in 2005, Abel-Koch (2013) shows that there is a significant negative correlation between firm size and the relative importance of indirect exports as opposed to direct exports.

The following statement in Bai et al. (2017) very much inspires the current paper: "We treat intermediaries as *agents who help export to rather than distribute in destination market*" (emphasis added) (p. 123). This implies that "learning-by-exporting" (LBE) via intermediation affects the choice of export mode. That is, a manufacturing firm (hereafter, manufacturer) may be more likely to export directly following indirect exporting via a trade intermediary firm (hereafter, intermediary). Thus, focusing on the role of an intermediary, we consider the following problems.

[2] For example, Bernard et al. (2010, 2011, 2015). For the empirical analysis of the wholesalers and retailers in international transactions, see Antràs and Costinot (2011), Crozet et al. (2013), MaCann (2013), and Tanaka (2013).

First, the choice of export mode by the manufacturer. We demonstrate that the choice of mode depends on, among other things, the marginal cost of the manufacturer.[3] That is, a manufacturer with a lower marginal cost prefers the direct export mode, whereas a manufacturer with a higher marginal cost prefers the indirect export mode through an intermediary. Second, the effect of LBE via an intermediary. For this, we consider the change of export mode, i.e., the transition from the indirect to the direct export mode, assuming the effect of LBE on the reduction of production and export costs.

Studies by Ahn et al. (2011), Felbermayr and Jung (2011), and Akerman (2018) are closely related to the first problem. All these studies develop a theoretical framework based on firm heterogeneity and fixed export costs along the lines of Melitz (2003), and then provide empirical evidence concerning the relationship between the export mode and the size and productivity of manufacturers. However, while all three studies provide similar empirical results in demonstrating the first problem, there are some differences in their characterization of the intermediation sector.[4] In particular, Akerman (2018)

[3] Unlike the previous models, we treat the marginal cost of production as an important parameter, instead of firm size and productivity.

[4] Ahn et al. (2011) model the intermediary sector as being perfectly competitive with (homogeneous) intermediaries exporting on behalf of manufacturers. In this model, intermediaries purchase varieties from manufacturers at the same price as domestic

assumes that wholesalers (i.e., intermediaries) can handle many different goods produced by manufacturers at a given fixed export cost. This implies that wholesalers can save on fixed costs by handling many goods, i.e., economies of scope. Thus, Akerman (2010) derives the sorting pattern of manufacturers by including wholesalers able to spread the fixed exporting costs across more than one good, but ones that also need to charge an additional markup on the manufacturer procurement price to cover these fixed costs. In other words, the choice of export mode depends on the size and productivity of the manufacturer. In particular, because intermediated exports are associated with lower fixed export costs of gaining access to foreign markets, they are attractive options for small and rather inefficient manufacturers that wish to export their goods. As shown below in our analysis, we reflect this by employing Nash bargaining between a manufacturer and an intermediary in the indirect export mode.

Several existing related studies explore the second problem, e.g., using the Chinese

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consumers and incur an additional marginal cost of selling these abroad. In contrast, both Antras and Costinot (2010) and Felbermayr and Jung (2011) assume that there is an infinitely elastic supply of trade intermediaries in every country. Each manufacturer that finds it optimal to export via an intermediary then makes a take-it-or-leave-it offer, which specifies an upfront-fee for participation in the relationship paid by the intermediary. This fee can be positive or negative, and we may interpret it either as a franchising fee paid by an intermediary to a manufacturer or as a down payment of a manufacturer to an intermediary towards the financing of any fixed foreign distribution costs.

census data recording firm-level export transactions across products and countries, Ahn et al. (2011) show that firms using intermediaries in previous periods are more likely to export directly in subsequent periods than other firms, with the probability of a change from an indirect to a direct export mode of 35.7%. Although this result is only suggestive, it does provide the first known evidence that intermediaries facilitate participation in direct export. More recently, but also using Chinese data, Bai et al. (2017) develop a dynamic discrete choice model and provide transition rates of 0.111 (at the data base) and 0.137 (at the model base) for the change of an indirect exporter in the previous period to a direct exporter in the subsequent period. Drawing on these empirical findings, we develop a simple two-period model and theoretically examine the change from indirect to direct export modes. We find that if the effects of LBE on reducing the marginal production cost and fixed export cost are significantly large, if the market size of the foreign country is very large, and if the bargaining power of the manufacturer is sufficiently weak, then a manufacturer using an intermediary in the previous period can export directly in the subsequent period.

The reminder of the paper is structured as follows. Section 2 discusses the direct and indirect modes of exporting and after comparing the net profits of the manufacturer for both, provides the optimal choice of export mode. After assuming the effect of LBE

on the marginal product and fixed export cost functions, Section 3 demonstrates that an intermediary is an agent that will assist the manufacturer to change export mode and export directly. Section 4 summarizes our main results and outlines some remaining problems.

2. The Model

2.1 Direct export mode and export costs: Self-selection hypothesis

As shown in Figure 1a, there are two countries, home and foreign, with a manufacturer locating in the former and a competing firm in the latter. We consider Bertrand competition between the manufacturer and the foreign firm in a foreign market.[5] To simplify the analysis, we assume the following linear demand functions:

$$q_M = a - p_M + \gamma p_F, \tag{1}$$

$$q_F = a - p_F + \gamma p_M, \tag{2}$$

where subscript M (F) denotes the manufacturer (foreign firm) and $0 < \gamma < 1$.

We assume that the marginal cost of production of the manufacturer is given by

[5] We assume that irrespective of the level of marginal cost, the manufacturer provides the product to the domestic market. Thus, to focus on the choice of export mode by the manufacturer, we need not analyze the manufacturer's behavior in the domestic market.

$C_{Mp} = cq_M$, $c \geq 0$, whereas that of the foreign firm is zero, i.e., $C_{Fp} = 0$. Following heterogeneous firm trade theories, we assume that the manufacture must expend export costs where $C_{Me} = tq_M + F$, $t(\geq 0)$ denotes the tariff, transportation and distribution costs, and $F(>0)$ is a fixed export cost reflecting the cost of entry into the foreign market and the startup cost of international business. This potentially includes employing labor working on foreign trade tasks, investment in foreign subsidiaries, building its own distribution network, and maintaining customer relations abroad. Given the above assumptions, the net profit functions of the two firms in the case of a direct export mode are:

$$\Pi_{Md} = \pi_{Md} - F = (p_M - c - t)q_M - F, \tag{3}$$

$$\Pi_F = \pi_F = p_F q_F, \tag{4}$$

where π_{Md} (π_F) is a gross profit of the manufacturer (foreign firm). Using equations (1) and (2), and the first-order conditions (FOC) for profit maximization of both firms, we obtain the price and quantity of the manufacturer in the Bertrand equilibrium:

$$p_{Md}^{*} = \frac{(2+\gamma)a + 2(t+c)}{4-\gamma^2}, \tag{5}$$

$$q_{Md}^{*} = p_{Md}^{*} - c - t = \frac{A - (2-\gamma^2)c}{4-\gamma^2}, \tag{6}$$

where $A \equiv (2+\gamma)\{a-(2-\gamma)t\} > 0$ and $(0 \le)c < \frac{A}{2-\gamma^2} \equiv \bar{c} \Leftrightarrow q_{Md}^* \ge 0$. The foreign firm's price and quantity are given by $p_F^* = \frac{(2+\gamma)a+\gamma(t+c)}{4-\gamma^2} = q_F^*$. Hereafter, because we mainly analyze the behavior of the manufacturer, we do not explicitly discuss the foreign firm.

Given the gross profit of the manufacturer is $\pi_{Md}^* = \left(p_{Md}^* - c - t\right)q_{Md}^* = \left\{q_{Md}^*\right\}^2$, the net profit is expressed as:

$$\Pi_{Md}^* = \pi_{Md}^* - F = \left\{\frac{A-(2-\gamma^2)c}{4-\gamma^2}\right\}^2 - F. \tag{7}$$

If the net profit is positive, the manufacturer can directly export the product to a foreign country. Using equation (7), the cutoff level of the marginal cost is given by $c_E \equiv \left\{0 \le c < \bar{c} \middle| \Pi_{Md}^* = \pi_{Md}^* - F = 0\right\}$, i.e., $c_E = \frac{A-(4-\gamma^2)\sqrt{F}}{2-\gamma^2} < \bar{c}$, where $A > (4-\gamma^2)\sqrt{F}$. Therefore, we summarize the direct export condition as the following lemma.

Lemma 1

If $0 \le c < c_E$, *then the manufacturer can export directly abroad. Otherwise, not, i.e.,* $c_E \le c < \bar{c}$.

Lemma 1 supports the self-selection hypothesis, indicating that exporters must have a productive advantage before they commerce exporting.

2.2 Indirect export mode and the role of the intermediary

Lemma 1 implies that even when expending a fixed export cost, the manufacturer can export abroad if its marginal cost is sufficiently low. Conversely, if the manufacturer is inefficient, i.e., a higher marginal cost firm, there are no exporting manufacturers located in the home country. However, as discussed, in exporting to various foreign markets, many manufacturers use wholesalers and retailers for trade intermediation. Here, we examine the case of an indirect export mode (see Figure 1b).

We examine the following two-stage game. In the first stage, the manufacturer bargains with an intermediary over the manufacturing price of the product and the down payment (as security). In particular, to decide the manufacturing price, p_{Mid}, and the down payment, G, they play a Nash bargaining game consisting with a two-part tariff. In the second stage, the intermediary and the foreign firm engage in Bertrand competition in the foreign market. Through backward induction, we derive the subgame perfect Nash equilibrium.

In contrast to the manufacturer, the intermediary competes on price in the foreign

market. Considering equations (1) and (2), the demand functions are given by

$$q_I = a - p_I + \gamma p_F, \tag{8}$$

$$q_F = a - p_F + \gamma p_I, \tag{9}$$

where subscript I denotes the intermediary. In this case, the net profit of the intermediary is given by:

$$\Pi_I = \pi_I + G = (p_I - p_{Mid} - t)q_I + G, \tag{10}$$

where we assume that the fixed export cost for the intermediary is either very low or negligible.[6] This would hold where the intermediary has already established trading distribution networks and foreign subsidiaries throughout the world.

The net profit of the foreign firm is identical to that in equation (4). Using equations (4) and (10), from the FOC, we obtain the following price and quantity for the intermediary at the Bertrand equilibrium in the second stage.

$$p_I^* = \frac{(2+\gamma)a + 2(t + p_{Mid})}{4 - \gamma^2}, \tag{11}$$

$$q_I^* = \frac{A - (2 - \gamma^2)p_{Mid}}{4 - \gamma^2}. \tag{12}$$

The net profit of the manufacturer is then:

$$\Pi_{Mid} = \pi_{Mid} - G = (p_{Mid} - c)q_{Mid} - G. \tag{13}$$

[6] Although the intermediary incurs nonzero fixed export costs, if these are sufficiently lower than under the direct export mode, the analysis that follows does not change (See Appendix A).

where $q_{Mid} = q_I^*$.

In the first stage, we investigate the following Nash bargaining game between the intermediary and the manufacture:

$$\underset{p_{Mid},G}{Max} V \equiv (\Pi_{Mid})^{\beta}(\Pi_I)^{1-\beta} = (\pi_{Mid} - G)^{\beta}(\pi_I + G)^{1-\beta}, \tag{14}$$

where β $(0 < \beta < 1)$ denotes the bargaining power of the manufacturer.[7] First, the FOC with respect to G is given by: $\frac{\partial V}{\partial G} = V\left\{(1-\beta)(\pi_I + G)^{-1} - \beta(\pi_{Mid} - G)^{-1}\right\} = 0.$ Thus, we obtain the following down payment:[8]

$$G^* = (1-\beta)\pi_{Mid} - \beta\pi_I. \tag{15}$$

Substituting equation (15) into equation (14), we rewrite the former as:

$$\underset{p_{Mid}}{Max} V = B(\pi_{Mid} + \pi_I) = B\left(p_I^* - c - t\right)q_I^*,$$

where $B \equiv \beta^{\beta}(1-\beta)^{1-\beta} > 0.$ Thus, the FOC with respect to the manufacturing price is given by: $\frac{\partial V}{\partial p_{Mid}} = \frac{B}{(4-\gamma^2)^2}\left\{\gamma^2 A + (2-\gamma^2)(4-\gamma^2)c - 4(2-\gamma^2)p_{Mid}\right\} = 0.$ We then obtain the following manufacturing price and quantity in the equilibrium of Nash bargaining game.

$$p_{Mid}^* = \frac{\gamma^2 A + (2-\gamma^2)(4-\gamma^2)c}{4(2-\gamma^2)}, \tag{16}$$

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[7] For $\beta = 1,$ see Appendix B.

[8] Given equation (15), $G^* > (<)0 \Leftrightarrow \frac{\gamma^2}{2} > (<)\beta$ holds.

$$q^*_{Mid} = q^*_I = \frac{A-(2-\gamma^2)c}{4}, \tag{17}$$

where $(0 \leq)c < \bar{c} \Leftrightarrow q^*_{Mid} \geq 0$. The gross and net profit of the manufacturer and the an intermediary are then:

$$\pi^*_{Mid} = \left(p^*_{Mid} - c\right)q^*_I = \frac{\gamma^2\left\{A-(2-\gamma^2)c\right\}^2}{16(2-\gamma^2)} < \pi^*_{Md}, \tag{18}$$

$$\Pi^*_{Mid} = \pi^*_{Mid} - G^* = \beta\left(\pi^*_{Mid} + \pi^*_I\right) = \beta\frac{\left\{A-(2-\gamma^2)c\right\}^2}{8(2-\gamma^2)}, \tag{19}$$

$$\Pi^*_I = \pi^*_I + G^* = (1-\beta)\left(\pi^*_{Mid} + \pi^*_I\right) = (1-\beta)\frac{\left\{A-(2-\gamma^2)c\right\}^2}{8(2-\gamma^2)}. \tag{20}$$

It is clear from equation (19) that the manufacturer can export the product through the intermediary and this differs from the direct export mode.

2.3 Choice of export mode

We now consider the optimal choice of export mode using the earlier results. Using equations (7) and (19), we first derive the cutoff level of marginal cost: $c_X \equiv \left\{0 \leq c < \bar{c} \middle| \Pi^*_{Md} = \Pi^*_{Mid}\right\}$, i.e., $c_X = \dfrac{A - \sqrt{\dfrac{8(2-\gamma^2)F}{\bar{\beta}-\beta}}}{2-\gamma^2} < c_E$, where we assume

$A > \sqrt{\frac{8(2-\gamma^2)F}{\overline{\beta}-\beta}}$ and $(1>)\overline{\beta} \equiv \frac{8(2-\gamma^2)}{(4-\gamma^2)^2} > \beta$.[9] An increase in the size of the foreign market and/or a decrease in the variable export cost (e.g., the tariff and transportation cost), and a fall in the fixed export cost will then increase the cutoff level of marginal cost, i.e., $\frac{dc_X}{dA} > 0$ and $\frac{dc_X}{dF} < 0$.

In view of Lemma 1, we summarize the result as the following proposition (see Figure 2).

Proposition 1

(i) If $0 \le c < c_X$, *it holds that* $\Pi^*_{Md} > \Pi^*_{Mid} > 0$. *Thus, the manufacturer chooses the direct export mode.*

(ii) If $c_X < c < c_E$, *it holds that* $\Pi^*_{Mid} > \Pi^*_{Md} > 0$. *Thus, the manufacturer changes the direct export mode to the indirect export mode.*

(iii) If $c_E \le c < \bar{c}$, *it holds that* $\Pi^*_{Mid} > 0 > \Pi^*_{Md}$. *Thus, the manufacturer chooses the*

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[9] It is necessary for the down payment to be positive, i.e., $G^* > 0$, such that $\frac{\gamma^2}{2} > \beta$. Because $\overline{\beta} > \frac{\gamma^2}{2}$, it always holds that $\overline{\beta} > \beta > 0$. Suppose there is a negative down payment, i.e., $G^* < 0$. Then $\frac{\gamma^2}{2} < \beta$. In this case, if $1 > \beta \ge \overline{\beta}$, then $\Pi^*_{Mid} > \pi^*_{Md} > \Pi^*_{Md}$. Thus, the manufacturer necessarily chooses the indirect export mode.

indirect export mode.

Proposition 1 (i) states that an efficient manufacturer can export the product directly even when expending a fixed export cost. A relatively inefficient manufacturer will only then export the product through an intermediary. In particular, equation (18) implies that the gross profit in the direct export mode is greater than that in the indirect export mode. In this case, Propositions 1 (ii) and 1 (iii) imply that the manufacturer with relatively inefficient technologies conserves the fixed export cost by using an intermediary, and as a result, can export the product to the foreign market.

3. “Learning-By-Exporting” Hypothesis and the Intermediary

3.1 Two-period LBE model

We develop the following two-period model. In the first period, there is a manufacturer unable to export the product abroad without an intermediary (because net profit would fall if the manufacturer exported directly), i.e., $c_{(1)} > c_{X(1)}$, as shown in Proposition 1 (ii) and (iii). This manufacturer will then produce export goods by choosing the indirect

export mode in the first period, and as a result, either production or export costs decrease through the effect of LBE. In the second period, the manufacturer with these reduced costs will then choose either the direct or indirect export mode according to the condition $c_{X(2)} > (<) c_{(2)}$.[10]

In what follows, to demonstrate the conditions of choosing the direct export mode, in the subsequent period, given the effect of LBE, we examine reducing the production or fixed export costs and address the economic implications in both cases.

First, with a reduction of the product cost, the LBE effect implies a reduction in the marginal cost of producing export goods not otherwise produced without using an intermediary. That is, the effect of LBE is the same as that of the well-known learning-by-doing hypothesis. Further, the manufacturer may also absorb technological knowledge through competition with rival firms in the foreign market (e.g., spillover effects). Based on the above, we assume the following marginal cost function:

$$c_{(2)} = c\left[q^{*}_{Mid(1)}\right], \quad c_{(1)} = c, \quad c'\left[q^{*}_{Mid(1)}\right] < 0, \text{ and } \quad c[0] = c. \tag{21}$$

Second, with a reduction of the fixed export cost, the LBE effect implies that the manufacturer will learn various skills and abilities, and acquire information about

[10] A manufacturer with a lower marginal cost, i.e., $c_{X(1)} > c_{(1)}$, can export without using an intermediary in the first period. Thus, even without the LBE effect, it can export directly in the second period.

transactions abroad through the bargaining process with the intermediary and through the exports themselves in the first period. It can then reduce its fixed export cost, especially the entry cost into the foreign market, at the beginning of the second period. The manufacturer will also maintain its relations and reputation with foreign customer at the beginning of the second period because it exported the product in the first period (although via an intermediary). This leads to a reduction in the entry cost, such as for advertising and brand awareness, for entry into the foreign market in the second period. Based on the above, we assume the following fixed export cost function:

$$F_{(2)} = F\left[q^{*}_{Mid(1)}\right], \quad F_{(1)} = F, \quad F'\left[q^{*}_{Mid(1)}\right] < 0, \text{ and } F[0] = F. \qquad (22)$$

Taking equation (22), the cutoff level of the marginal cost function is represented as:

$$c_{X(2)} = c_X\left[F_{(2)}\right], \quad c_X{}'\left[F_{(2)}\right] < 0, \text{ and } c_X[F] = c_X. \qquad (23)$$

3.2 Reduction of marginal cost through the effect of LBE

In this case, we assume that the fixed export costs in the two periods are constant and given, such that $F_{(1)} = F_{(2)} = F$. Thus, it holds that $c_{X(1)} = c_{X(2)} = c_X$. To demonstrate the choice of the direct export mode in the second period, we examine the following condition: $c = c_{(1)} > c_X > c_{(2)} = c\left[q^{*}_{Mid(1)}\right]$. We also assume the following marginal cost

function for the second period $c\left[q^*_{Mid(1)}\right]=\frac{c}{1+\delta q^*_{Mid(1)}}$, where $q^*_{Mid(1)}=\frac{2-\gamma^2}{4}(\bar{c}-c)$ and $\delta>0$ is a parameter indicating the strength of LBE. That is, the larger the parameter value, the greater the reduction in marginal cost. We derive the following relationship:

$$c_{X(2)} > (<) c_{(2)} \Leftrightarrow \delta > (<) \Gamma_C[A,\beta] \Leftrightarrow \textit{The direct (indirect) mode}, \quad (24)$$

where $\Gamma_C[A,\beta] \equiv \frac{4}{2-\gamma^2}\frac{c-c_X}{\bar{c}-c}\frac{1}{c_X}$, $\frac{d\Gamma_C}{dA}<0$ and $\frac{d\Gamma_C}{d\beta}>0$.

Considering equation (24), if the strength of LBE is sufficiently large, the manufacturer chooses the direct export mode for the second period. For example, manufacturers in newly industrializing and less-developed countries have a stronger incentive to acquire advanced technologies and expertise, i.e., international spillover effects, than firms in developed countries. Thus, the strength of LBE would be sufficiently large. Further, if the export destinations are markets in developed countries, the market sizes are generally sufficiently large and the trade barriers are very low. This implies that the level of $\Gamma_C[A,\beta]$ is small because parameter A is large. Similarly, the level of $\Gamma_C[A,\beta]$ is small because the bargaining power of the manufacturer in less developed countries is weak. Therefore, if these conditions hold, the manufacturer, which could not export without a trade intermediary frim in the first period, chooses the direct export mode in the second period.

3.3 Reduction of the fixed export cost through the effect of LBE

In this case, we instead assume that the marginal costs of production in the two periods are constant and given, such that $c_{(1)} = c_{(2)} = c$. Thus, to demonstrate the choice of the direct export mode in the second period, we examine the following condition: $c_X\left[F_{(2)}\right] = c_{X(2)} > c_{(2)} = c = c_{(1)} > c_{X(1)} = c_X\left[F_{(1)} = F\right] = c_X$. We assume the following fixed export cost function in the second period; $F_{(2)} = F\left[q^*_{Mid(1)}\right] = \frac{F}{1+\rho q^*_{Mid(1)}}$, where $q^*_{Mid(1)} = \frac{2-\gamma^2}{4}(\bar{c}-c)$ and $\rho > 0$ is a parameter indicating the strength of LBE. That is, the larger the magnitude of the parameter, the greater the reduction in the fixed export cost. We derive the following relationship:

$$c_{X(2)} > (<)c \Leftrightarrow \rho > (<)\Gamma_F[A,\beta] \Leftrightarrow \textit{The direct (indirect) mode}, \qquad (25)$$

where $\Gamma_F[A,\beta] \equiv \frac{4}{2-\gamma^2}\frac{c-c_X}{\bar{c}-c}\frac{(\bar{c}-c)+(\bar{c}-c_X)}{(\bar{c}-c)^2}$, $\frac{d\Gamma_F}{dA} < 0$ and $\frac{d\Gamma_F}{d\beta} > 0$.

As shown in equation (25), and like the previous case, if the strength of LBE, ρ is sufficiently large, if the market size of a foreign market is large and/or trade barriers are low, and if the bargaining power of the manufacturer is weak, the manufacturer chooses the direct export mode in the second period.

Clearly, there is an important role of intermediaries in international transactions and business in the effect of LBE lowering the fixed export cost, which in turn promotes

international business activity of manufacturers (including trade, foreign direct investment, and offshoring) in developing countries.[11] Related to this point, it is worth noting that the following empirical studies provide the evidence of the substantial productivity gains possible from entering export markets. For instance, De Loecker (2007, 2013) provides the evidence using microdata from the Slovenian manufacturing sector from 1994 to 2000, while Fernandes and Isgut (2015) examine the LBE hypothesis for Colombian manufacturing plants from 1981 to 1991 and likewise provide significant evidence in its favor.[12] Combined with Ahn et al. (2011) and Bai et al. (2017), these empirical studies together suggest that by using intermediaries, manufacturers in developing countries such as China, Slovenia, and Colombia in previous periods can directly export to advanced countries with large market sizes and liberalized trade in subsequent periods.

[11] See Peng and Ilinictch (1998, Table 1, p. 621), which for a listing of major export trading companies in developing countries, including Japan in the Meiji era, from the late 19th to 20th centuries. Rauch (1998) discusses Japan's *Sogo Shosha*.

[12] See also Martins and Yang (2009), and Silva et al. (2012).

4. Conclusion

The model in this paper is a partial equilibrium analysis and thus differs from those drawn from heterogeneous firm trade theory (e.g., Melitz, 2003; Helpman, et al., 2004; Helpman, 2006). However, using the model, we derived similar results as previous studies such that a productivity efficient manufacturer (one with a lower marginal cost of production) can export abroad directly, even though incurring trade costs. Nevertheless, even a relatively productivity inefficient manufacturer (one with a higher marginal cost of production) can export abroad indirectly via a trade intermediary.

We also considered the LBE hypothesis to better focus on the role of intermediation. In particular, a manufacturer using an intermediary in previous periods can export directly in subsequent periods. This implies a change in export mode (i.e., from indirect to direct exports) through the LBE effect. We examined this hypothesis in the situations of a reduction in the marginal cost of production and the fixed export cost, and demonstrated the conditions needed for a change in export mode. Our theoretical findings also found support in existing empirical findings in that manufacturers in developing countries, which have strong incentives to absorb technological skills, to build brand image and reputation, and to maintain customer relationships in foreign markets, are likely to export directly to advanced countries, given their markets are large and their trade barriers low.

We appreciate that our model is very specific through the need to simplify the analysis, e.g., linear demand functions, Bertrand duopoly, a Nash bargaining between manufacturer and intermediary over a two-part tariff, and specified marginal production

and fixed cost functions. It would be a useful research direction to relax these specifications and provide the more general case. In particular, we used a simple two-period model in which the manufacturer exports abroad using an intermediary in the first period. In future research, we intend to develop a theoretical model of the dynamic discrete choice of export mode, corresponding to the empirical work of Das et al. (2007) and Bai et al. (2017).

Appendix A: The case of an intermediary with a fixed export cost

Revising equation (10) as follows:

$$\Pi_{If} = \pi_I + G = (p_I - p_{Mid} - t)q_I - f + G, \tag{A.1}$$

where $f > 0$ is the fixed export cost incurred by the intermediary.

The cutoff level of marginal costs is then:

$$c_{Xf} = \frac{A - \sqrt{\frac{8(2-\gamma^2)(F-\beta f)}{\overline{\beta} - \beta}}}{2-\gamma^2}, \tag{A.2}$$

where we assume $F > \beta f$. it is necessary for the following condition to hold $c_{Xf} < c_E$:

$$F > (4-\gamma^2)^2 f. \tag{A.3}$$

In this case, equations (19) and (20) are rewritten as:

$$\Pi^*_{Midf} = \beta\left[\frac{\{A-(2-\gamma^2)c\}^2}{8(2-\gamma^2)} - f\right] \text{ and } \Pi^*_{If} = (1-\beta)\left[\frac{\{A-(2-\gamma^2)c\}^2}{8(2-\gamma^2)} - f\right].$$

Thus, if it holds that $\frac{\{A-(2-\gamma^2)c\}^2}{8(2-\gamma^2)} > f$ then $\Pi^*_{Midf} > 0$ and $\Pi^*_{If} > 0$. Taking equations (7) and (A.3), we derive the following relationship:

$$\frac{\{A-(2-\gamma^2)c\}^2}{8(2-\gamma^2)} > \left\{\frac{A-(2-\gamma^2)c}{(4-\gamma^2)}\right\}^2 > F > (4-\gamma^2)^2 f > f.$$

Appendix B: Price leader manufacturer case; $\beta = 1$

If $\beta = 1$, we revise equation (14): $\underset{p_{Mid}, G'}{Max} V = \Pi_{Mid'} = \pi_{Mid'} - G'$. This suggests the profit function of a manufacturer as a price leader ($M_{id'}$) or an upstream firm in a vertical structure. Because $G' = 0$, the optimal price and quantity are given by:

$$p^*_{Mid'} = \frac{A-(2-\gamma^2)c}{2(2-\gamma^2)} \text{ and } q^*_{Mid'} = p^*_{Mid'} - c = \frac{A-(2-\gamma^2)c}{2(4-\gamma^2)}.$$

Thus, we have the following profit:

$$\pi^*_{Mid'} = \frac{\{A-(2-\gamma^2)c\}^2}{4(4-\gamma^2)(2-\gamma^2)}. \quad \text{(B.1)}$$

Comparing the gross profit in the direct export case with that in the indirect export case, it holds that $\pi^*_{Md} > \pi^*_{Mid'}$. With respect to the net profits, i.e. equations (7) and (B.1), if $A > 2(4-\gamma^2)\sqrt{\frac{(2-\gamma^2)F}{4-3\gamma^2}}$, the following cutoff level of a marginal cost exists:

$$c_{X'} = \frac{A - 2(4-\gamma^2)\sqrt{\frac{(2-\gamma^2)F}{4-3\gamma^2}}}{2-\gamma^2} < c_E, \tag{B.2}$$

Therefore, unless $\beta = 0$, Proposition 1 is robust.

References

Abel-Koch, Jennifer (2013) "Who uses intermediaries in international trade? Evidence from frim-level survey," *World Economy*, 36 (8), pp. 1041–1064.

Akerman, Anders (2018) "A theory of the role of wholesalers in international trade based on economies of scope," *Canadian Journal of Economics*, 51 (1), pp. 156–185.

Ahn, JaeBin, Khandelwal, Amit K., and Wei, Shang-Jin (2011) "The role of intermediaries in facilitating trade," *Journal of International Economics*, 84, pp. 73–85.

Antràs, Pol and Helpman, Elhanan (2004) "Global sourcing," *Journal of Political Economy*, 112 (3), pp. 552–580.

Antràs, Pol and Costinot, Arnaud (2011) "Intermediated trade," *Quarterly Journal of Economics*, 126 (3), pp. 1319–1374.

Bai, Xure, Kurishna, Kala, and Ma, Hong (2017) "How you export matters: Exports mode, learning and productivity in China," *Journal of International Economics*, 104, pp. 122–137.

Bernard, Andrew B., Jensen, J. Bradford, Redding, Stephen J., and Schott, Peter K.

(2007) “Firms in international trade,” *Journal of Economic Perspectives*, 21 (3), pp. 105–130.

Bernard, Andrew B., Jensen, J. Bradford, and Redding, Stephen J. (2010) “Wholesalers and retailers in US trade,” *American Economic Review*, 100 (2), pp. 408–413.

Bernard, Andrew B., Grazzi, Marco, and Tomasi, Chiara (2011) “Intermediaries in international trade: Direct versus indirect mode of export,” NBER Working Paper Series, 17711.

Bernard, Andrew B., Grazzi, Marco, and Tomasi, Chiara (2015) “Intermediaries in international trade: Products and destinations,” *Review of Economics and Statistics*, 97 (4), pp. 916–920.

Crozet, Matthieu, Lalanne Guy, and Oncet, Sandra (2013) “Wholesalers in international trade,” *European Economic Review*, 58, pp. 1–17.

Das, Sanghamitra, Roberts, Mark J., and Tybout, James R. (2007) “Market entry costs, producer heterogeneity, and export dynamics,” *Econometrica*, 75 (3), pp. 837–873.

De Loecker, Jan (2007) “Do exports generate higher productivity? Evidence from Slovenia,” *Journal of International Economics*, 73, pp. 69–98.

De Loecker, Jan (2013) “Detecting learning by exporting,” *American Economic Journal: Microeconomics*, 5 (3), pp. 1–21.

Felbermayr, Gabriel and Jung, Benjamin (2011) “Trade intermediation and the organization of exporters,” *Review of International Economics*, 19 (4), pp. 634–648.

Fernandes, Ana M. and Alberto E. Isgut (2015) “Learning-by exporting effects: Are they real?” *Emerging Markets Finance and Trade*, 51, pp. 65–89.

Helpman, Elhanan (2006) “Trade, FDI, and the organization of firms,” *Journal of Economic Literature*, 44(3), pp. 589–630.

Helpman, Elhanan, Marc J. Melitz, and Stephen R. Yeaple (2004) “Export versus FDI with heterogeneous firms,” *American Economic Review*, 94 (1), pp. 300–316.

MaCann, Fergal (2013) “Indirect exporters,” *Journal of Industry, Competition and Trade*, 13 (4), pp. 519–535.

Martins, Pedro, S. and Yong Yang (2009) “The impact of exporting on firm productivity: a meta-analysis of the learning-by-exporting hypothesis,” *Review of World Economics*, 145, pp. 431–445.

Melitz, Marc J. (2003) “The impact of trade on intra-industry reallocations and aggregate industry productivity,” *Econometrica*, 71 (6), pp. 1695–1725.

Peng, Mike W. and Ilinictch, Anne Y. (1998) “Export intermediary firms: A note on export development research,” *Journal of International Business Studies*, 29 (3), pp. 609–620.

Rauch, James, E. (1996) “Trade and search: Social capital Sogo Shosha, and Spillovers,” NBER Working Paper Series, 5618.

Silva, Armando, Oscar Afono, and Ana Paula Africano (2012) “Leaning-by-Exporting: What we know and what we would like to know,” *International Trade Journal*, 26, pp. 255–288.

Tanaka, Ayumu (2013) “Firm productivity and exporters in the wholesale sector: Evidence from Japan,” RIETI Discussion Paper Series, 13-E-007.

Figure 1a: Direct export mode in the presence of export costs

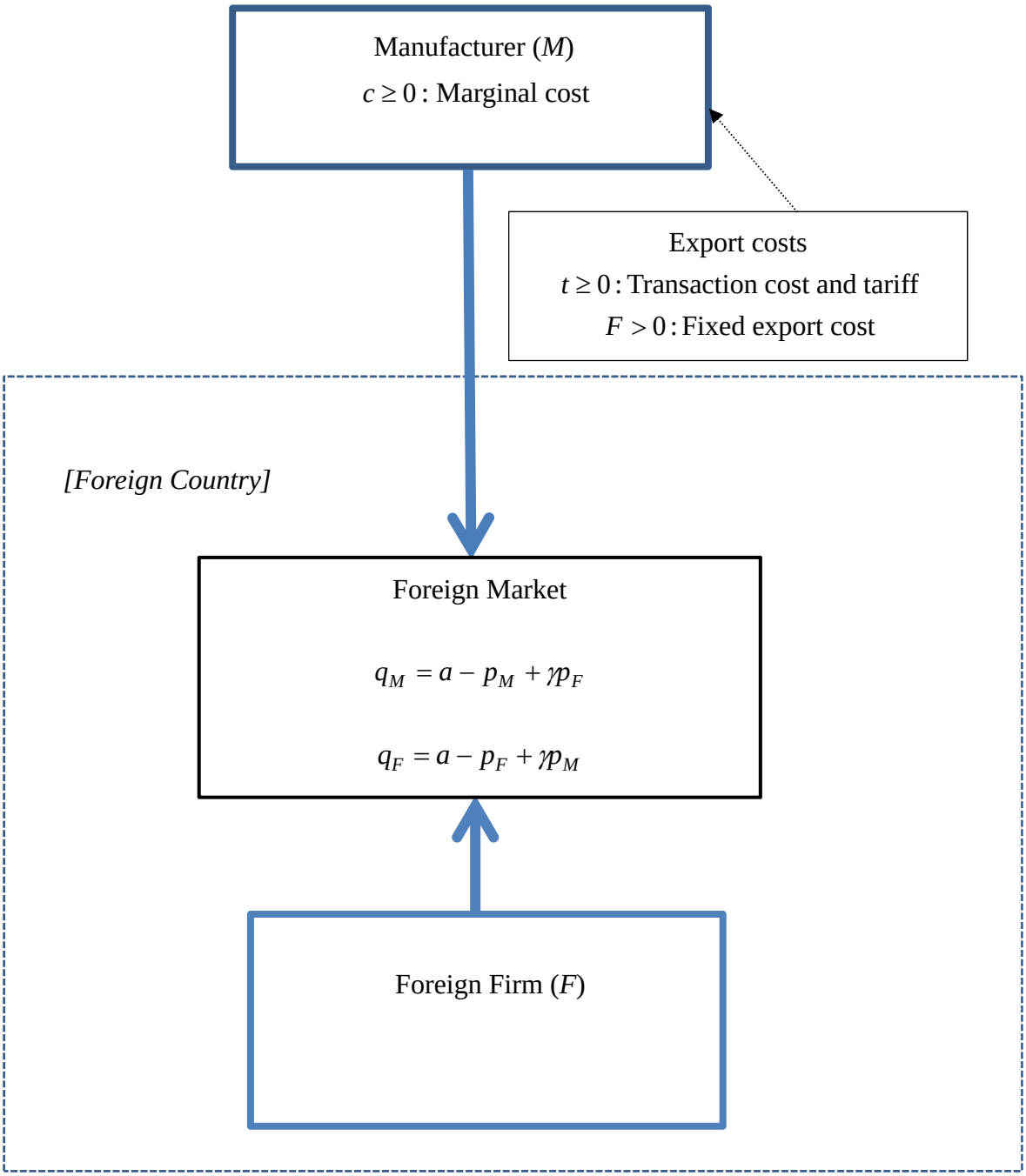

Figure 1b: Indirect export via an intermediary

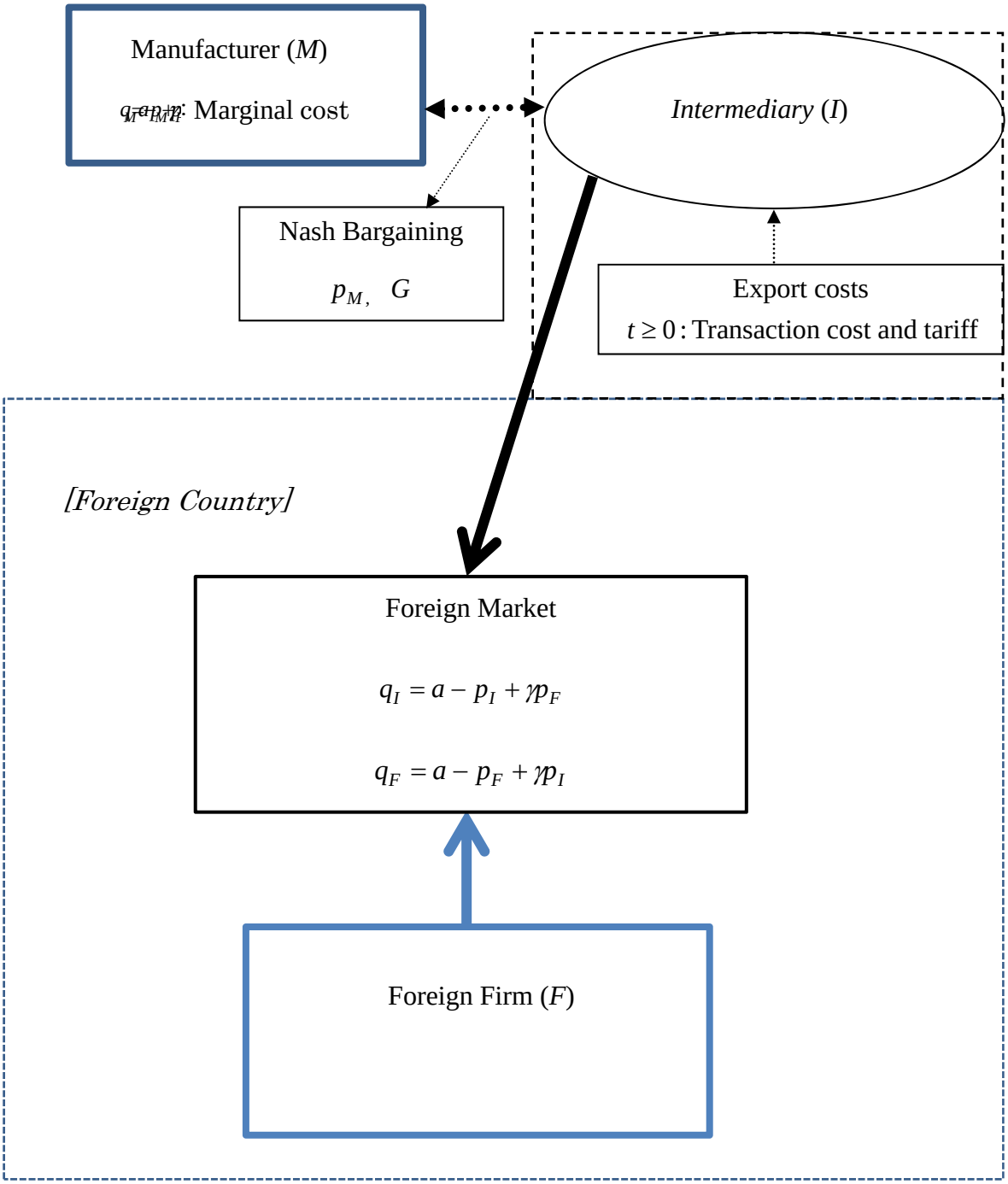

Figure 2: Choice of export mode