# Impacts of Export-platform FDI on backward linkages – Do third country size, trade agreements and heterogeneity of firms matter? Evidence from the Vietnamese supporting industries

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## Abstract

The paper investigates the impacts of export-platform foreign direct investment (FDI) on backward linkages. First, in a three-country model, these impacts are explained through the competition effect and the demand effect. Whenever the former is stronger than the latter, the investment has a negative impact on the level of backward linkages and conversely. Otherwise, the level of backward linkages is also affected by third country size, local content requirement, and the power of trade agreements between the host and the third countries. Second, in the case of the Vietnamese supporting industries between 2000 and 2012, export-platform FDI generates a negative effect. Moreover, local content requirement, and trade agreements between Vietnam and third countries (bilateral trade agreement with the U.S. and entry of Vietnam into the WTO) positively impact the level of backward linkages whereas third country size has an ambiguous impact.

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## 1.  Introduction

Over the last two decades, the number of trade agreements has grown at a particular rate. About 85 per cent of the 210 notifications in force today were concluded during this period.[1] This increase in trade agreements has a significant impact on overseas operations of multinational firms (MNFs) leading to the appearance of a new foreign investment, namely Export-platform foreign direct investment (Export-platform FDI). It is defined as a foreign investment in a host country in order to export most of output to third countries. In 2000, exports to third countries as shares in total sales by American manufacturing affiliates accounted for 28 per cent. Particularly, for affiliates located in Ireland, Holland, and Belgium, those shares are respectively accounted for 71 per cent, 60 per cent, and 57 per cent (Ekholm et al. 2007). According to Ito (2013), American firms in countries such as Luxembourg, Hong Kong, Singapore, Netherlands, and Switzerland have high ratios of exports to third countries over the total sales in 2008, ranging from approximately 40 per cent to 70 per cent.

Export-platform FDI differs from traditional foreign investments of MNFs (that is, vertical and horizontal FDI) by some important aspects. On the one hand, the final destination of the goods produced is different from horizontal FDI. The output of Export-platform FDI mainly serves third countries, whereas the host country market is the target of horizontal FDI. O the other hand, Export-platform FDI differs from vertical FDI in terms of the nature of goods produced. By using vertical FDI, MNFs produce intermediate goods to export back to the home country or other countries for the assembly of final goods. Conversely, by using Export-platform FDI, MNFs produce final goods to serve the final customers in third countries.[2]

There is a rich literature examining Export-platform FDI as a strategic behavior of MNFs. In order to serve a free trade area, outsider MNFs may have three entry modes: exporting, tariff jumping, or Export-platform FDI. Export-platform FDI is used when intra-regional costs are low and the common market size is sufficiently large (See for example Motta and Norman 1996; Montout and Zitouna 2005; Ekholm et al. 2007; Nguyen and Minda 2012.). This is why some MNFs, particularly from the United States and Japan, have located subsidiaries in a country of the European Union (EU) to export the output to other member countries (Kumar 1998; Blonigen et al. 2007; Neary 2008). The American MNFs also use their subsidiaries in Singapore and Brazil to export to the countries of ASEAN and Mercosur, respectively (Ito 2013). Likewise, some outsider MNFs are implemented in Mexico to export production to the North American market after the formation of NAFTA (Hanson et al. 2001; Markusen 2004). Other factors influencing the location of Export-platform FDI are the similarities between the host and the third countries, skilled and unskilled labor endowments of the third countries, and the low labor cost of the host countries (Ekholm et al. 2007; Baltagi et al. 2007).

While Export-platform FDI is widely analyzed as a strategic behavior of MNFs in the literature, its impacts on the host country are little studied, particularly in the case of developing countries. For instance, Geishecker et al. (2008) and Omelanczuk (2013), by using the Polish manufacturing industries data, argue a significant effect of Export-platform FDI on export performance of local firms. Similarly, Ruane and Ugur (2006) also state the existence of that relationship in Singapore and Ireland. However, the impact is higher for the Singaporean firms. The purpose of this research is to fill

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[1]Source: WTO, Statistics Database (www.wto.org)

[2]See Antrs and Yeaple (2014) for a detail review about horizontal and vertical FDI by MNFs.

this gap by investigating impacts of Export-platform FDI on backward linkages. We are particularly interested in such relationship, because it is one of the main channels through which foreign firms may affect the host country (UNCTAD 2001; Carluccio and Fally 2013).

To deal with this question, we develop a three-country model which is, in turn, applied in the case of supporting industries in Vietnam. Our research provides some interesting findings. From a theoretical point of view, Export-platform FDI improves backward linkages if and only if spillovers exceed a critical threshold. Second, the local content requirement of the host country has an ambiguous effect on backward linkages, and there may be an optimal threshold maximizing the level of backward linkages. The latter are also affected by the third country size and trade agreements. Turning to the case of Vietnam during the period 2000-2012, Export-platform FDI is proxied to foreign investments in export-oriented industries. The estimates prove that the latter have a negative impact on backward linkages. On the contrary, the latter are positively impacted by trade agreements signed with other countries while impacts of third market size are ambiguous.

The paper is organized as follows. In Section 2, we develop the three-country model to examine the different impacts of Export-platform FDI on backward linkages. In Section 3, we test the model on the Vietnamese supporting industries. Section 4 summarizes the main findings and provides further lines of research.

## 2. The three-country model

We consider a three-country model including a host developing country $L$, a home country $M$ and a third country $A$. Country $L$ is less developed than the two other countries. Furthermore, countries $L$ and $A$ may sign a bilateral trade agreement (BTA), or particularly create a free trade area (FTA).[3] We are interested in the consumption of a final good in country $A$. This good can be produced either by a representative domestic firm in country $L$ (denoted by $l$) or by a representative MNF in country M (also called foreign firm and denoted by firm $m$). Firms $l$ and $m$ compete with other one in a Cournot fashion, that is each firm chooses her output level by taking that of her competitor as given.

There are two main reasons inciting us to use a Cournot model. On the one hand, such model is much developed and becomes an interesting way to analyze the competition between firms in the FDI topic. This framework is initially used to study strategic behaviors of MNFs between export and horizontal FDI, as in the seminal work by Smith (1987) and a series of subsequent papers (Motta 1992; Belderbos and Sleuwaegen 1997; Qiu and Tao 2001; Lahiri and Mesa 2009 among other). It is then developed to study MNFs' strategies in a regional integration context in which Export-platform FDI appears (see for example Motta and Norman 1996; Montout and Zitouna 2005; Nguyen and Minda 2012. On the other hand, using a Cournot model is helpful to study impacts of MNFs on backward linkages, as it is shown in Belderbos and Sleuwaegen (1997); Lin and Saggi (2007a) or Kadochnikov and Drapkin (2008).

We assume that for each unit of the final good produced, one unit of intermediate goods (also called inputs) and one unit of labor are required. Nevertheless, the inputs produced in country $L$ (local inputs) is more expensive than those produced in country

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[3]The literature on Export-platform FDI is based on the assumption of a FTA created by the host and the third countries. We extend this assumption by referring to a BTA. Consequently, the model can apply in a more general case and not uniquely in a FTA.

$M$. By contrast, labor is cheaper in country $L$ than in country $M$. Let $c_l$ be the price of inputs in country $L$ and $w_m$ be the labor cost in country $M$. The price of inputs in country $M$ and the labor cost in country $L$ are respectively represented as $\gamma c_l$, $\delta w_m$ ($0 < \delta, \gamma < 1$). Hence, $\delta$ ($\gamma$) can be considered as the comparative advantage of country $L$ ($M$).

To establish a benchmark for our analysis, the model takes place in two moments. First, in an *Export economy*, there is no trade agreement between country $L$ and country $A$. Firms $l$ and $m$ enter into the third country by exporting. Second, in an *Export-platform economy*, a BTA (or in the particular case, a FTA) is signed by the two countries, following a lower intra-regional export cost. Firm $l$ continues to export while firm $m$ uses Export-platform FDI as her entry mode into the third country.

The inverse demand function for final good in the third country is given by

$$p_A^R = S_A - b(q_l^R + q_m^R) \tag{1}$$

where

  - $S_A$: third country size.
  - $R$: Export economy ($Exp$) or Export-platform economy ($Ep$).
  - $p_A^R$: price of final good in economy $R$.
  - $q_l^R$ ($q_m^R$): output level of firm $l$ ($m$) in economy $R$

In what follows, we study the equilibria of the final good market in the third country (Section 2.1). Then, we deal with the impacts of Export-platform FDI on backward linkages and the role of different structural variables (Section 2.2).

## 2.1. *Third market equilibria*

*Export economy*

In the Export economy, there is no trade agreement between $L$ and $A$. Firm $m$ exports from country $M$ and firm $l$ exports from country $L$ to serve country $A$. Let denote $\tau_l$ and $\tau_m$ the intra- and the extra-regional export costs, respectively. The profit function of each firm is given by:

$$\pi_m^{Exp} = \max_{p_m^{Exp} \geq 0} \left[ p_A^{Exp} q_m^{Exp} - (w_m + \gamma c_l + \tau_m) q_m^{Exp} \right] \tag{2}$$

$$\pi_l^{Exp} = \max_{p_l^{Exp} \geq 0} \left[ p_A^{Exp} q_l^{Exp} - (c_l + \delta w_m + \tau_l) q_l^{Exp} \right]$$

where $\pi_l^{Exp}$ and $\pi_m^{Exp}$ are profit of firm $l$ and firm $m$, respectively.

Each firm takes the output level of her rival as given, and maximizes her profit by choosing the quantity of final good to produce. The Cournot-Nash equilibrium under the Export economy is represented by

$$q_m^{Exp} = \frac{1}{3b} \left[ S_A - 2(w_m + \gamma c_l + \tau_m) + (\delta w_m + c_l + \tau_l) \right] \tag{3}$$

$$q_l^{Exp} = \frac{1}{3b} \left[ S_A - 2(\delta w_m + c_l + \tau_l) + (w_m + \gamma c_l + \tau_m) \right]$$

**Proof.** See Appendix A.1. $\square$

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In this economy, local inputs are only required by firm $l$. Hence, the level of backward linkages is determined by

$$BK^{Exp} \quad = \quad q_l^{Exp} = \frac{1}{3b}\left[S_A - 2(\delta w_m + c_l + \tau_l) + (w_m + \gamma c_l + \tau_m)\right] \qquad (4)$$

*Export-platform economy*

Under the Export-platform economy, the host country and the third country sign a BTA (or a FTA), followed by smaller intra-regional export cost. Let denote $\tau$ the new intra-regional cost, hence $\tau < \tau_l$. As aforementioned, firm $m$ now applies an Export-platform FDI as her entry mode to country $A$ while firm $l$ continues to export.

An interesting discussion in the literature about the MNF location is the existence of local content requirement (LCR) imposed by the host countries, particularly the developing ones (Belderbos and Sleuwaegen 1997; Qiu and Tao 2001; Lahiri and Mesa 2009). Indeed, to increase the local added value in the Global Value Chain, the government of those countries can impose such requirement on the production process of MNF as a condition allowing the latter to produce in their countries. However, to compensate eventually the high local inputs' cost, MNF can benefit from low and/or zero tariff duty of imported inputs. In our model, LCR is measured by the degree of local inputs used by firm $m$. Let assume that for each unit of final good produced in country $L$, firm $m$ uses $\lambda$ unit of local inputs ($0 \leq \lambda \leq 1$), the resting ($1 - \lambda$) unit of inputs is imported abroad and/or from the home country ($\lambda$ is given for the foreign firm). We suppose that the imported inputs' cost remains $\gamma c_l$.

Another important aspect in the FDI's topic is associated with FDI spillovers generated by the MNF. Those spillovers can be positive or negative depending on the development level of the host country.[4] We suppose that the foreign production in country $L$ generates some positive (negative) FDI spillovers reducing (increasing) the production costs of domestic firm. Let denote $\theta$, the degree of FDI spillovers on each unit of final good produced by firm $l$. Hence, her unit access costs to country $A$ becomes $c_l + \delta w_m - \theta + \tau$.

**Remark 1.** *When $\theta > 0$, FDI spillovers are positive and conversely, when $\theta < 0$, these spillovers become negative.*

Given the demand function in the third country (cf. Equation 1), the profit function of each firm can be represented as:

$$\pi_m^{Ep} \quad = \quad \max_{p_m^{Exp} \geq 0}\left[p_A^{Ep}q_m^{Ep} - \left[\lambda c_l + (1 - \lambda)\gamma c_l + \delta w_m + \tau\right]q_m^{Ep}\right] \qquad (5)$$

$$\pi_l^{Ep} \quad = \quad \max_{p_l^{Exp} \geq 0}\left[p_A^{Ep}q_l^{Ep} - \left(c_l + \delta w_m - \theta + \tau\right)q_l^{Ep}\right]$$

where $\pi_m^{Ep}$ is the profit of firm $m$ and $\pi_l^{Ep}$ is the profit of firm $l$.

The Cournot-Nash equilibrium in the third country under the Export-platform econ-

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[4]See for example Blomstrom and Kokko (1998); Greenaway and Gorg (2004); Crespo and Fontoura (2007) for a detail review about FDI spillovers.

omy is determined by

$$q_m^{Ep} = \frac{1}{3b}\left[S_A - 2\left(\delta w_m + \lambda c_l + (1-\lambda)\gamma c_l - \theta + \tau\right) + (\delta w_m + c_l + \tau)\right] \quad (6)$$

$$q_l^{Ep} = \frac{1}{3b}\left[S_A - 2\left(\delta w_m + c_l - \theta + \tau\right) + (\delta w_m + \lambda c_l + (1-\lambda)\gamma c_l + \tau)\right]$$

**Proof.** See Appendix A.1. □

Under this economy, local inputs are used by both firms $l$ and $m$. Therefore, the level of backward linkages is determined by

$$\begin{aligned} BK^{Ep} &= q_l^{Ep} + \lambda q_m^{Ep} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad (7)\\ &= \frac{(1+\lambda)S_A - (2-\lambda)\left(\delta w_m + c_l - \theta + \tau\right) + (1-2\lambda)\left(\delta w_m + \lambda c_l + (1-\lambda)\gamma c_l + \tau\right)}{3b} \end{aligned}$$

One can wonder about the reason preventing firm $m$ from investing in country $L$ before the BTA (FTA). Likewise, what is the reason that force this firm to do not continue to export after the BTA (FTA). Proposition 1 gives the answer.

**Proposition 1.** *The foreign firm exports in the Export economy, and invests in the host country in the Export-platform economy if and only if the following condition is satisfied*

$$\tau_l - \tau_m > \quad (1-\delta)w_m - (1-\gamma)\lambda c_l \quad > \tau - \tau_m \quad (8)$$

**Proof.** See Appendix A.2. □

It is noted that the term $(1-\delta)w_m$ in Condition (8) represents the gain (due to low labor cost) for firm $m$ from producing in country $L$ while $(1-\gamma)\lambda c_l$ measures the loss of this production, due to the existence of LCR. Furthermore, $\tau_l - \tau_m$ (respectively, $\tau - \tau_m$) indicates the difference in export cost of country $L$ and country $M$ before the BTA/FTA (respectively, after the BTA/FTA). Hence, Proposition 1 implies that in the Export economy (i.e., before the BTA/FTA), high export cost from country $L$ to country $A$ discourages firm $m$ to invest in the developing country. Exporting (from the home country $M$) is therefore her entry mode to the third country $A$. Conversely, in the Export-platform economy (i.e., after the BTA/FTA), export cost between the two countries considerably falls inciting the foreign firm to use an Export-platform FDI in the host country $L$.

We now consider the case where Condition (8) is fulfilled and interior solution exists.[5]

## 2.2.  *Impacts of Export-platform FDI on backward linkages*

The production of firm $m$ in the host country may have opposite impacts on backward linkages. On the one hand, firm $m$ sources inputs locally, and thereby creating supplemental demand for inputs and increasing the level of backward linkages (direct demand effect). Moreover, such production may even increase output level of firm $l$ leading to higher demand for local inputs (indirect demand effect). On the other hand,

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[5]See Appendix A.1 for a discussion about the existence of interior solution.

foreign production may lower output level of firm $l$ through competition effect that in turn conducts to smaller demand for local inputs.

Let denote $\Delta q_l = q_l^{Ep} - q_l^{Exp}$. Hence, there is a competition effect when $\Delta q_l < 0$ and inversely, an indirect demand occurs when $\Delta q_l > 0$. We state that

**Proposition 2.** *There exists a threshold $\underline{\theta}$ such that $\Delta q_l > 0$ if and only if $\theta > \underline{\theta}$ where*

$$\underline{\theta} := \frac{1}{2} \left[ (1 - \delta)w_m - (1 - \gamma)\lambda c_l - (\tau_l - \tau) - (\tau_l - \tau_m) \right]$$

**Proof.** Replacing $\theta$ by $\underline{\theta}$, we have $\Delta q_l = 0$. $\qquad\square$

Given Condition (8) and $\tau < \tau_l$, we have $\underline{\theta} < 0$. It follows that the foreign production in the developing country can generate negative spillovers and once the latter are high enough, a competition occurs reducing the domestic firm's output level. An implication of Proposition 2 is that although there are some negative spillovers, an indirect demand effect can still be generated (i.e., $\Delta q_l > 0$) if the condition $\underline{\theta} < \theta < 0$ is fulfilled. In this case, this effect is only associated with the fall in export cost after the BTA/FTA. We have the following corollary.

**Corollary 1.** *Without FDI spillovers, there is no competition but an direct demand effect.*

Let denote $\Delta BK = BK^{Ep} - BK^{Exp}$, the difference level of backward linkages between the Export-platform economy and the Export economy. Given Equations (4) and (7), we have

$$\Delta BK \quad = \quad \Delta q_l + \lambda q_m^{Ep} \tag{9}$$

We note that in Equation (9), $\lambda q_m^{Ep}$ indicates the direct demand effect while $\Delta q_l$ represents a competition or an indirect demand effect. It is straightforward that when $\Delta BK > 0$, Export-platform FDI has a positive impact on the level of backward linkages. This happens when there is (i) a high direct demand effect that dominates a low competition one, or (ii) no competition effect, but a direct and an direct demand one. In the opposite case, the impact becomes negative, owing to a strong competition effect that dominates a direct demand one.

Since the competition effect is generated through negative FDI spillovers, we have the following proposition.

**Proposition 3.** *There exists a threshold $\bar{\theta}$ such that*

*(i) $\Delta BK > 0$ if and only if $\theta > \bar{\theta}$ where*

$$\bar{\theta} := \frac{2\lambda^2(1 - \gamma)c_l - \lambda(S_A + (2 - 3\gamma)c_l - \delta w_m - \tau) + [(1 - \delta)w_m - (\tau_l - \tau) - (\tau_l - \tau_m)]}{2 - \lambda}.$$

*(ii) $\bar{\theta}$ decreases in $S_A, \Delta\tau := \tau_l - \tau$.*
*(iii) $\bar{\theta} < \underline{\theta}$.*

**Proof.** Point (i): Replacing $\theta$ by $\bar{\theta}$, we have $\Delta BK = 0$. Hence we have $\Delta BK > 0$ if and only if $\theta > \bar{\theta}$.

Point (ii): We have $\frac{\partial \bar{\theta}}{\partial \gamma} > 0$, and $\frac{\partial \bar{\theta}}{\partial S_A}, \frac{\partial \bar{\theta}}{\partial \delta\tau}, \frac{\partial \bar{\theta}}{\partial \delta} < 0$.

Point (iii): It is straightforward. $\qquad\square$

Proposition 3 shows that Export-platform FDI increases the level of backward linkages in the developing country if and only if FDI spillovers exceed a threshold. Below it, the foreign production creates strong negative FDI spillovers and the competition effect becomes stronger than the direct demand one, following a smaller level of backward linkages.

However, it should be noted that such a threshold decreases with the third market size, and the power of the BTA/FTA measured by $\Delta\tau$. Indeed, the higher the third market size, the higher the foreign firm's output level, generating thereby a stronger direct demand effect. Therefore, the latter can suffer a higher competition effect. Likewise, the higher value of parameter $\Delta\tau$, the more export cost between the host and the third counties fall after the BTA/FTA, leading to higher output level of the foreign firm. In addition, the higher $\Delta\tau$, the lower firm $l$'s access costs to country $A$, following a fewer competition effect.

From Proposition 3, we have two consequences which can be formulated in the following corollary

**Corollary 2.** $\Delta BK > 0$ *if and only if*

*(i)* $S_A > \bar{S}_A$ *where*

$$\bar{S}_A := 2\lambda(1-\gamma)c_l + (\delta w_m + \theta + \tau) - (2-3\gamma)c_l + \frac{(1-\delta)w_m + (\tau + \tau_m - 2\tau_l - 2\theta)}{\lambda}.$$

*(ii)* *or* $\Delta\tau > \Delta\bar{\tau}$ *where*

$$\Delta\bar{\tau} := 2\lambda^2(1-\gamma)c_l - \lambda\left[S_A + (2-3\gamma)c_l - (\delta w_m + \theta + \tau)\right] + \left[(1-\delta)w_m - 2\theta - (\tau_l - \tau_m)\right].$$

Hence, Corollary 2 implies that Export-platform FDI improves the level of backward linkages if only if the third market size is high enough, or the power of BTA/FTA measured by parameter $\Delta\tau$ is strong enough.

Using Proposition 2 and Proposition 3, $\underline{\theta}$ and $\bar{\theta}$ can be rewritten as

$$\underline{\theta} = \frac{1}{2}\Delta Z$$
$$\bar{\theta} = \frac{2\lambda^2(1-\gamma)c_l - \lambda(S_A + (1-2\gamma)c_l - \delta w_m - \tau)}{2-\lambda} + \frac{\Delta Z}{2-\lambda}$$
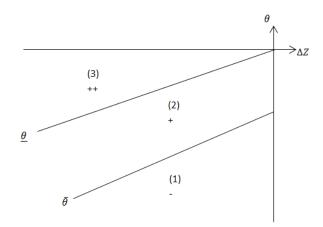
where $\Delta Z := (1-\delta)w_m - (1-\gamma)\lambda c_l - \Delta\tau - (\tau_l - \tau_m)$.

Hence, $\underline{\theta}$ and $\bar{\theta}$ can be represented in Figure 1, which allows us to examine different impacts of Export-platform FDI on the level of backward linkages.

**Case 1.** *Export-platform FDI has no impact on backward linkages*

In this case, there is a competition effect which is completely compensated by the direct demand effect. We are in the line $\bar{\theta}$ of Figure 1. The foreign production in the host country replaces some parts of the domestic production, following a fall in the demand for inputs. However, this fall is fully offset by the direct demand effect. The total demand for inputs does not change and Export-platform FDI causes no impact on backward linkages.

**Figure 1.** Impacts of Export-platform FDI on backward linkages



This is the so-called *100% crowding-out effect* discussed by Markusen and Venables (1999). In their framework, the authors mention that the multinational production may replace that of domestic firms in an exactly offsetting way. Thereby, there is no effect of FDI on the industry producing intermediate goods.

**Case 2.** *If $\theta \leq \underline{\theta}$, Export-platform FDI has an ambiguous impact on backward linkages*

In this case, there is no indirect demand effect, but a competition effect. If the latter is stronger than the direct demand effect (that is $\theta \leq \bar{\theta}$), Export-platform FDI lowers the level of backward linkages (Area 1 of Figure 1). This is the situation where the foreign production in the developing country generates strong negative FDI spillovers such that the domestic firm's output level significantly falls. As a consequence, the decline in demand for inputs by firm $l$ is high and cannot be compensated by the direct demand by firm $m$. Such negative impact on backward linkages can be also due to a weak power of BTA/FTA and/or a small third market size.

On the other hand, if the direct demand effect becomes stronger than the competition effect (that is $\underline{\theta} \geq \theta \geq \bar{\theta}$), Export-platform FDI improves the level of backward linkages (Area 2 of Figure 1). In this situation, negative FDI spillovers are at an intermediate level. Hence, the decline in demand for inputs by firm $l$ is low and dominated by the direct demand effect.

**Case 3.** *If $\theta > \underline{\theta}$, Export-platform FDI highly increases the level of backward linkages.*

In this case, the foreign production in country $L$ creates no competition effect, but an indirect demand one (Area 3 of Figure 1). Indeed, under the Export-platform economy, the domestic firm gains from low export costs and/or strong positive FDI spillovers. As a consequence, the output level of this firm considerably improves, increasing her demand for inputs. Given the existence of the direct demand effect by the foreign firm, the level of backward linkages significantly increases.

This case is related to the host countries in which the output level of the domestic firm is small under the Export economy, due to high entry costs to the third country (either high production cost or high export cost). That leads to a small demand for inputs and so small level of backward linkages. By contrast, the domestic firm's entry

cost significantly decreases under the Export-platform economy (thanks to the existence of positive FDI spillovers and/or low export cost). That in turn leads to a high output level and so high demand for inputs. Given the demand for inputs by firm $m$, the level of backward linkages increases significantly.

Our result seems to be consistent with Markusen and Venables (1999). In their framework, the authors also state the case where foreign production in the host country significantly increases the level of backward linkages. Consequently, FDI may be considered as a catalyst for industrial development.

In what follows, we examine how the LCR ($\lambda$) can affect the level of backward linkages.

**Proposition 4.** *There exists an optimal level of $\lambda$ maximizing $\Delta BK$ if the following conditions are satisfied*

*(i) $\delta w_m + \theta + \tau < S_A + (2 - 3\gamma)c_l$*
*(ii) $S_A < (2 - \gamma)c_l + \delta w_m + \theta + \tau$*
*(iii) $\tau - \tau_m < (1 - \delta)w_m - \frac{S_A + (2-3\gamma)c_l - (\delta w_m + \theta + \tau)}{4} < \tau_l - \tau_m$*

*In this case, the optimal level of $\lambda$ is*

$$\lambda^* = \frac{S_A + (2 - 3\gamma)c_l - (\delta w_m + \theta + \tau)}{4(1 - \gamma)c_l}$$

***Proof.*** See Appendix A.3. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\square$

Proposition 4 implies that an increase in $\lambda$ has an ambiguous impact on $\Delta BK$ and so on the level of backward linkages under the Export-platform economy. Indeed, this increase influences the backward linkages by two opposite ways. On one hand, it leads to a greater output level of firm $l$ and so, demand for inputs. On the other hand, it shrinks the output level of firm $m$ and thereby lowers the demand for inputs. If the threshold $\lambda^*$ exists, then below this threshold, the higher the LCR, the greater the level of backward linkages. Conversely, above this threshold, the higher that LCR, the smaller level of backward linkages.

In summary, the aforementioned framework shows an ambiguous impact of Export-platform FDI on the level of backward linkages. Positive impact occurs when FDI spillovers exceed a critical threshold. Likewise, beneficial impact is associated with large third market size and/or strong power of the BTA/FTA. Besides, there is an optimal level of LCR that maximizes the level of backward linkages. In Section 3 following, we examine our framework in the case of Vietnamese supporting industries.

### 3. Evidence from Vietnamese supporting industries

Building on the aforementioned framework, we develop an empirical study in the case of Vietnam between 2000-2012 to search for any backward linkages created by Export-platform FDI. The country is a very interesting case-study because during the analyzed period, the Vietnamese government signed different trade agreements with its trade partners. First, it is the BTA with the United States in 2001 from which Vietnam faces non-tariff barriers or gets tariff reductions for its exporting goods to American market.[6] Second, there are several economic and trade agreements between

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[6]http://www.usvtc.org/trade/bta/text/

Vietnam and the European Community, particularly the Agreement on market access in 2005 and the new Partnership and Cooperation Agreement in 2007 replacing the 1995 Cooperation Agreement.[7] Moreover, Vietnam and its European partners are undergoing negotiations for free trade agreements. Most importantly, Vietnam became the 150th member of WTO in 2007 and thereby received the most favored nation status with the other members. Last but not least, Vietnam is considered as one of the ten most attractive countries for FDI worldwide according to UNCTAD (2007, 2008, 2009).

### 3.1. *The data collection*

The official data on Export-platform FDI is not available in Vietnam. Hence, the database used in this study is identified, checked and matched from two major sources: the Vietnamese enterprises' surveys and the World Bank database.

The Vietnamese enterprises' surveys began in 2000 and are conducted annually by the General Statistics Office (GSO), with technical assistance from the World Bank. The surveys refer to all business entities existing at the end of surveyed year and cover annual data on their commercial activities (for example, standard industrial classification, labor, capital, wage, asset, debt, production value, profit, investment, corporate tax, and so forth). Until 2013, 13 surveys were conducted covering firm-level annual data from 2000 to 2012.

Based on these surveys, we first select the export-oriented industries in which foreign investments are used to identify Export-platform FDI. According to the Foreign Investment Law (the decree No. 24 of July 31, 2000), an industry is considered as export-oriented whenever the most of its production (that is, more than 50%) is for exporting.[8] We match all domestic firms (foreign firms) to calculate domestic production value (foreign production value). Then, we obtain the total domestic and foreign demands for a given input by using the 2007 Input-Output Matrix. Second, we select the supporting industries that supply those export-oriented industries.[9]. After examining the raw data and deleting firms with missing key information, we have a database including 382 year-industry observations. The database covers different variables such as the number of foreign firms, labor force, capital stock, production value, investment, wage, and so forth.

To search for the role of third country size, we use the GDP of the principal trade partners of Vietnam. According to GSO statistics, these countries include the members of the APEC and the EU. During the period studied, the exporting of Vietnamese manufacturing products to these countries always covers more than 80 per cent of the total export value.[10] Using the World Bank database, we obtain the GDP of those countries (at U.S 2005 constant price) from 2000 to 2012. Then, we match them with the initial database.[11]

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[7] http://wtocenter.vn

[8] See Appendix B.2 for the list of export-oriented industries.

[9] See Appendix B.3 for the list of supporting industries.

[10] See http://www.gso.gov.vn/

[11] See Appendix B.1 for a descriptive analysis of different variables used in this study.

## 3.2. *Empirical strategy and testable hypotheses*

### 3.2.1. *Empirical strategy*

The dependent variable, denoted by $Y_{i,t}$, is the production value of a typical supporting industry $i$ in year $t$. This variable is calculated by $Y_{i,t} = \sum y_{ik,t}$ where $y_{ik,t}$ represents the production value of a typical firm $k$ located in industry $i$ during year $t$.

Our benchmark regression is given by:

$$\ln Y_{it} = \alpha + \beta_1' \ln DBL_{it} + \gamma X_{it} + \varepsilon_{it} \tag{10}$$

and to examine the impacts of Export-platform FDI, we have the following regression

$$\ln Y_{it} = \alpha + \beta_1 \ln DBL_{it} + \beta_2 \ln FBL_{it} + \gamma X_{it} + \varepsilon_{it} \tag{11}$$

The index $it$ represents supporting industry $i$ in year $t$ and $\varepsilon_{i,t}$ is the error term. The vector $X_{i,t}$ regroups control variables, including industrial investment level (denoted by $indus\_invest_{i,t}$), industry size (denoted by $indus\_size_{i,t}$) and labor qualification (denoted by $w_{i,t}$). These covariates are calculated as:

$$indus\_invest_{it} = \sum_{k=1} inves_{kit}$$
$$indus\_size_{it} = \frac{\sum_{k=1} L_{kit}}{\sum_{i=1} \sum_{k=1} L_{kit}}$$
$$w_{it} = \frac{\sum wage_{kit}}{\sum L_{kit}}$$

where the indices $kit$ respectively represent firm $k$ located in supporting industry $i$ during year $t$. The investment level and labor force of a given firm are denoted by $invest_{kit}$ and $L_{kit}$, respectively. In our study, wage is used as a proxy to indicate labor qualification. All things being equal, an increase in wage can be considered as an improvement in labor qualification (Liu et al. 2000; Todo et al. 2009; Nguyen Huu 2016).

The domestic and foreign demand (respectively denoted by $DBL_{it}$ et $FBL_{it}$) are calculated as:

$$DBL_{it} = \sum_{j=1} a_{ij} DP_{jt}$$
$$FBL_{it} = \sum_{j=1} a_{ij} FP_{jt}$$

where

- $DP_{j,t}$ ($FP_{j,t}$): the total domestic (foreign) production of a typical export-oriented industry $j$ throughout year $t$.
- $a_{ij}$: the proportion of output level of a typical supporting industry $i$'s that supplies an export-oriented industry $j$. The parameter $a_{ij}$ is taken from the 2007 Input - Output Matrix by excluding all export-oriented industries which supply themselves or supply other export-oriented industries.

The estimate of $\beta_2$ identifies the power of direct demand effect. Hence, the parameter is estimated to be positive ($\beta_2 > 0$). Otherwise, parameters $\beta_1$ and $\beta'_1$ represent the extent of domestic demand for inputs.

To examine the role of different structural variables, we use the following regression

$$\ln Y_{it} \quad = \quad \alpha + \beta SV_t + \gamma X_{it} + \varepsilon_{it} \tag{12}$$

where $SV_t$ is a vector of structural variables. It first includes trade agreements signed between Vietnam and other countries during the period studied. This means the BTA with the United States (denoted by $usa_t$, $usa_t = 0$ if $t < 2001$ and $usa = 1$ if not), and ,the entry of Vietnam into the WTO (denoted by $wto_t$, $wto_t = 0$ if $t < 2007$ and $wto_t = 1$ if not). Second, parameter $dbf2$ ($dbf2 := \log FBL * \log FBL$) is used to identify impacts of LCR. Indeed, information about LCR is not available in the database. Therefore, the 2007 Input-Output matrix can be useful because the parameter $a_{ij}$ in this matrix reports the proportion of output level of a given supporting industry $i$ that supplies an export-oriented industry $j$ including foreign production.[12] Third, $SV_t$ also contains the size of the United States, the APEC countries and the EU, the principal export destination of Vietnam (respectively denoted by $ussize_t, apecsize_t$ and $eusize_t$). These variables are measured as:

$$\begin{aligned} ussize_t &= usa_t * \log gdpus_t \\ apecsize_t &= wto_t * \log gdpapec_t \\ eusize_t &= wto_t * \log gdpeu \end{aligned}$$

The estimate of $\beta$ in Equation (12) is interpreted as the impact of the structural variables mentioned above on the production value of a typical supporting industry (that is the level of backward linkages).

It should be noted that over the roles of Export-platform FDI and structural variables (as the third market size, the power of BTA, or LCR), the production value of a typical supporting industry (the dependent variable) can be affected by different observed characteristics which can create endogeneity if they are not controlled for. Hence, to deal with this problem, labor qualification, industry investment, and industrial size are added in Regressions (10), (11), and (12). In addition, there might exist unobserved factors being different across industries, but time-invariant within industries such as sophistic, nature of the produced inputs, etc. If these factors are correlated with the regressors, the fixed effects model capturing industrial unobserved effects is used to estimate the above-mentioned three regressions. Hence, the problem with omitted variables' bias is solved. However, once industrial characteristics are not corrected with the regressors, the fixed-effects model become unsuitable. In this case, random effects may become relevant.[13]

### 3.2.2. Testable hypotheses

Based on our framework developed in Section 2, we first test the following hypothesis

**Hypothesis 1.** *Foreign investments in export-oriented industries have an ambiguous impact on the production of a typical supporting industry.*

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[12]We state that the parameter $a_{i,j}$ taken from the 2007 Input-Output Matrix strictly belongs to the interval (0,1). Then the critical threshold $\lambda^*$ mentioned in Proposition 4 exists.

[13]See (Green 2012, Chapter 11) for a detail discussion about Models for Panel Data.

Using Equations (10) and (11), we can determine the net impact of Export-platform FDI on backward linkages. We consider three cases:

(i) $\beta_1 > \beta_1'$. There exists an indirect demand and no competition effect. The location of FDI in export-oriented industries significantly increases the production of supporting industries (Area 3 of Figure 1).

(ii) $\beta_1 < \beta_1' < \beta_1 + \beta_2$. There is a competition effect. However, its impact is low and dominated by the direct demand effect. The net impact of Export FDI on backward linkages is positive (Area 2 of Figure 1).

(iii) $\beta_1 + \beta_2 < \beta_1'$. There exists a strong competition effect such that it dominates the direct demand effect. Export FDI has a net negative impact on backward linkages (Area 1 of Figure 1).

Second, we should find evident support for the impact of LCR.

**Hypothesis 2.** *LCR has an ambiguous impact on the production of a typical supporting industry.*

Given Regression (12), if the associated parameter of variable $fbl2$ takes positive value, then the higher the LCR, the higher the production value of the typical supporting industry. Conversely, if it is negative, then the higher the LCR, the smaller the considered production value.

Third, Hypothesis 3 searches for the impacts of the trade agreements between Vietnam and other countries.

**Hypothesis 3.** *Trade agreement between Vietnam and a third country positively impacts the production of a typical industry if and only if the power of this agreement is sufficiently strong.*

We note that if the estimated parameter for variable $usa$ ($wto$) is negative, then the power of this agreement is weak leading to a negative impact on the production value of a typical supporting industry. Inversely, if the estimated value is positive, the related agreement improves the production value.

Lastly, we expect to find evidence for the role of third country size.

**Hypothesis 4.** *Third country size has a positive impact on the production value of a typical supporting industry if and only if it is sufficiently high.*

If the estimated value of variable $ussize$ ($apecsize, eusize$) is negative, the size of the related market is small that negatively impacts the production value of a typical supporting industry. By contrast, if it is positive, third country size has a positive impact on such production.

### 3.3. Empirical results

*Foreign investments in export-oriented industries and production of supporting industries*

We rely on Benchmark regression (10) and Regression (11) to investigate the impacts of foreign investment in export-oriented industries on the production of supporting industries. The estimates for these regressions are represented in Table 1. Column 1 and 2 show the estimations for Regression (10) using the RE and the FE models, respectively. Those of Equation (11) are in columns 3 and 4, using the RE and FE

models, respectively.

**Table 1.** Export FDI and production of supporting industries

| Variable | Label | (1) RE Coefficient Std. Err. | (2) FE Coefficient Std. Err. | (3) RE Coefficient Std. Err. | (4) FE Coefficient Std. Err. |
|---|---|---|---|---|---|
| Domestic demand | DBK | $0.24^{***}$ | $0.35^{***}$ | $0.0003^{ns}$ | $0.041^{ns}$ |
| | | 0.05 | 0.09 | 0.09 | 0.13 |
| Foreign demand | FBK | | | $0.22^{**}$ | $0.24^{**}$ |
| | | | | 0.07 | 0.07 |
| Industry size | indus_size | $0.17^{***}$ | $0.14^{**}$ | $0.17^{***}$ | $0.13^{**}$ |
| | | 0.04 | 0.05 | 0.04 | 0.05 |
| Industrial investment | indus_inves | $0.27^{***}$ | $0.24^{***}$ | $0.25^{***}$ | $0.24^{***}$ |
| | | 0.03 | 0.03 | 0.03 | 0.03 |
| Labor qualification | w | $0.15^{***}$ | $0.13^{***}$ | $0.13^{***}$ | $0.12^{***}$ |
| | | 0.02 | 0.02 | 0.02 | 0.02 |
| Constance | | $5.55^{***}$ | $4.51^{***}$ | $6.14^{***}$ | $5.68^{***}$ |
| | | 0.76 | 1.05 | 0.81 | 1.15 |
| Observations | N | 382 | | 382 | |
| Number of groups | n | 33 | | 33 | |
| $R^{2a}$ | | 0.7921 | 0.7649 | 0.799 | 0.7754 |
| Breusch et Pagan' test | LM | $415.9^{***}$ | | $430.26^{***}$ | |
| Ficher' test | F | | $92.38^{***}$ | | $75.36^{***}$ |

Significant levels :    $*: p < 0.05$    $**: p < 0.01$    $***: p < 0.001$    $ns$ : not significant    $+: p < 0.1$
Standard errors are robust.
$a$: $R^2$ within for fixed effects model and $R^2$ between for random effects model

The table gives ratios $F$ statistically significant to the threshold of 0.1 per cent. Hence, the individual effects are justified and the FE model is more efficient than the grouped regression model. Similarly, the Lagrange multipliers ($LM$), being higher than the chi-square of 3.84 ($\chi^2(1) = 3.84$) justifies the relevance of the RE model over the OLS model.

We state that over the period 2000-2012, all control variables are significant and have a positive influence on the production of supporting industries. Using the RE model (FE model) if the size of a given industry increases by 10%, its production will grow by 1.7 per cent (1.4%). The same 10% increase in investment of the considered industry leads to an increase of 2.5 per cent in its production.

Table 1 also shows that estimated coefficient of $FBL$ (presented in columns 3 and 4), considered as a direct demand effect, is positive and statistically significant in both modules. Using the RE method (FE method), if foreign firms in export-oriented industries increase their demand for a given input by one per cent, the production of this input will increase up to 0.21 per cent (0.24%). However, variable $DBK$ is statically non significant. On the other hand, in the absence of foreign production, the domestic demand for inputs become statically significant for both the FE and RE models (cf. estimates in column 1 and 2). It follows that one per cent increase of domestic demand for a given input leads to an increase of 0.25 per cent (by the RE model) or 0.37 per cent (by the FE model) in production of this input. Such increase is even higher than that generated by foreign demand (cf. 0.21% for the RE model and 0.24% for the FE model). The results validate Hypothesis 1 and indicate that:

(i) During the period 2000-2012, backward linkages were created by foreign firms rather than by domestic ones.
(ii) There is a strong competition effect so that it highly dominates the direct demand one.

Hence, the Vietnamese supporting industries are located in Area 1 of Figure 1 ( Figure
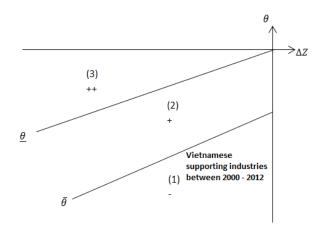
below).

**Figure 2.** Impacts of Export-platform FDI on the Vietnamese supporting industries



Using our analysis developed in Section 2.2, it follows that the foreign production in export-oriented industries creates strong negative FDI spillovers. As a consequence, the competition effect becomes very strong and dominates the direct demand effect, that reduces the production value of supporting industries.

*Impacts of trade agreements, LCR and third country size*

We now examine the impacts of trade agreements, LCR and third country size on the production value of supporting industries, by using Regression (12). The estimate results are shown in Table B1 below.

*Impacts of LCR*: The associated coefficient of this variable are represented in columns 1 and 2. We state that the estimated is positive and statistically significant at 0.1 per cent level in both RE and FE models. Hence, we validate Hypothesis 2 and conclude that in our sample, the higher LCR, the higher the production value of supporting industries.

*Role of trade agreements*: Recall that during the period studied, there are two important trade agreements signed between Vietnam and third countries: BTA with the United States in 2001 and Vietnam becoming the member of the WTO in 2007. The estimates for the impacts of these agreements, using the RE and the FE methods, are reported in column 3 and 4 of Table B1, respectively. We observe that two variables *wto* and *usa* positively and statistically affect the production value of supporting industries. These findings support Hypothesis 3 so that the power of trade agreements between Vietnam and third countries is sufficiently strong to improve the production of supporting industries.

*Impacts of third countries size*: The estimates for third market size, using the RE and the FE methods, are shown in columns 5 and 6 of Table B1. The estimated coefficient for U.S. market size appears to be positive and significant in both columns. Hence, given the BTA signed with the United States in 2001, the size of this country positively affects the production value of supporting industries. Interestingly, given the entry of Vietnam into the WTO, the size of the EU market has a negative effect on the production value of Vietnamese supporting industries while impact of the APEC

**Table 2.** Impacts of trade agreements, local inputs intensity and third country size

| | | Local inputs intensity | | Trade agreements | | Third countries size | |
|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) |
| | | RE | FE | RE | FE | RE | FE |
| Variable | Label | Coeffi. | Coeffi. | Coeffi. | Coeffi. | Coeffi. | Coeffi. |
| | | Std. Err. | Std. Err. | Std. Err. | Std. Err. | Std. Err. | Std. Err. |
| Local inputs intensity | FBL2 | 0.009*** | 0.011*** | | | | |
| | | 0.002 | 0.002 | | | | |
| Membership of WTO | wto | | | 0.49*** | 0.56*** | | |
| | | | | 0.10 | 0.10 | | |
| BTA with United States | usa | | | 0.24*** | 0.32** | | |
| | | | | 0.10 | 0.09 | | |
| Size of United States | ussize | | | | | 0.009** | 0.011*** |
| | | | | | | 0.003 | 0.003 |
| Size of APEC | apecsize | | | | | $2.11^{ns}$ | $2.61^{+}$ |
| | | | | | | 1.38 | 1.36 |
| Size of EU | eusize | | | | | $-2.14^{ns}$ | $-2.66^{+}$ |
| | | | | | | 1.41 | 1.39 |
| Industry size | indus_size | 0.17*** | 0.14** | 0.17*** | 0.12** | 0.17*** | 0.12** |
| | | 0.04 | 0.05 | 0.03 | 0.04 | 0.04 | 0.04 |
| Industrial investment | indus_inves | 0.25*** | 0.24*** | 0.24*** | 0.22*** | 0.24*** | 0.23*** |
| | | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Labor qualification | w | 0.13*** | 0.12*** | 0.12*** | 0.10*** | 0.11*** | 0.08** |
| | | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 |
| Constance | | 7.46*** | 7.51*** | 8.9*** | 9.35*** | 8.96*** | 9.45 |
| | | 0.37 | 0.35 | 0.36 | 0.35 | 0.38 | 0.37 |
| Observations | N | 382 | 382 | 382 | 382 | 382 | 382 |
| Number of groups | n | 33 | 33 | 33 | 33 | 33 | 33 |
| $R^{2a}$ | | 0.794 | 0.7791 | 0.865 | 0.7641 | 0.8651 | 0.7687 |
| Breusch et Pagan' test | LM | 440.79*** | | 428.81*** | | 429.74*** | |
| Ficher' test | F | | 97.74*** | | 83.34*** | | 74.91*** |

Significant levels :   * : $p < 0.05$    ** : $p < 0.01$    *** : $p < 0.001$    $ns$ : not significant    $+$ : $p < 0.1$
Standard errors are robust.
[a]: $R^2$ within for fixed effects model and $R^2$ between for random effects model

market is positive. However, these impacts are all statistically non significant in both methods. Indeed, one of the main reasons for this *surprising* finding is the *subprime crisis* and its persistence that strongly hurts the GDP of these regions. Hypothesis 4 can be validated.

## 4.   Conclusion

The rising in the number of trade agreements over the world leads to the appearance of Export-platform FDI. While there is an abundant literature on this type of investment as a strategic behavior of MNFs, its impacts on the host country are little studied and hence this is the purpose of this research.

We have developed a three-country framework allowing to examine impacts of such investment through the competition and the demand effects. The former is generated when foreign production generates negative FDI spillovers and then replaces domestic production whereas the latter can be directly or indirectly created. We have shown that Export-platform FDI has ambiguous effects on backward linkages, and there exists a case through which this investment improves both the output level of domestic firm and the level of backward linkages. We have also studied the role of different variables of the economy as the third country size, the power of trade agreements and the LCR. In the case of Vietnamese supporting industries over the period 2000-2012, a negative

impact of this investment has been found. However, trade agreements between Vietnam and other countries, and LCR have a positive impact while that of third market size is ambiguous.

Our research is in line with the literature concerning the relationship between FDI and backward linkages by examining the existence of the competition effect and the demand for inputs effect (Rodriguez-Clare 1996; Markusen and Venables 1999; Lin and Saggi 2007b). In their framework, the authors only consider the existence of the demand effect created by MNFs while in our model, the demand for inputs effect can be generated by both foreign and domestic firms. Moreover, we develop a three-country model concept instead of a two-country model. Given the rising in trade agreements across the world, the two-country standard models on FDI become irrelevant to study the complex strategies including Export-platform FDI used by MNFs Yeaple (2003); Baltagi et al. (2007). Consequently, we cannot use a two-country framework to examine the impacts of this investment. Our framework is also different from that of (Rodriguez-Clare 1996; Markusen and Venables 1999; Lin and Saggi 2007b) by taking into account the impacts of third country size, trade agreement, and LCR on the level of backward linkages.

This paper leaves open many discussions for further research. First, we have worked entirely in a partial equilibrium framework. As a consequence, sole the final good's price is endogenous. Wage, inputs' price are taken as given. Developing the three-country general equilibrium framework may be helpful to study the impacts of Export-platform FDI on wage, inputs' price as well as the welfare of the host country. Second, the paper only consider one MNF and one domestic firm. By endogenizing the entry of firms, we can study how this investment impacts the market structure. This is also interesting to examine whether the domestic firms can become more competitive than their foreign counterparts.

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## Appendix

### Appendix A. Third-country model

#### A.1.  *Equilibrium in the third market*

Let $AC_m^R, AC_l^R$ respectively be the access cost to the third market in the Economy $R$. The problem of each firm is given as

$$\max_{q_l^R \geq 0} \pi_l^R = p_A^R q_l^R - AC_l^R q_l^R \tag{A1}$$

$$\max_{q_m^R \geq 0} \pi_l^R = p_A^R q_m^R - AC_m^R q_m^R \tag{A2}$$

In our model, firms compete in a Cournot fashion. In other words, each firm determine her output level by taking given that of her competitor. Hence, the best response strategies of firm $m$ and firm $l$ are represented as

$$q_l^R(q_m^R) = \frac{2b}{S_A - AC_l^R} - \frac{q_m^R}{2} \tag{A3}$$

$$q_m^R(q_l^R) = \frac{2b}{S_A - AC_m^R} - \frac{q_l^R}{2} \tag{A4}$$

Solving Equations (A3) and (A4) yields the market equilibrium in the Economy $R$

$$q_l^R = \frac{S_A - 2AC_l^R + AC_m^R}{3b} \tag{A5}$$

$$q_m^R = \frac{S_A - 2AC_m^R + AC_l^R}{3b} \tag{A6}$$

$$p_A^R = \frac{S_A + AC_m^R + AC_l^R}{3} \tag{A7}$$

from where the profit of each firm is computed as

$$\pi_l^R = \left(\frac{S_A - 2AC_l^R + AC_m^R}{3b}\right)^2 \tag{A8}$$

$$\pi_m^R = \left(\frac{S_A - 2AC_m^R + AC_l^R}{3b}\right)^2 \tag{A9}$$

It should be noted that Equations (A3) and (A4) have a unique interior solution $(q_l^R, q_m^R > 0)$ only if the third market size $(S_A)$ is high enough. In order to investigate impacts of Export-platform FDI on backward linkages, we only consider the case where interior solution exists $(q_l^R, q_m^R > 0)$. The situation according to which firms are inactive (i.e., $q_l^R, q_m^R = 0$) is widely analyzed in the literature.

## A.2.  *Strategy choice of the foreign firm*

Let $\pi_m^{Exp}(Epfdi)$ be the profit of firm $m$ when using an Export-platform FDI in the Export economy. This firm finally exports instead of using an Export-platform FDI in the Export economy if and only if $\pi_m^{Exp} > \pi_m^{Exp}(Epfdi)$. The equivalent condition is

$$\frac{S_A - 2(w_m + \gamma c_l + \tau_m) + (\delta w_m + c_l - \theta + \tau_l)}{3b} >$$
$$\frac{S_A - 2(\delta w_m + \lambda c_l + (1-\lambda)\gamma c_l + \tau_m) + (\delta w_m + c_l - \theta + \tau_l)}{3b} \tag{A10}$$

or

$$\tau_l - \tau_m > (1-\delta)w_m - (1-\gamma)\lambda c_l \tag{A11}$$

Likewise, let $\pi_m^{Ep}(Exp)$ be the profit of firm $m$ when using an Export strategy in the Export-platform economy. An Export-platform FDI is used instead of Exporting if and only if $\pi_m^{Ep} > \pi_m^{Ep}(Exp)$. This implies that the following condition must be fulfilled

$$(1-\delta)w_m - (1-\gamma)\lambda c_l > \tau - \tau_m \tag{A12}$$

Using Equations (A11) and (A12) yields the condition given in Proposition 1.

## A.3.  *Role of local content requirement*

Equation (9) can be rewritten as

$$\Delta BK = \frac{1}{3b}\left[-2\lambda^2(1-\gamma)c_l + (S_A + (2-3\gamma)c_l - \delta w_m - \theta - \tau)\lambda + (2\theta + 2\tau_l - \tau - \tau_m) - (1-\delta)w_m\right] \tag{A13}$$

Since $(1-\gamma)c_l > 0$, the function $f(\lambda) := -2\lambda^2(1-\gamma)c_l + (S_A + (2-3\gamma)c_l - \delta w_m - \theta - \tau)\lambda + (2\theta + 2\tau_l - \tau - \tau_m) - (1-\delta)w_m$ has a maximum value at

$$\lambda := \lambda^* = \frac{S_A + (2-3\gamma)c_l - (\delta w_m + \theta + \tau)}{4(1-\gamma)c_l},$$

However, $\lambda^*$ exists if and only if $0 \leq \lambda^* \leq 1$ that is equivalent to conditions (i) and (ii) given in Proposition 4.

In addition, replacing $\lambda$ in Condition (8) by $\lambda^*$ yields condition (iii) of Proposition 4.

## Appendix B. Evidence from Vietnam

### B.1.  *Data description*

**Table B1.**  Descriptive analysis for supporting industries

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| VARIABLES | N | mean | sd | min | max |
| gdpus | 382 | 1.302e+13 | 8.416e+11 | 1.156e+13 | 1.423e+13 |
| gdpapec | 382 | 2.633e+13 | 2.685e+12 | 2.210e+13 | 3.069e+13 |
| gdpeu | 382 | 1.375e+13 | 6.935e+11 | 1.243e+13 | 1.457e+13 |
| lnindus_prod | 382 | 13.85 | 1.766 | 4.120 | 17.27 |
| lnindus_invest | 382 | 11.33 | 2.718 | -12.05 | 15.55 |
| qualif | 382 | 9.989 | 3.467 | 1.991 | 23.20 |
| indussize | 382 | 3.224 | 3.479 | 0.00696 | 17.73 |
| Number of indus_id | 33 | 33 | 33 | 33 | 33 |

### B.2.  *List of Vietnamese export-oriented industries*

**1500 – Food products and beverages**
- 1511 - Animal food manufacturing
- 1512 - Seafood product preparation and packaging
- 1514 - Grain and oilseed milling
- 1520 - Dairy product manufacturing
- 1532 - Bakeries and Tortilla manufacturing
- 1542 - Sugar and Confectionery product manufacturing

**1700 – Textile products manufacturing**
- 1711 - Fibre, yearn and thread mills
- 1712 - Textile ennoblement
- 1721 - Textile and Fabric
- 1722 - Carpet and Rug mills
- 1723 - Net and String products
- 1729 - Other textiles products
- 1730 - Knitting products

**1800 – Clothing manufacturing**
- 1810 - Garment products manufacturing

**1900 – Leather, leather products and shoes**
- 1920 - Shoes manufacturing

**2500 – Plastics and Rubber products manufacturing**
- 2520 - Plastics products manufacturing

**2690 – Non-metallic mineral products**
- 2691 - Pottery, Ceramics and Plumbing fixture manufacturing
- 2692 - Clay building material and Refractory manufacturing
- 2693 - Brick and construction products

**3000 – Computer and Peripheral equipment manufacturing**

**3100 – Electrical equipment manufacturing**
- 3130 - Electrical cables manufacturing

**3200 – Radio, television and communication equipments manufacturing**
- 3210 - Electronic components
- 3220, 3230 - Communication equipment

### B.3.  *List of supporting industries*

**1500 – Food products and beverages**
- 1533 - Prepared feeds for farm animals
- 1549 - Other Foods manufacturing

**1910 – Leather and related products**
- 1911 - Tanning and dressing of leather, dressing and dyeing of fur

1912 - Luggage, handbags and like, saddler and harness

**2000 - Wood and wood products and cork (except furniture) manufacturing, Articles of straw and plaiting materials**

2010 - Saw-milling and planing of wood, excluding impregnation

**2100 - Paper products manufacturing**

2101 - Pulp, paper and paper-board manufacturing

2102 - Corrugated paper and paper-board, containers of paper and paper-board manufacturing

2109 - Other articles of paper and paper-board

**2400 - Chemical industries**

2411 - Other organic basic chemicals manufacturing

2413 - Plastics, synthetic rubber in primary forms manufacturing

2422 - Paints, varnishes and similar coatings, printing ink and mastics manufacturing

2429 - Other chemical products

2430 - Man-made fibres manufacturing

**2500 - Plastic and rubber products manufacturing**

2511 - Rubber tires and tubes, retreading and rebuilding of rubber tires manufacturing

2519 - Other rubber products manufacturing

**2690 - Non-metallic mineral products**

2694 - Cement, lime and plaster manufacturing

2695 - Other articles of concrete, cement and plaster manufacturing

2696 - Cutting, shaping and finishing of store

2699 - Other non-metallic mineral products

**2700 - Basic metals manufacturing**

2720 - Precious and light metals production

2732 - Casting of light metals

**2900 - Machinery and equipment manufacturing**

2911 - Engines and turbines (except aircraft), vehicle and cycle engine manufacturing

2912 - Fluid power equipment, other pumps and compressors manufacturing

2913 - Bearings, gears, gearing and driving elements manufacturing

2914 - Ovens, furnaces and furnaces burners manufacturing

2915 - Packing, packaging and weighing equipment manufacturing

2919 - Other general purpose machinery manufacturing

**3100 - Electrical equipment manufacturing**

3120 - Electricity distribution and control apparatus manufacturing

3140 - Batteries and accumulators manufacturing

3150 - Electric lighting equipment manufacturing

3190 - Other Electrical equipment manufacturing

**3500 - Other transport equipment manufacturing**

3591 - Motorcycles manufacturing

**3700 - Collection, treatment and recovery**

3710 - Collection, treatment and recovery of metallic waste

3710 - Collection, treatment and recovery of non-metallic waste

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