Exports and inward value chains: evidence from Indonesia

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Abstract

Drawing on the experience of Indonesian firms, we analyse the relationship between importing and exporting activities in two years (2009 and 2015) to test whether this relationship changes following a reversal of trade liberalization. We hypothesize that reversal in trade liberalization affects firms in developing countries because they experience a decreased access to market opportunities and technology that is already standard in developed countries. We validate the theoretical underpinnings of the claim that importing Indonesian firms export more, and we contribute to the literature by introducing a newly-identified underlying mechanism behind the positive relationship between imports and exports: when trade barriers are low, firms that import intermediates sourced from "complex" value chains achieve significant increases in their exports. However, following a reversal of trade liberalization, value chains are disrupted and "simple" importing becomes more relevant for firms' exports. In such circumstances, emerging market firms' participation in value chains becomes less global. Relevant policy implications can be made: in a world marked by growing scepticism surrounding globalization and openness to international trade and competition, policy makers should bear in mind that policies inhibiting access to global value chains have negative consequences for firms' exports.

Keywords: value chains, exports, imports, reversal of trade liberalization, "simple" importing, "complex" importing, Indonesia.

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1. Introduction

In this paper, we aim to study how the reversal of trade liberalization affects the relationship between importing and exporting activities in emerging market firms. We hypothesize that reversal in trade liberalization affects particularly firms in developing countries because they experience a decreased access to market opportunities and technology that is already standard in developed countries.

Regarding to two-way traders in emerging markets, Aristei et al. (2013) found that being an importer has a positive effect on the probability to be a two-way trader, while being an exporter has not such an effect. However, to the best of our knowledge, there are not previous studies focusing on how the relationship between firm's exports and imports changes under a deterioration of trade conditions. To fill this this gap in the literature, we test how participation in value chains has shaped the positive relationship between imports and exports in Indonesia before and after a deterioration of trade conditions for importers has occurred.

Our focus is on Indonesia because it is a large emerging market that underwent a deep trade liberalization process starting at the end of the 1980s,[1] but later experienced a reversal of trade liberalization over the post- global financial crisis (GFC) period, 2009-2016.[2] It is worth mentioning that tariff increases are not the only evidence of reversal

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[1] The tariff rate (applied, weighted mean, all products) was 14.54% in 1989 and decreased to 1.71% in 2009 (data extracted from World Development Indicators, The World Bank).

[2] Although weighted average tariffs in Indonesia are considerably below the average in the group of low-income countries, Indonesia experienced a reversal in trade liberalization over the period 2009-2016. Specifically, the tariff rate applied (weighted average for all products) in Indonesia in 2009 was 1.71% and increased to 2.64% in

of trade liberalization in Indonesia. Importantly, increasing protectionism is reflected in non-tariff measures, as tariffs are already very low (Patunru and Rahardja 2015). According to the Global Trade Alert database, the number of newly implemented non-tariff measures (NTMs) by country between 2009 and 2014 was led by the United States, which implemented by far the most NTMs (662). Saudi Arabia (130) and India (128) were the second and third largest users, followed by Germany (76) and Brazil (71) (see Kinzius et al. 2019). During the same period, Indonesia implemented 63 NTMs.[3]

The case of Indonesia is instructive: it is a big, fast-growing country located in a dynamic emerging region. However, this research can be generalized beyond Indonesian firms, as Indonesia is not the only nation whose participation in the global economy has weakened during what some researchers have described as a great trade collapse (Bems et al. 2013). Indeed, the GFC marked the start of a dramatic reversal of the rising trend in so-called global import intensity (Timmer et al. 2016), with value chains becoming less global and more fragmented. Therefore, we see the Indonesian experience as a harbinger of future events in other emerging countries.

We contribute to the literature by scrutinizing the causal effect of importing activities on exports, and we consider the integration of the firm in worldwide activities by accounting for the depth and scope of inward value chains. We rely on a value chain

2016. Figure A.1 in the Appendix shows that the magnitude of the reversal in trade liberalization was unique to Indonesia for the period under study.

[3] Also, see, e.g., Patunru et al. (2018); and Patunru and Rahardja (2015), for a list of protectionist trade laws, non-tariff barriers imposed, local content requirements, and export measures taken by Indonesia since 2009.

perspective that allows us to distinguish between foreign value added that only crosses

the border once and foreign value added that crosses the border twice or more. Then,

we identify the effect of "simple" *versus* "complex" importing on exports in a context in

which emerging market firms experience a deterioration of their trade conditions. As our

empirical research focuses on the Indonesian experience, we analyse the role of "simple"

versus "complex" importing in two years in which we observe a reversal of trade

liberalization in Indonesia: 2009 and 2015.

Our key assumption is that reversal of trade liberalization complicates international

trade processes and disrupts existing trade networks. As a consequence, firms into

trouble might "simplify" their importing strategy because some imported products might

become unavailable (or very expensive) and they have to rely on alternative sources to

substitute them. In this vein, the Economist Intelligence Unit (2009) found that

protectionism is a relevant cause for supply-chain disruption.

Crucially, we should consider different stages of the Indonesian value chains and move

beyond the gross value of exports to consider the intersection with its domestic economy.

The simple value of exports would tell us only about the last stage of the value chain as

it leaves Indonesia. However, we want to know the composition of imports of inputs used

in the production process; we can then gain fresh insights into Indonesia's global

engagement by using the World Input-Output Database (WIOD).[4] In addition, we use

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[4] Specifically, we use the UIBE GVC Index, which is a database derived from the original WIOD. See RIGVC UIBE, 2016, UIBE GVC Index, available at:

data from the World Bank Enterprise Survey (WBES) conducted in Indonesia in 2009 and 2015.[5]

We show that when firms source from foreign countries, firms in that country export more. However, this positive causal effect is channelled through "complex" importing (that is, when firms import intermediates that have crossed international borders several times); "simple" importing (that is, when firms import intermediates that have crossed an international border only once—in this case, the Indonesian border) does not increase firms' exports in periods of trade liberalization. Conversely, "simple" importing becomes more relevant for exports in periods of trade liberalization reversal.

Our findings have relevant policy implications. From our focus on the reversal of trade liberalization in Indonesia, we learn how decreased involvement in global value chains (GVC) might shape firm performance (measured in terms of exports). Therefore, re-imposing trade controls does not seem to be the best strategy in this globalized world.

The rest of the paper is organized as follows. Section 2 reviews the most closely related literature and explains the already-identified underlying mechanisms behind the positive relationship between firms' imports and exports. Section 3 introduces a new underlying mechanism behind the positive association between imports and exports (firms' integration in worldwide activities) and describes the main tests to be performed in the empirical analysis. Section 4 presents the data and measures. Section 5 details the

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http://rigvc.uibe.edu.cn/english/D_E/database_database/index.htm

[5] The WBES for Indonesia covers a representative sample of firms in terms of firm size and includes exporters and non-exporters, as well as importers and non-importers from a broad range of sectors.

methods and results. Section 6 provides a discussion of our research findings, and Section 7 concludes.

2. Value chains and the relationship between importing and exporting activities

2.1. A brief review of the literature on the effects of value chains using firm-level data

Previous related literature focuses on the impact of imported intermediate inputs on employment and inequality (see, e.g., Feenstra and Hanson 1996) and on the country-level benefits from offshoring (Amiti and Wei 2009; Winkler 2010). At the microeconomic level, foreign inputs have been associated with firm productivity improvements (Topalova and Khandelwal 2011), and with an increase in the number of varieties of goods produced by the firm (Goldberg et al. 2010). There is extensive empirical research that supports the theoretical predictions linking foreign intermediates to productivity, but the role of foreign inputs in shaping exports in emerging market firms is not yet fully understood. A study that is closely related to our research used firm-level data from emerging markets and found that firms' importing activities increase the probability of exporting, while serving foreign markets does not affect the probability to source foreign inputs (Aristei et al. 2013).

Related literature provides analyses that use firm-level data to examine the consequences of offshoring and value chains (Bernard et al. 2018; Hummels et al. 2018). Recent research in international trade provides insights into the effects of offshoring and value

chains on labour markets (Hummels et al. 2018), and examines the concept of "global firms" (Bernard et al. 2018). Concerning firms in emerging markets, previous literature offers four relevant observations. First, the average firm is very small. Second, firms often do not grow significantly as they age. Third, firms in emerging markets appear to have low productivity on average and, fourth, there is significant productivity dispersion across firms. Therefore, they mostly buy locally (see Jensen and Miller 2018). These observations reinforce the importance of further analysing the role of firms' integration in worldwide activities (value chains) in the relationship between imports and exports in emerging market firms, particularly when they are affected by trade liberalization reversals.

2.2. On the positive association between firms' imports and exports: Six underlying mechanisms

Firms that use imported inputs in their production process are more productive. This is a key finding in a large body of research in the literature on firms' decision-making about engaging in international trade.[6] The effect of imports on productivity is just the first step. As a secondary effect, importing can have such a great impact on productivity that these firms subsequently become successful exporters. In other words, exporters are importers.

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[6] For a survey, see, e.g., Wagner (2012).

Why does this happen? The first underlying mechanism is a "selection channel" for more productive firms: firms that are more productive find it financially worthwhile to incur the costs associated with both importing and exporting (Bernard et al. 2018). An increase in firm productivity is the key underlying mechanism that can explain the relationship between imports and exports. This, and five additional mechanisms drawn from this branch of the literature are discussed in this section.

The second underlying mechanism is the wider variety of inputs available to importing firms compared to firms that use only domestic providers. As result, importing firms are more likely to get the intermediate input that best fits their needs. Importing may help firms to extract the technology embodied in imported intermediates and capital goods. Imported inputs may also be of better quality and cheaper than domestic inputs. All of these factors help drive productivity growth (Bas and Strauss-Kahn 2014; Halpern et al. 2015; Wagner 2012).

The third underlying mechanism is the product diversification that firms can achieve through inputs. Since firms that have access to imported inputs can increase their productivity, they are in turn better able to adapt their products to foreign markets. As an additional benefit, previous research indicates that firms using imported inputs also tend to sell a wider range of products in their domestic markets (Goldberg et al. 2010).

The fourth underlying mechanism is the higher quality of products exported by importing firms. Bas and Strauss-Kahn (2015) found that Chinese firms took advantage of trade liberalization to increase both the number of input varieties imported and the

price paid for imported inputs. In response to tariff reductions, Chinese firms upgraded their product quality. Also in a study of Chinese firms, Fan et al. (2015) analysed the effects of tariff reductions on export quality. Fan et al. (2015) addressed shifts in the extensive margin of export markets by identifying three types of export orientation: "entry", "exit", and "continuing". The results obtained imply that trade liberalization in China had the effect of shifting Chinese exports from countries where demand for high-quality goods was weak to countries where demand for high-quality goods was strong. As a consequence, increasing imports (resulting from trade liberalization) meant that products of higher quality could be exported.[7]

The fifth underlying mechanism is the complementarity between imports and innovation. Bøler et al. (2015) looked at the relationship between innovation and imports of intermediate goods, and their joint impact on productivity. They found that imports and R&D investment play a key role in explaining firm-level productivity growth. At least two mechanisms are important determinants of innovation in a firm: knowledge transfers and competition. There may be multiple channels for these mechanisms, including international trade (Gorodnichenko et al. 2010).[8] With regards to competition, Levinsohn (1993) tested the hypothesis of "imports-as-market-discipline" for Turkish firms. This hypothesis states that "when faced with intensified international competition,

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[7] The interpretation is that higher export prices can be charged due to a quality upgrade in exported products.
[8] For a survey of empirical studies analysing the relationship between productivity and innovation in firms, see Hall (2011).

domestic industries [...] are forced to behave more competitively. This phenomenon is frequently claimed to be especially relevant in developing countries where the protected domestic market often will only support a few firms" (see Levinsohn 1993, page 2). Recently, Jensen and Miller (2018) tested this hypothesis for firms in India and confirmed that opening an emerging market to trade introduces foreign firms as additional competitors. Indeed, because there are large differences in productivity across countries (Hall and Jones 1999), the complementarity between imports and innovation allows firms in developing markets to access high-income markets, which can help firms in emerging countries to close the productivity gap.

The sixth underlying mechanism is the interdependencies and complementarities between exports and imports (Bernard et al. 2018): firms that engage in one of these forms of internationalization (imports or exports), also engage in the other. There are interdependencies in importing decisions across source countries. In addition, importing (exporting) can facilitate exporting (importing), and exporting to one market can promote exporting to another market. The processes behind these interdependencies and complementarities are complex and associated with the fixed costs that firms face in order to participate in international markets.

In sum, there are at least six underlying mechanisms behind the positive correlation between imports and exports. Firms that import more: 1) are more productive (and more productive firms export more); 2) have access to a wider variety of inputs; 3) achieve greater product diversification; 4) upgrade the quality of their exported products; 5)

benefit from the complementarity between imports and innovation; and 6) benefit from the interdependencies and complementarities between imports and exports.

3. The role of firms' integration in worldwide activities in the relationship between imports and exports

We identify and test one additional mechanism that we hypothesize to be relevant in relationship between imports and exports: firms' integration in worldwide activities (that is, value chains). Specifically, we go backwards and consider the depth and scope of importing activities. The reversal in trade liberalization experienced in Indonesia during the period under study provides us with a perfect causal analysis that allows us to test how exports react to a firm's reduced integration in worldwide activities. This effect is expected to be relevant for firms in emerging markets because a reversal of trade liberalization means firms have less access to market opportunities and technology that is already standard in developed countries.[9] We measure the involvement of Indonesian firms in value chains and consider the depth and scope of importing. To analyse the scope and depth of importing, we distinguish between being an importer and "complexity" of importing activities. In a first step, we test the causal effect of imports

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[9] Firms in emerging economies take advantage of the higher technological content of imported inputs from developed countries. For example, the relationship between the origins of imported inputs and total factor productivity (TFP) has been studied by comparing the effects of imports from OECD countries and those from low-wage countries: both categories of imports were found to have a positive effect on productivity, but the impact of imports from OECD countries was more pronounced (Smeets and Warzynski 2010). In this vein, Bas and Strauss-Kahn (2014) find that importing more varieties of inputs raises TFP, and this positive effect is magnified for imported inputs from developed countries thanks to the diffusion of modern technologies embodied in imported intermediate inputs. In a country-level study, Florensa et al. (2015) found that Latin American countries exported more when they imported more intermediates of capital goods from the European Union than from developing regions.

on exports. The multiple confounding factors and subsequent endogeneity concerns warrant a more detailed discussion of possible models of causality.[10] It is likely that the main causality between imports and exports runs in the opposite direction; e.g., that firms subjected to the discipline of international markets need to import intermediates to achieve sufficient end product quality; or that exporting firms are more often integrated into global production networks where overseas buyers and value chain participants actively support the quality upgrade of the exporting firm; or, with respect to the correlation between imports and productivity (confounding factor), that higher productivity is a factor that enables firms to embed more imports in their products. Other models of causality are, of course, conceivable. We use the propensity score method (PSM) and, more specifically, our analysis relies on comparing the firms selected for the treatment group (importing firms) with statistically similar controls, using a matching algorithm.

Next, we examine the importance of two different levels of importing. Specifically, we distinguish between "simple" importing (when imported goods crossed an international border only once) and "complex" importing (when imported goods crossed borders twice or more). Our expectation is that, for firms in emerging markets with low trade barriers, "complex" importing is more relevant for exports than "simple" importing. As access to market opportunities and technology is crucial for firms' performance in emerging

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[10] Endogeneity, which includes omitted variables, omitted selection, simultaneity, common-method variance, and measurement error, renders estimates causally uninterpretable (see Antonakis et al. 2010).

economies, a reversal of trade liberalization is expected to have an adverse effect on the relationship between importing and exporting activities. Therefore, we expect that a reversal of trade liberalization in these emerging markets increases the importance of "simple" importing in explaining exports. This would be indicative of decreased access to and participation in GVC; as a consequence, firms might be missing out on important market opportunities.

We illustrate the difference between "simple" and "complex" importing in Figure 1, which also displays three stages (1: the use of intermediates, 2: the production process, and 3: selling the good) and a type of firm that both exports and imports. The key difference between "simple" and "complex" importing is the number of borders that goods have crossed before they enter the country.

Insert Figure 1 about here

4. Data and measures

4.1. Data

Data on Indonesian firms are obtained from the WBES dataset. WBES is a firm-level survey of a representative sample of an economy's private sector. The surveys cover a broad range of business environment topics including international trade engagement, innovation, ownership structure, and performance measures. The sample for Indonesia was selected using stratified random sampling and three levels of stratification were used:

industry, establishment size, and region.[11] The enterprise surveys for Indonesia contain

responses from a sample of 1,444 firms in the year 2009 and 1,320 firms in 2015. Due to

missing data, the pooled sample was composed of 2,230 firms, as shown in Table 1.[12]

Table 1 shows that in 2009 most Indonesian firms (72.8%) were not engaged in

international trade. Although the proportion of export-only firms has increased over time

(from 8.7% to 9.5%), the overall engagement in internationalization has declined over

time, as reflected in the decrease in the number of importers and in the number of firms

that participate in both exporting and importing activities. Likewise, the last two

columns of Table 1 show a significant reduction over time in the mean foreign inputs of

the importing firms. Specifically, for two-way traders this figure drops from an average

of 48.4% in 2009 to an average of 37.1% in 2015.[13]

Insert Table 1 about here

Although WBES provides us information about the import of intermediate goods, i.e.,

foreign input, using this (firm-level) dataset solely, we are unable to identify the

production-sharing activities of these foreign inputs. This happens because supply chains

increasingly blur the concept of "country of origin" (WTO and IDE-JETRO 2011).

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[11] In a simple random sample, all members of the population have the same probability of being selected and no weighting of the observations is necessary. In a stratified random sample, all population units are grouped within homogeneous groups and simple random samples are selected within each group.

[12] Fewer observations are used later in the empirical analysis due to missing data.

[13] This descriptive analysis should be taken with caution, as we are relying on a limited sample of Indonesian firms.

Trade is becoming more complicated, with more interconnections, and traditional international statistics fail to distinguish between trade flows of intermediate and final goods, thus overstating the actual level of global engagement (Grossman and Rossi-Hansberg 2008). Therefore, we complement our firm-level analysis with another set of (sectoral-level) data, which we use to gain insights into value-chain activities. Specifically, our primary dataset is from the UIBE GVC Index, which is developed by the research team for GVC at the University of International Business and Economics (UIBE). The UIBE GVC Index is a derived database, which is constructed using publicly-released inter-country input-output tables such as WIOD.[14] The decomposition of production activities that underpins the UIBE GVC Index is adopted from Wang et al. (2017a) and is of central interest in our research.

4.2. Measures

Johnson (2018) has recently reviewed both the macro-approach and the micro-approach to measuring GVC activities. While the macro-approach uses global input-output tables to measure trade in value added as well as the complexity of value chains, the micro-approach relies on firm-level data to document firms' input sourcing decisions and how import and export participation are linked.

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[14] The November 2016 Release from the WIOD consists of a series of databases and covers 43 countries and a model for the rest of the world for the period 2000-2014. Timmer et al. (2012) explain how this database was constructed. A series of GVC accounting methods have been developed since then. Important related work includes Koopman et al. (2014); Wang et al. (2017a), (2017b).

In line with previous studies that apply the micro-approach to measure GVC, our final dataset includes firm-level foreign input sourcing, as well as other firm-level measures that are relevant in our analysis; namely, labour productivity, exports, foreign ownership, number of employees, adoption of foreign technology and international certification. The first part of Table A.2 (Appendix A) presents the firm-level variables obtained from WBES.

One shortcoming in the micro-approach to measuring GVC is that input sourcing is only a narrow slice of the firm's overall GVC strategy (see Johnson 2018). Therefore, in our dataset we include two additional constructed (firm-level) variables that are generated using the UIBE GVC Index. The second part of Table A.2 (Appendix A) presents the variables used to construct these measures. As the two sources of data differ in the unit of analysis (firms *versus* sectors), we merge the sectors in which firms available in the WBES operate with the corresponding sectors in the WIOD (see correspondence in Table A.3, Appendix A). This allows us to construct, firstly, a variable that measures the share of foreign inputs that cross a border only once (our "simple" importing measure, foreign_inp_once) and, secondly, a variable that measures the share of foreign inputs that cross a border twice or more (our "complex" importing measure, foreign_inp_twice_or_more).[15] In other words, firm and sectoral variation allow us to classify importing firms as either "simple" or "complex" importers.

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[15] Note that we focus on the decomposition of intermediate imports: foreign value added directly used in the production of domestically consumed products (crossing a border once), domestic value added that returns and is

Figure 2 depicts the decomposition of final goods production based on backward linkages. According to this decomposition, country-sector pairs' participation in GVC activities is viewed from the user's perspective (i.e., tracing which types of final goods production belong to GVC).

<center>Insert Figure 2 about here</center>

The decomposition of production activities has a number of important implications for the analysis. It enables researchers to determine the domestic and foreign content at each stage of the supply chains, overcome issues of double counting and improve previously proposed measures of engagement (Koopman et al. 2014).

5. Empirical analysis

5.1. Methods

In order to isolate as far as possible the effect of importing on exporting, it is essential to control for firm characteristics that are likely to affect whether or not a firm imports. In a conventional regression framework, in order to analyse the causal effect of imports

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consumed at home (crossing a border twice), and foreign value added used in the production of exported products (crossing a border twice or more). These values are available from the UIBE GVC Index at sectoral level. By using these values, we estimate two additional firm-level variables: share of the firm's foreign input that crosses a border only once and share of the firm's foreign input that crosses a border twice or more. The former is equivalent to the share of foreign value added that crosses a border only once. The latter is the share of domestic value added that returns to Indonesia and foreign value added that crosses a border twice or more (i.e., a more complex GVC activity, or "complex" importing). Table A.4 in the Appendix A summarises the construction of the two variables of interest. In Appendix B, we present the decomposition technique that allows us to decompose and trace foreign value added and to calculate the measures "foreign_inp_once" and "foreign_inp_twice_or_more".

on exports, researchers could consider multiple stages that enable them to isolate the correlation between imports and exports. However, the complexity of the components of the relationship between imports and exports, as well as the non-randomness of our sample, makes it very difficult to use regression analysis to isolate an unbiased causal effect of imports on exports. Therefore, in this paper, we resort to a flexible/non-parametric method: matching.

We match each importing firm with a control group of non-importing firms that, in terms of their labour productivity, employment and other characteristics, are equally likely to import. By matching firms, we control for the import determinants commonly suggested by previous literature. Specifically, we control for the following confounders: (labour) productivity, foreign ownership, number of employees, foreign technology and international certification (see first part of Table A.2, Appendix A, for definition of the variables used).

We restrict the sample to those firms with sufficient information across all variables of interest after cleaning the data for missing values. Our final sample of Indonesian firms contains 896 firms in 2009 and 1,041 firms in 2015. Table 2 shows the selection bias into importing; specifically, we observe that importing firms are, on average, foreign-owned, more productive, larger and adopt better technological innovations, compared to the group of non-importing firms. For example, in 2009 importing firms have, on average, 23% foreign ownership (i.e., they are FDI firms). On the contrary, non-importing firms tend to be local firms, with average foreign ownership at only 2.6% (see Table 2 for other

variables). The standardized mean differences (smd) from Table 2 highlight that the two groups are imbalanced in terms of firms' characteristics that explain importing activities. This reinforces our choice of a matching method to isolate the causal effect of importing on exporting. The practical objective of the matching method is to reduce the existing imbalance, or more precisely, to minimize the standardized mean differences between the two groups.[16]

Insert Table 2 about here

By matching on the propensity score, researchers can recover the causal parameter of interest and thus approximate a randomized field experiment (see Antonakis et al. 2010; Rosenbaum and Rubin 1983). However, the use of PSM techniques to analyse causal effects of firms' internationalization decisions is a fairly recent development in the related research. For example, Dalgıç et al. (2015) investigated firms' productivity improvements through trade and find that importing has a greater impact on firms' productivity than exporting. More recently, Boddin et al. (2017) studied the extent to which foreign ownership helps manufacturing firms in developing countries to export and import.

In this paper, we use PSM as our baseline model. However, as a robustness test, we provide an alternative specification using another commonly-used matching method:

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[16] We apply the 10% criterion (see, e.g., Boddin et al. 2017).

multivariate distance matching (MDM). In each method, we complete our analyses by calculating the average treatment effect on the treated (ATT), i.e., the effect of importing (treatment) on exporting (potential outcomes).[17]

5.2. Baseline results

In our basic set-up, we apply PSM to reduce the imbalance between the two groups of firms (importers vs. non-importers). Firms' characteristics are distilled into a single scalar (propensity score) reflecting the probability of a firm being an importer. Specifically, we use propensity scores to match each importing firm to one or more non-importing firms that have a similar predicted probability of being an importer based on the covariates. We opt for this n-to-1 matching with replacement (that is, potentially using each unit in the control group as a match more than once) due to the relatively moderate ratio between the number of firms in the control group (non-importers) and those in the treatment group (importers).[18] We estimate the propensity score using the logit model.

Insert Table 3 about here

Table 3 shows the mean values of firms' characteristics after we apply PSM. We observe that PSM successfully reduces the imbalance between the two groups, as shown by the

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[17] For the seminal works on potential outcomes framework, see Neyman (1923); Rubin (1974), (1990).
[18] We tried the 1-to-1 matching without replacement and found the quality of the matching was very low (standardized mean differences were mostly greater than 0.3).

smaller standardized mean differences (see column "smd" in Table 3). With the groups

balanced, the conditional independence assumption holds and therefore our estimates of

the effect of importing on exports (ATTs) will be unbiased.

Table 4 shows our results for the average treatment (importing) effect on the treated

after we apply PSM to balance the groups. Column (2) in Table 4 displays the ATTs

based on the matching results of Table 3. The results validate the claim that importing

activities are key for Indonesian firms' exporting activities. When a firm imported, it

increased exports by 9.8% in 2009 and by 11% in 2015.

Columns (3) and (4) in Table 4 display the results obtained when the two (firm-sectoral)

constructed variables are utilized ("foreign_inp_once" and

"foreign_inp_twice_or_more"). We use these values to classify firms as "simple"

importers or "complex" importers. If a firm's "foreign_inp_once" value is greater than

10%, then we categorize this firm as a "simple" importer, i.e., we set the dummy variable

simple_importing to 1 (otherwise, 0). We follow the same rule for "complex" importing.

If a firm's "foreign_inp_twice_or_more" value is greater than 10%, then we categorize

this firm as a "complex" importer, i.e., we set the dummy variable complex_importing

to 1 (otherwise, 0).[19] We then repeat the same steps as we did for the aggregate

importers: matching (based on propensity scores) and analysing the ATT (now with

simple/complex importing as the treatment status).

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[19] We use 10% as the cut-off point as we observe that the mean values of foreign_inp_once and foreign_inp_twice_or_more from the treatment group in 2009 are only 25.3% and 23.2%, respectively. In 2015, the means are 18.4% and 18.2%, respectively.

Insert Table 4 about here

Table 4 not only validates previous results about the importance of imports in explaining exports (in both 2009 and 2015, importing leads to a significant increase in firms' exports), but also confirms that the reversal of trade liberalization in Indonesia has had an effect on firms' internationalization process. In other words, the results from the two years under study show the increasing importance of "simple" importing (foreign inputs that cross a border only once) in explaining exports from Indonesian firms. In 2009, "simple" importing was not statistically significant in explaining firms' exports. On the contrary, "complex" importing increased firms' exports by 14.7%. In 2015, however, "simple" importing became statistically significant and increased exports by 10.8%. "Complex" importing remained statistically significant following the reversal of trade liberalization. Our results show a decrease in the magnitude of the effect; that is, in 2015, the effect of "complex" importing on firms' exports (10.8%) was similar in magnitude to that found for "simple" importing.

5.3. Robustness

A shortcoming of our analysis is that the validity of our findings depends on the quality of the matching. Although our PSM approach has reduced the imbalance, the results of the matching have to be interpreted with caution. One of the disadvantages of our baseline PSM is the fact that it transforms multi-dimensional values of covariates into

a single value of probability. Thus, the possible match becomes less restrictive, especially with our approach of n:1 matching with replacement. Consequently, we observe that the mean values of importing firms' characteristics after matching (see Table 3) are quite different from their original values before matching (see Table 2). To deal with this one-dimensional issue, we provide an alternative specification using multivariate distance matching (MDM). Instead of using the probability, we match each importing firm based on the distance measure of the variances in the covariate values between units (see Abadie and Imbens 2011; Imbens 2004).

Insert Table 5 about here

Then, we repeat the matching exercise using MDM. Table 5 shows the mean values of firms' characteristics after we apply MDM. We observe that MDM is mostly able to reduce the imbalance between the two groups, except for one covariate (number of employees) in 2009. Given the nature of the variable number of employees, along with its standard deviation, we conclude that the matching quality is still good and will not substantially affect the interpretation of the results. More importantly, MDM leaves the mean values of the firms' characteristics unchanged (or largely unchanged) for the treated group (importers).[20]

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[20] For a comparison of the effectiveness of matching methods for causal inference, see, e.g., King et al. (2011).

Insert Table 6 about here

The ATT results from Table 6 are consistent with results obtained by using PSM. They validate the claim that importing activities are important for Indonesian firms' exports in both years, 2009 and 2015. Column (2) of Table 6 shows that when a firm imports, it increases its exports by 10.5% in 2009 and by 9.8% in 2015. The results shown in columns (3) and (4) of Table 6 are also consistent with our PSM findings. In 2009, "simple" importing is not statistically significant in explaining firms' exports. On the contrary, "complex" importing increases firms' exports by 10.8%. As we found in our baseline model, in 2015, "simple" importing becomes an important factor, leading to a significant rise in exports; in addition, "complex" importing retains its positive sign and statistical significance. The results are thus highly robust to the choice of the matching technique.

6. Discussion

In a framework that accounts for value chains, a number of relevant research questions can be studied. For example, do firms export more final or intermediate goods as a result of their increasing involvement in GVC? Do exporting firms benefit from the use of foreign inputs? Are exported goods consumed at destination, sold to a third nation, or re-exported back to the country of origin? In the present research, we have contributed to shedding some light to these questions by providing a novel method that allows us to validate the claim that importing activities significantly increase exports in emerging

market firms. The results are in line with those of previous studies that analyse the two-way relationship between imports and exports in firms in emerging economies (Aristei et al. 2013).

We go one step further: distinguishing between "simple" and "complex" importing, we find that "simple" importing does not cause higher exports, but "complex" importing does. Therefore, the positive effect of imports on exports is channelled through "complex" importing; in other words, when firms import more complex, sophisticated inputs, they export more. However, after a reversal of trade liberalization, "simple" importing becomes more relevant for explaining emerging market firms' exporting activities. Such circumstances weaken firms' participation in the global economy.

The main implication that can be derived from these results is that, when an emerging country facilitates sourcing from foreign countries, firms in that country export more. However, the trend towards increasing globalization and openness to international competition seems to have begun a global reverse and there is growing scepticism surrounding globalization. As a consequence, a number of countries have re-imposed controls on trade and investment, including Indonesia. Indeed, given the potential for an international reversal of trade liberalization (in both developed and developing countries), we see the Indonesian experience as a harbinger of future events in other emerging countries.

There are two main limitations in this study. First, we have relied on a two-year survey for Indonesian firms. Therefore, the magnitudes estimated have to be interpreted with

caution. For example, PSM results are more conservative than MDM results because, following the reversal of trade liberalization (in 2015), "complex" importing and "simple" importing seem to play an equally important role in increasing firms' exports (a firm with either "simple" or "complex" importing exports around 10.8% more). Conversely, MDM results show that "simple" importing seems to lead to a greater increase in exports (13.7%) than "complex" importing (around 11.2%) in 2015. Due to data availability, we have only been able to analyse firms in 2009 and 2015. Administrative data for Indonesian firms would allow researchers to analyse a full panel of firms over time, and further study the relevant characteristics that affect their internationalization process. The second limitation of this study is that our measures of "simple" and "complex" importing have been constructed by relying on a combination of micro- and macro-measures of value chains. That is, our variables of interest proxying for "simple" and complex" importing (foreign_inp_once and foreign_inp_twice_or_more, respectively) are an interaction of industry-level indicators and firm-level information about importing activity. Complementing administrative data for firms in Indonesia with transaction-level data would allow researchers to build improved measures of firms' access to and participation in GVC,[21] as well as of the scope and depth of existing value chains.

7. Conclusion

We explore the role of value chains in the relationship between importing and exporting activities following a deterioration of trade conditions in emerging markets. Methodologically speaking, we introduce a novel method to trace foreign value added of imports (according to whether they cross an international border once *versus* twice or more) that allows us to consider the importance and degree of value chains (we thus distinguish between "simple" and "complex" importing).

This paper not only validates the idea that importing activities are key for emerging market firms exporting activities, but also that firms importing goods that crossed the Indonesian border only once ("simple" importing) did not export more in a period of trade liberalization. Conversely, firms that were involved in "complex" importing (importing goods that had crossed a border at least twice) exported more. Following a reversal of trade liberalization, we observe the increased importance of "simple" importing in explaining the relationship between imports and exports. Therefore, following a reversal of trade liberalization, value chains become less global. One potential explanation for this result is that a reversal of trade liberalization makes it increasingly difficult for firms to avoid poor home country conditions and to exploit existing resources abroad. In addition, such a reversal triggers changes in firms' internationalization process, as "simple" importing becomes more important in explaining the increase in firms' exports.

Our results help shed some light on emerging market firms' internationalization processes and our analysis is relevant because the internationalization trajectory of emerging

market firms might change with a reversal of trade liberalization, as we have proven that a deterioration of trade conditions affects firms' participation in global value chains. This research also has important policy implications. Given the interdependencies and complementarities of importing and exporting activities, governments should bear on mind that policies which inhibit imports of intermediates have negative consequences for exports.

Figures

Figure 1. A value-chain approach to analysing the relationship between importing and exporting activities.
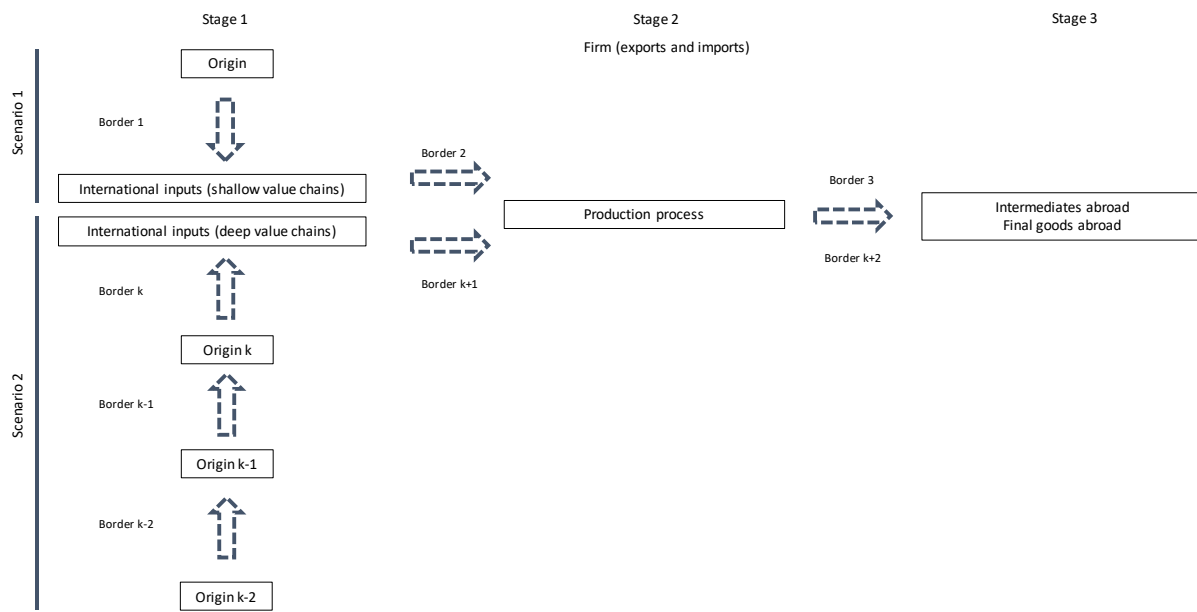
Note: Figure 1 distinguishes between "simple" importing or shallow value chains (scenario 1), and "complex" importing" or deep value chains (scenario 2).
Source: Own elaboration.

Figure 2. The decomposition of final goods production based on backward linkages.
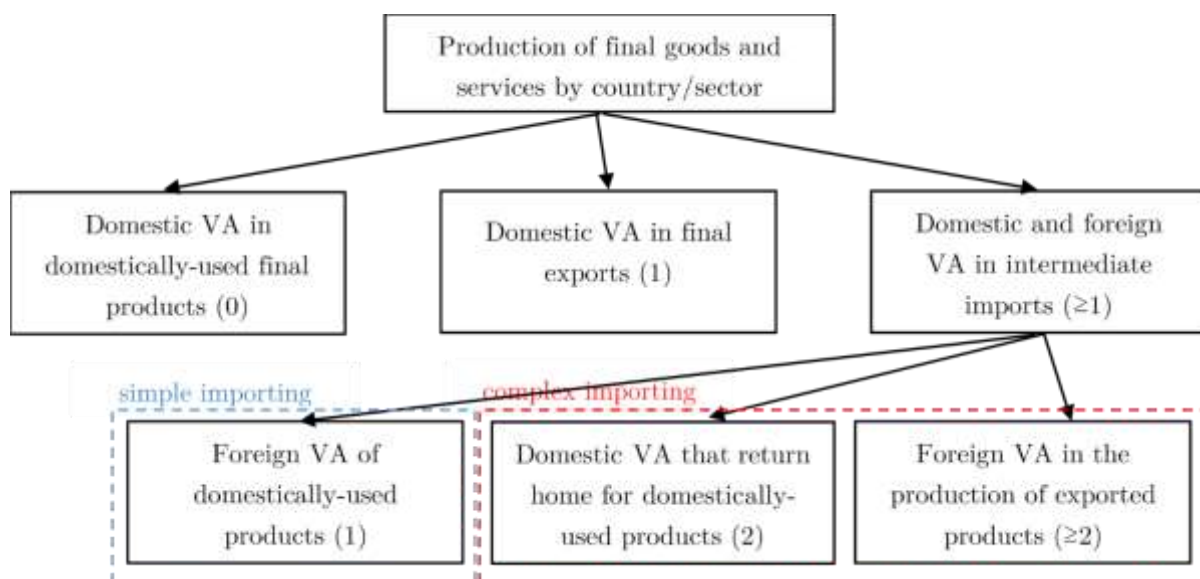
Note: VA stands for value added; numbers in parentheses denote number of border crossings.

Tables

Table 1. Sample composition.

Year	Number of Firms	Percentage Values					Mean of Imported Inputs	
		Export-only	Import-only	Export and Import	Domestic	Total	Import-only	Export and Import
2009	1,165	8.7	7.1	11.4	72.8	100	45.3	48.4
2015	1,065	9.5	6.6	9.7	74.3	100	36	37.1
Pooled	2,230	9.1	6.9	10.6	73.5	100	41.5	43.4

Table 2. Mean values of firms' characteristics: comparison between importers and non-importers (before matching)

BEFORE MATCHING	2009			2015		
	Importers	Non-importers	smd	Importers	Non-importers	smd
	(2)	(3)	(4)	(5)	(6)	(7)
Log (Labour Productivity)	18.69 (2.09)	17.01 (1.63)	0.896	20.47 (2.94)	18.16 (1.74)	0.960
Foreign ownership (%)	22.96 (39.80)	2.58 (15.48)	0.675	19.58 (27.38)	1.95 (11.46)	0.840
Number of employees	420.70 (764.84)	50.97 (163.60)	0.669	415.48 (566.45)	108.50 (341.77)	0.656
Foreign technology	0.40 (0.49)	0.07 (0.25)	0.842	0.66 (0.48)	0.21 (0.41)	1.017
International certification	0.41 (0.49)	0.04 (0.19)	0.985	0.59 (0.49)	0.16 (0.36)	1.012
Number of firms	186	710		172	869	

Note: standard deviations are in parentheses; smd: standardized mean difference

Source: Author's calculations using data from the World Bank Enterprise Survey

Table 3. Mean values of firms' characteristics: comparison between importers and non-importers (after matching with PSM)

MATCHING with PSM	2009			2015		
	Importers	Non-importers	smd	Importers	Non-importers	smd
	(2)	(3)	(4)	(5)	(6)	(7)
Log (Labour Productivity)	17.99 (1.79)	18.14 (1.46)	0.095	18.95 (2.78)	19.10 (2.46)	0.057
Foreign ownership (%)	12.25 (31.16)	11.14 (30.28)	0.036	9.84 (21.42)	12.22 (29.84)	0.091
Number of employees	238.41 (576.96)	168.15 (349.48)	0.147	273.65 (435.12)	271.51 (799.32)	0.003
Foreign technology	0.22 (0.41)	0.24 (0.43)	0.051	0.39 (0.49)	0.35 (0.48)	0.098
International certification	0.22 (0.42)	0.23 (0.42)	0.026	0.34 (0.47)	0.26 (0.44)	0.164
Number of firms*	369	369		360	360	

Note: standard deviations are in parentheses; smd: standardized mean difference; *unweighted

Source: Author's calculations using data from the World Bank Enterprise Survey

Table 4. Average treatment effect (PSM)

Year	Importing	Simple importing	Complex importing
(1)	(2)	(3)	(4)
2009	9.815*	8.510	14.706***
2015	11.049**	10.842**	10.827**

*p<0.1; **p<0.05; ***p<0.01

Table 5. Mean values of firms' characteristics: comparison between importers and non-importers (after matching with MDM)

MATCHING with MDM	2009			2015		
	Importers	Non-importers	smd	Importers	Non-importers	smd
	(2)	(3)	(4)	(5)	(6)	(7)
Log (Labour Productivity)	18.59 (2.05)	18.51 (1.59)	0.040	20.43 (2.94)	20.25 (2.76)	0.062
Foreign ownership (%)	23.36 (40.17)	22.13 (40.63)	0.030	19.25 (27.27)	17.10 (25.93)	0.081
Number of employees	386.45 (729.54)	243.53 (370.54)	0.247	408.82 (563.82)	355.55 (553.00)	0.095
Foreign technology	0.38 (0.49)	0.40 (0.49)	0.029	0.65 (0.48)	0.63 (0.48)	0.024
International certification	0.36 (0.48)	0.36 (0.48)	0.010	0.58 (0.49)	0.58 (0.49)	<0.001
Number of firms*	211	211		175	175	

Note: standard deviations are in parentheses; smd: standardized mean difference; *unweighted

Source: Author's calculations using data from the World Bank Enterprise Survey

Table 6. Average treatment effect (MDM)

Year	Importing	Simple importing	Complex importing
(1)	(2)	(3)	(4)
2009	10.484***	5.755	10.809***
2015	9.820***	13.712***	11.19**

*p<0.1; **p<0.05; ***p<0.01

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Appendix A

Figure A.1. Reversed trade liberalization in Indonesia (comparison with average values for the world, low-income and high-income countries).
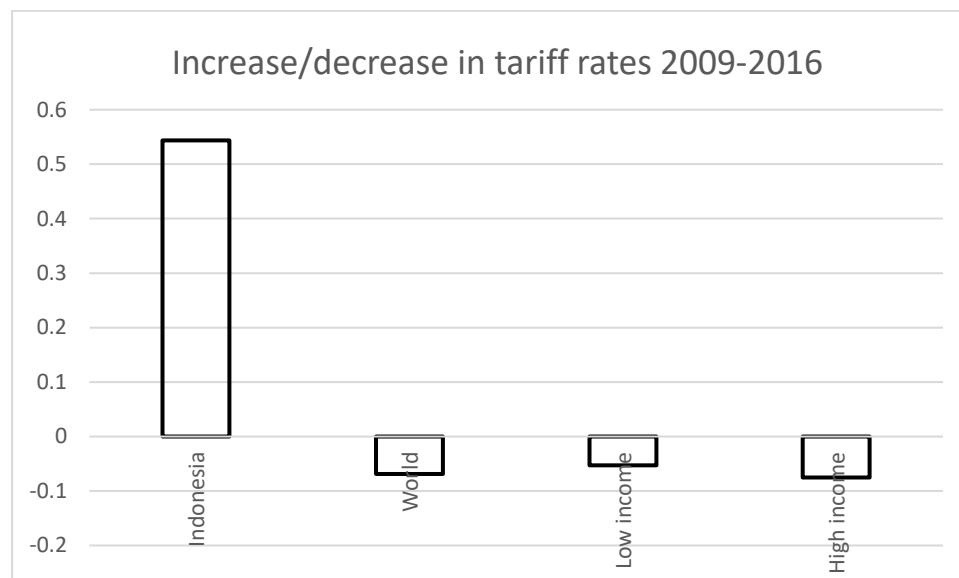
Source: Own elaboration with data from the World Bank (World Development Indicators, extraction date 26 March 2019). Indicator used: "Tariff rate, applied, weighted mean, all products (%)".

Table A.2. Variables used from two separate datasets.

Variables	Definition	Source
Firm-level data		
labor_prod	Labour productivity measured as sales divided by number of employees	WBES
foreign_inp_pctg	Percentage of foreign input in final goods production	WBES
exp_pctg	Export share as percentage of total sales	WBES
foreign_own_pctg	Percentage of the firm's foreign ownership	WBES
n_employees	Number of employees	WBES
foreign_tec	Dummy variable equal to one if the firm adopts any foreign technology	WBES
international_cert	Dummy variable equal to one if the firm has any international certification	WBES
Decomposition of Intermediate Goods Import at Industry level		
FVA_once	Foreign value-added directly used in production of domestically consumed products	UIBE GVC Index System
DVA_return	Domestic value-added returned to and consumed in home country	UIBE GVC Index System
FVA_twice_or_more	Foreign value-added used in production of final goods that has crossed a border twice or more	UIBE GVC Index System

Table A.3. Sectoral match between WBES and WIOD.

Industry ID and name in WBES	Industry ID and name in WIOD
(15) Food, (16) Tobacco	(05) Manufacture of food products, beverages and tobacco products
(17) Textiles, (18) Garments, (19) Leather	(06) Manufacture of textiles, wearing apparel and leather products
(20) Wood	(07) Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
(21) Paper	(08) Manufacture of paper and paper products
(22) Publishing, printing and recorded media	(09) Printing and reproduction of recorded media
(23) Refined petroleum products	(10) Manufacture of coke and refined petroleum products
(24) Chemicals	(11) Manufacture of chemicals and chemical products
(25) Plastics and rubber	(13) Manufacture of rubber and plastic products
(26) Non-metallic mineral products	(14) Manufacture of other non-metallic mineral products
(27) Basic metals	(15) Manufacture of basic metals
(28) Fabricated metal products	(16) Manufacture of fabricated metal products, except machinery and equipment
(29 & 30) Machinery and equipment	(19) Manufacture of machinery and equipment n.e.c.
(31 & 32) Electronics	(17) Manufacture of computer, electronic and optical products
(34 & 35) Transport machines	(20) Manufacture of motor vehicles, trailers and semi-trailers, (21) Manufacture of other transport equipment
(36) Furniture	(22) Manufacture of furniture; other manufacturing
(45) Construction	(27) Construction
(50) Services of motor vehicles	(28) Wholesale and retail trade and repair of motor vehicles and motorcycles
(51) Wholesale	(29) Wholesale trade, except of motor vehicles and motorcycles
(52) Retail	(30) Retail trade, except of motor vehicles and motorcycles
(55) Hotel and restaurants	(36) Accommodation and food service activities
(60, 61, 62, 63 & 64) Transport	(31) Land transport and transport via pipelines, (32) Water transport, (33) Air transport, (34) Warehousing and support activities for transportation, (35) Postal and courier activities
(72) IT	(40) Computer programming, consultancy and related activities; information service activities

*Two sectors (Precision instrument and Recycling) are excluded as no match could be found in WIOD.

Table A.4. Constructed firm-level foreign input variables.

Variables	Definition
foreign_inp_once	Percentage of foreign input in final goods production that crosses a border only once. The values are calculated using the equation: WBES.foreign_inp * UIBE.FVA_once / 100
foreign_inp_twice_or_more	Percentage of foreign input in final goods production that crosses a border twice or more. The values are calculated using the equation: WBES.foreign_inp * (UIBE.DVA_return + UIBE.FVA_twice_or_more) / 100