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The effect of foreign inputs and imported inputs on exporting: evidence from the World Bank Enterprise Survey

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Abstract

This paper aims to investigate the effect of the use of foreign inputs as well as importing inputs on the export share of a firm. Foreign inputs show what percentage of a firms' materials and supplies used for production were of foreign origin in the last fiscal year. Importing inputs is proxied by a dummy variable that equals one when a firm has directly imported any of its used materials and supplies used for production. It is important to note here that using foreign inputs does not necessarily mean those were directly imported. For example, an input can be foreign but supplied by a domestic supplier. Firm-level panel data over the period 2008-2020 was obtained from the World Bank Enterprise Survey, a survey that covers many firm-level topics such as performance, workforce and trade. Furthermore, a Total Factor Productivity variable was constructed in order to see what part of the effect goes through productivity, as existing theory predicts. A significant positive effect of importing inputs on the share of exports was found, while the effect of the share of foreign inputs used remains debatable.

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1: Introduction

Over the recent years, firm-level data has become increasingly publicly available, extending the amount of research possibilities on this type of data aggregation. This means that more economical theories about trade, productivity or wages can be empirically tested with data that was not available before.

One of the most relevant papers regarding trade and productivity is the paper written by Melitz (2003). Melitz argued that firms differ in their productivity, thus being heterogeneous. This eventually led to the theory that potential exporters are the ones that are the most productive, as these firms are the ones that have the ability to recover fixed export costs.

An important variable possibly affecting productivity is the import of input materials. Amiti and Konings (2007) empirically found that a decrease in input tariffs significantly increases productivity in Indonesia, especially for the firms that import those inputs. By diving deeper into this finding, Halpern et al. (2015) found that about half of this effect has to do with imperfect substitution between foreign and domestic inputs using Hungarian firm-level data.

Whereas there are many papers written on the relationship between importing inputs and productivity on one side (Amiti and Konings, 2007; Halpern et al., 2015) and the relation between productivity and exporting on the other (Grossman and Helpman, 1991; Melitz, 2003), there remains a gap in the literature, especially for cross-country comparison, in empirically investigating the combination of the two: the (causal) relationship between importing inputs and exporting. This thesis aims to fill that gap, leading to the following research question:

Does importing inputs and using foreign inputs significantly affect the propensity to export for firms?

Panel data from a total of 36 countries located in Eastern Europe, North Africa and Central Asia over the period 2008-2020 has been obtained from the World Bank Enterprise Survey in order to examine the relationship between importing/using foreign inputs and export share on the firm-level. The difference between importing inputs and using foreign inputs is that foreign inputs are from foreign origin, but can possibly be obtained domestically, whereas importing inputs indicates whether a firm has directly imported inputs from abroad. In order to perform such an analysis, a panel data fixed effects regression will be done, using firm-level

fixed effects and country-year interaction fixed effects. The explanation on the use of this model can be found in the methodology section. Furthermore, a Total Factor Productivity variable was constructed with data from the World Bank Enterprise Survey. This variable was used to see whether there is a major change in the effect of the variables of interest once the variable is included.

Results show that importing inputs significantly increases exports. This finding is in line with what the theory predicts. The results indicate that the share of foreign inputs used has no significant effect on exports. However, a significant positive effect was found for the interaction variable of the two variables, indicating that the share of foreign inputs has some effect on exports.

The structure of this thesis is as follows: Chapter 2 will give a broad theoretical background with several theories on the relationship between importing, productivity and exporting. Chapter 3 presents information on the data source used, as well as variable explanation and hypothesis development. Chapter 4 will include the methodology. Chapter 5 will present the results and their implications, as well as robustness checks. Chapter 6 will include a discussion of these results and conclude.

2: Theoretical Background

The theoretical basis for this thesis lies in the work of Paul Krugman (1980). Before Krugman, most theories regarding trade were mainly focused on comparative advantages between countries, leading to inter-industry trade. However, as the second half of the 20th century passed by, countries with no comparative advantage over one another traded more and more with each other. As the theory on comparative advantages between countries could not explain this trade pattern, the 'New Trade Theory' was formed by Krugman. Krugman's theory had two key assumptions. The first key assumption is that consumers have love-of-variety preferences. In other words, they get more utility from consuming different varieties of the same good. The other key assumption is that producers enjoy increasing returns to scale. This induces producers to concentrate their production.

The main theory that supports the assumptions of this paper is that of Melitz (2003). Melitz extends the Krugman model by allowing firms to be heterogeneous in productivity parameters, something that Krugman (1980) had not done before. By introducing export market entry costs, Melitz finds that only the most productive firms in a country can start exporting. This is because it is only those firms that can overcome those export costs because of their higher productivity. This hypothesis on the productivity of firms with respect to exporting is also called the self-selection hypothesis.

However, the self-selection hypothesis is not the only theory on why exporters are usually more productive than non-exporters. Many different papers argue that causality may run from exporting to productivity, which is contrary to Melitz' theory of self-selection. Grossman and Helpman (1991) argue that by having trade partners from abroad, firms can learn from the knowledge of their trading partners, improving productivity. Among many examples, Evenson and Westphal (1995) argue that a part of the contribution to efficiency increases for firms comes from offering technical assistance by their trading partners abroad. Since these are advantages that only exporters enjoy, this could also be an explanation as to why exporters are more productive than non-exporters. The hypothesis on causality running from exporting to productivity is called the learning-by-exporting hypothesis.

As relative distances continue to decline due to transport technology improvements, imported inputs start to become more and more commonly used in the manufacturing process. One of the main reasons behind this is the increase in vertical specialization (Hummels et al., 2001). Vertical specialization occurs when firms import intermediate materials (inputs), to produce a final good which it sells domestically and potentially also abroad. This increase in vertical specialization goes partly hand-in-hand with the increase of productivity through imported inputs. Hummels et al. argue that vertical specialization allows for a finer division of labor, leading to specialization and thus a more effective workforce. This is the same argument used by Ethier (1982), who also argues that productivity increases through an increased amount of available input varieties. The increased productivity here is induced by imperfect substitution between domestic and foreign varieties. Thus, foreign varieties can be better complements than domestic inputs, allowing for a smoother production process. This love-of-variety setting, modeled by Krugman (1979), is very similar to the one used for the New Trade Theory, as explained above.

Another channel through which importing inputs affects productivity is spillover effects. Coe and Helpman (1995) argue that foreign technological advances embedded in the input product allow firms to increase their own technology and efficiency by learning about those innovations and techniques used. However, it is not just embedded technology that can lead to increased productivity through spillover effects. Verspagen (1997) names a variety of other channels which he categorizes as 'pure knowledge spillovers'. One of these channels is for example conferences, which could be held between trade partners and could lead to positive externalities regarding productivity. This relates closely to the argument made on the learning-by-exporting hypothesis by Grossman and Helpman (1991).

A third channel through which firms produce more cheaply is through more beneficial prices. Bas and Strauss-Kahn (2014) use the love-of-variety model to predict that an increase in variety gains is also reflected in a lower price index. This allows firms to use cheaper inputs than non-importing firms, allowing for a more efficient production process.

However, there are also theories regarding importing inputs and their relationship with exporting that do not go through an increase in productivity. For example, high-quality inputs that are imported compared to domestic inputs, can lead to better final product quality (Pane and Patunru, 2022). A higher product quality can help a firm to establish itself as a high-quality brand. This could ultimately increase product demand and thus profitability. According to the Melitz model, firms thus can overcome their export costs through higher profits and can start exporting, even when productivity is kept constant.

Goldberg et al. (2009) link the import of foreign inputs to innovation. The authors argue that foreign inputs decrease the cost of innovation, allowing firms to extend their product scope through innovation. The increased product scope could lead firms to unexplored markets, where entry barriers might be lower than the markets of their other products. The increased product scope could thus induce domestic producers to start exporting, even if productivity remains the same.

3: Data and Hypothesis Development

3.1: Data

The main data source used for this thesis will be the World Bank Enterprise Survey[1]. The survey, conducted by the World Bank, covers many firm-level topics such as performance, workforce and trade. The first conducted firm-level survey done by the World Bank dates from the year 2002. In total, the World Bank Enterprise Survey has collected data from over 125.000 firms, in a total of 139 countries. Most datasets from the World Bank Enterprise Survey are data from firms in a certain country for a certain year. For empirical purposes, I will use the panel data sets of the World Bank Enterprise Survey provided by the World Bank. This survey used stratified random sampling. The panel data consists of firm-level data gathered by the World Bank and comprises of countries in Eastern Europe, Central Asia and North Africa. A total of 36 countries are included in the panel dataset. The surveys were conducted between the years 2008 and 2020. Between this period, there were different waves wherein firms in countries were surveyed. Some firms were surveyed only during one wave, some have data on two waves and some firms were surveyed during all three waves. All firm-level variables used in this thesis are gathered from the results of this survey.

To further enhance the analysis and split the effect into multiple channels, data from the World Bank Enterprise Survey was used in order to construct a proxy for productivity. By doing so, the aim is to see the exact effect of importing inputs and using foreign inputs on exporting that goes through productivity, and to see what part of the effect does not go through productivity. In order to construct this proxy for productivity, I use Francis et al. (2020) as a guideline. Data on exchange rates and GDP deflators necessary for the construction of the proxy were gathered from the World Development Indicator database by the World Bank[2]. The data was not entirely complete, as the following countries switched currencies during the period of interest: *Estonia, Latvia, Lithuania, Slovakia, and Slovenia*. Furthermore, some currency exchange rate data is missing for: *West Bank & Gaza and Uzbekistan*.

[1] Source: https://www.enterprisesurveys.org/en/enterprisesurveys

[2] Source: https://databank.worldbank.org/source/world-development-indicators

To construct Total Factor Productivity, from now on referred to as TFP, I use the total annual sales (d2), the replacement value of machinery, vehicles, and equipment (n7a) as a proxy for capital, cost of annual labor (n2a) as a proxy for labor and total annual cost of inputs (n2e) as a proxy for material. The codes between brackets indicate the variable names as used in the World Bank Enterprise Survey. I construct value added by subtracting the annual cost of inputs from the total annual sales.

I use a simple Cobb-Douglas specification of the production function, where I use value added rather than output as the dependent variable. This leads to the following specification:

$$va_{ijt} = \beta_0 + \beta_l l_{ijt} + \beta_k k_{ijt} + \varepsilon_{ijt} + \omega_{ijt}$$

Where l_{ijt} is the logarithmic value of labor and k_{ijt} is the logarithmic value of capital. The error term is split into two parts. The first part, ε_{ijt}, is correlated with the firms' input choices, whereas ω_{ijt} is uncorrelated to the firms' input choices. The specification is based on Petrin et al. (2004). Therefore, I use the Levinson-Petrin method in order to estimate TFP per firm. The descriptive statistics of the variables used for TFP in the final dataset are displayed in table 1A. The values of the variables are displayed in U.S. dollars and deflated to the year 2009, following Francis et al. (2020). The outcome of the Levinson-Petrin estimation regression can be found in table 1B. Furthermore, table 1B shows that importing inputs significantly positively impacts TFP, as theories by Bas and Strauss-Kahn (2014) and Verspagen (1997) predict. Table 1C shows the descriptive statistics for all the remaining main variables used in the analysis. These variables will be explained in the upcoming section.

Table 1A: Descriptive Statistics TFP Estimation

Variable	Obs	Mean	Std. Dev.	Min	Max
(*log)* Sales	7714	13.923	1.925	7.309	18.418
(*log)* Materials	7714	12.650	2.255	.454	18.307
(*log)* Labor	7714	11.896	1.835	.454	18.297
(*log)* Capital	7714	12.880	2.273	-5.709	18.418
(*log)* VA	7714	13.303	1.943	4.654	18.41
(*log)* TFP	7714	4.051	1.127	-5.452	15.232

Table 1B: TFP Estimation

VARIABLES	(1) (log) Value Added	(2) (log) Value Added
(log) Labor	0.625***	0.568***
	(0.010)	(0.013)
(log) Capital	0.141	0.315*
	(0.114)	(0.170)
Directly Imported Input		0.191***
		(0.028)
% Used Inputs Foreign		-0.001***
		(0.000)
Observations	14,478	7,714

Notes: Column one shows an LP regression in order to estimate the log of Total Factor Productivity for each firm. Column 2 estimates the effect of the imported input and foreign input variables on the log of TFP for firms. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * p < 0.10, ** p < 0.05, *** p < 0.0

Table 1C: Descriptive Statistics Main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
% of Sales Domestic	7714	77.67	33.19	0	100
% of Sales Indirect Exports	7714	4.973	16.015	0	100
% of Sales Direct Exports	7714	17.356	30.252	0	100
% Used Inputs Domestic	7714	47.275	31.565	0	99
% Used Inputs Foreign	7714	52.718	31.56	1	100
Directly Imported Input	7714	.524	.499	0	1
% Private Domestic Ownership	7714	88.765	28.795	0	100
% Private Foreign Ownership	7714	8.877	26.12	0	100
% Governmental Ownership	7714	.99	8.405	0	99
% Other Ownership	7714	1.368	10.16	0	100
Firm Age	7714	20.315	16.853	0	211
Innovation	7714	.398	.489	0	1
Employees	7714	123.692	283.899	1	5500
% High Skill Employees	7714	41.631	27.784	0	100

3.2: Variable Explanation and Hypothesis Development

As mentioned above, this thesis aims to test whether using foreign inputs and importing inputs has a significant effect on the propensity to export. This section will briefly explain the meaning of the variables used in the (first part of) the analysis, shown in table 1C above, and will also briefly explain the possible effects on the propensity to export.

% used inputs foreign: This variable shows what percentage of a firms' materials and supplies used for production were of foreign origin in the last fiscal year. Hence, this variable can take on a value ranging anywhere from 0 to 100%. The higher the percentage, the more foreign inputs were used relative to domestic inputs. If we relate this to the theoretical background discussed in the previous section, a significant positive effect on the share of direct exports relative to total sales is expected. Theory argues exports increase by using foreign inputs as this indicates access to more varieties (Ethier, 1982), can embed foreign technology (Coe and Helpman, 1995) and allows better product quality (Pane and Patunru, 2022).

Directly imported input: This dummy variable equals one when a firm has directly imported any of its used materials and supplies used for production. It is important to note here that using foreign inputs does not necessarily mean those were directly imported. For example, an input can be foreign but supplied by a domestic supplier. Using theory, we also expect a significant positive effect of directly importing inputs on the exporting share. The main channel through which directly importing inputs would influence exporting besides the abovementioned effects is the pure knowledge spillover effects, thus by learning from the trade partner (Verspagen,1997).

Innovation: Innovation is a dummy variable that equals one when a firm has introduced new products or services over the last three years. The link of innovation with respect to importing inputs goes through the cost channel, as access to foreign inputs can decrease costs which could allow firms to extend their product scope, as discussed by Goldberg et al. (2009). Among many theories regarding innovation and exporting, Hirsch and Bijaoui (1985) argue that innovative firms are price makers and must create their demand, whereas for non-innovative firms demand is given. This allows firms to create heterogeneous prices for different groups of customers, thus allowing them to set optimal prices in foreign markets. This, according to the authors, is one of the reasons why innovative firms usually export more than non-

innovative firms. Hence, a positive significant effect of innovation on the share of exports is expected in the analysis.

% Foreign ownership: The share of foreign ownership indicates how much of a firm is owned by foreign private individuals or other companies. Foreign-owned companies, also referred to as multinationals, are likely to have bigger market networks in foreign countries than domestically owned firms, and are likely to exploit that bigger network (Ramstetter, 1999). This means that foreign-owned firms tend to trade more abroad, which holds for both importing and exporting. This means that a positive significant effect of foreign ownership on exports is expected.

Firm Age: The variable firm age is the age of the firm since the establishment began its operations, measured in years. The effect of firm age is also theoretically argued to be roughly the same for both imports and exports. The theoretical argument goes that it takes years for firms to gain experience in the domestic market first, whereafter it has gained enough experience to lower fixed costs to start exporting. This, again, gains a firm new experience, further lowering fixed costs and allowing entries to markets firms have not entered yet (Sheard, 2014). This market network also allows firms to import inputs more easily, similar to the argument made by Ramstetter (1999) as mentioned above. Empirically, not much research has been done on the relationship between firm age and importing. However, Wagner (2015) did find that the higher the firms' age, the more likely the firm is to import (different) goods and to import from different countries. To conclude, a positive significant effect between firm age and exports is expected in my analysis.

(% High-skill) employees: The share of high-skill employees is the amount of high-skill employees over the total amount of employees in the firm. The direction of causality between skilled employees and importing/exporting remains partially unclear. However, most papers found that trade liberalization led to an increase in demand for skilled workers, such as Goldberg and Pavcnik (2007) & Harrison and Hansen (1999). Furthermore, Kasahara et al. (2016) develop a model where adopting skill-biased technology affects the import decision, and this is related to the mix of skilled and unskilled workers within firms. From the theory, expectations of a positive significant effect of the share of high-skilled employees on exports can be formed. The number of employees is also expected to have a positive significant effect by a wide variety of theoretical literature (Bonaccorsi, 1992).

4: Methodology

In this panel dataset, a panel fixed effects regression will be performed with the share of direct exports of firm i in country j at time t relative to its total sales as the main dependent variable. I will make use of two main variables of interest. The first variable of interest is the percentage of foreign inputs (*ForInp* in the baseline specification) used by firm i in country j in year t. Thus, this number varies between 0 and 100. Using foreign inputs could increase productivity specifically through embedded technology. The second variable of interest is a dummy indicating whether the firm has directly imported any materials used in the last fiscal year (*Imp* in the baseline specification). This could increase productivity through knowledge spillover effects. The other effects mentioned in the theoretical background could go through either of these variables of interest. The baseline regression looks as follows:

$$Exp_{ijt} = \alpha_0 + \alpha_1 ForInp_{ijt} + \alpha_2 Imp_{ijt} + \beta X_{it} + \gamma_i + \delta_{jt} + +\varepsilon_{it}$$

Firm (γ_i) fixed effects are used in this regression. Firm-specific fixed effects are used to control for any unobservable time-invariant characteristics within firms. Having attempted to eliminate any threat of bias coming from unobservables, a regression would still be likely to face threat from time-varying observables. δ_{jt} is a country-year fixed effect, which captures any time-varying economic variable that holds for every part of a certain country. Most importantly, for the analysis that will be conducted regarding importing and exporting, this fixed effect captures variables such as terms of trade and trade openness. In other words, this captures any time-varying variable on the country level that can play a role in importing inputs and the propensity to export. Using this fixed effect, the possible bias coming from the country level is eliminated. The use of the country-year fixed effect follows a methodology similar to Storeygard (2016). This leaves the potential omitted variable bias only possible for time-varying firm-level variables. Thus, a subset of control variables have been added to this regression to account for any bias included there. The firm-specific variables include characteristics on the firm level such as the number of employees, firm age, foreign ownership, skilled production worker share and innovation. By adding these observable control variables most, if not all, omitted variable bias will be eliminated and the regression estimate will be likely close to its true value.

One other possible endogeneity issue is reverse causality. Existing empirical literature investigating the relationship between importing inputs and exports, such as Feng et al. (2016), fail to include any tests for reverse causality. It could be that firms start importing inputs after they started exporting. Logical reasoning for this comes close to the theory of Verspagen (1997), which argues that knowledge spillovers exist through having a trade partner. It could thus be that when a firm starts exporting, it learns about useful inputs and starts importing them. In the empirical literature, Aristei et al. (2013) is the only paper that empirically investigates whether importing causes exporting or whether there is a two-way relationship between importing and exporting. Using year-, sector- and country-specific fixed effects, the authors find that exporting does not significantly have a positive impact on the probability of importing, whereas importing does have a significant positive effect on the probability of exporting. In the robustness section, reverse causality in this dataset will be tested to see whether the effect found in the results suffered from endogeneity bias through reverse causality.

The use of fixed effects regression when investigating the relationship between importing inputs and exports is common and widely used in the existing empirical literature. Feng et al. (2016) tested the effect of using imported inputs on exports for Chinese firms using panel data and year- and firm-fixed effects. Bas and Strauss-Kahn (2014) used firm-level panel data from France to test whether the number of imported inputs positively affects the number of exported varieties. Like Feng et al., Bas and Strauss-Kahn used a fixed effects model with year- and firm-fixed effects. Pane and Patunru (2022) used Indonesian firm-level data to test whether the amount of import varieties increase export value using firm, year and industry fixed effects.

Hence, it has become pretty clear that the fixed effects regression is commonly used in the related empirical literature. The empirical analysis used for this paper is unique in the sense that it is the first to investigate the relationship between importing inputs/using foreign inputs and exports with a cross-country dataset.

5: Results and Robustness

5.1: Results

Table 2A column 1 shows a simple OLS regression with clustered standard errors of the share of direct exports on the share of foreign inputs used. This simple OLS regression is performed to see if there is a (biased) relationship between the use of foreign inputs and the share of direct exports. Column 1 reports a significant 'relationship'. Column 2 adds the firm-level control variables. However, this regression still does not include any of the fixed effects. As seen, the magnitude of the share of foreign inputs dropped by about 27% with the inclusion of the control variables. This indicates that the bias included in column 1 led to an overestimation of the magnitude. This is furthermore confirmed in column 3, where firm-level fixed effects are included, as the magnitude of the use of foreign inputs decreases marginally further. Finally, column 4 includes country-year fixed effect, thus controlling for trends on the country level. Including these fixed effects leave the variable of interest significant, but it takes away roughly half of the magnitude in column 1.

Furthermore, we see that innovation, firm age and the share of high-skill employees have no significant effect on the share of exports with the inclusion of the fixed effects. However, the share of foreign ownership and the number of employees both seem to have a significant positive effect on the share of direct exports.

Table 2B performs the same steps, but uses the imported input dummy as variable of interest. As with the share of foreign inputs, the base regression in column 1 shows a positive significant relationship between importing inputs and the share of direct exports. When including the control variables in column 2, the magnitude of importing inputs also decreases, albeit less than in table 2A. Including firm-level fixed effects does not alter the magnitude of any of the variables much. However, consistent with table 2A, including the country-year fixed effects in column 4 takes away another part of the magnitude of the effect. It is however very interesting to note, that importing inputs leads to an increase of export share of about 10.73 percentage points. Given that the maximum share of direct exports can be 100%, this coefficient can be interpreted as a large effect on the share of exports.

Table 2A: Share of exports regressed on share of foreign inputs used

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports	(3) % of Sales Direct Exports	(4) % of Sales Direct Exports
% Used Inputs Foreign	0.095***	0.069***	0.064***	0.047***
	(0.012)	(0.011)	(0.011)	(0.011)
Innovation		2.341***	2.165***	0.232
		(0.665)	(0.639)	(0.697)
% Foreign Ownership		0.334***	0.324***	0.272***
		(0.018)	(0.018)	(0.017)
Firm Age		0.052***	0.053***	-0.002
		(0.020)	(0.019)	(0.019)
% High Skill Employees		-0.021*	-0.022*	0.020
		(0.012)	(0.012)	(0.013)
Employees		0.020***	0.019***	0.021***
		(0.002)	(0.002)	(0.002)
Constant	12.353***	7.186***	7.654***	39.238***
	(0.630)	(0.931)	(0.908)	(6.793)
Observations	7,714	7,714	7,714	7,714
Firm-level FE	No	No	Yes	Yes
Country-Year FE	No	No	No	Yes

Notes: Column one shows a direct regression with the share of direct exports as dependent variable and the share of inputs used that were foreign as independent variable. Column two shows the same regression performed, but including relevant control variables. Column three includes firm-level fixed effects. Column four adds the country-year fixed effects, completing the fixed effects regression. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As in table 2A, innovation does not have a significant effect on the share of exports, albeit in all 3 columns this time. Firm age still has no significant effect in column 4 of table 2B. What is interesting to note is that the share of high-skill employees suddenly becomes significant with the inclusion of country-year fixed effects in column 4, whereas this variable was insignificant in table 2A. The other two variables, share of foreign ownership and employees, remain significant as in table 2A, with their magnitudes not being drastically different compared to the previous table.

Table 2B: Share of exports regressed on imported input dummy

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports	(3) % of Sales Direct Exports	(4) % of Sales Direct Exports
Directly Imported Input	18.460***	14.271***	13.842***	10.728***
	(0.654)	(0.651)	(0.649)	(0.661)
Innovation		0.869	0.846	-0.790
		(0.654)	(0.632)	(0.694)
% Foreign Ownership		0.303***	0.294***	0.254***
		(0.018)	(0.018)	(0.016)
Firm Age		0.030	0.035*	-0.007
		(0.019)	(0.019)	(0.019)
% High Skill Employees		0.002	-0.001	0.030**
		(0.012)	(0.012)	(0.013)
Employees		0.016***	0.016***	0.018***
		(0.002)	(0.002)	(0.002)
Constant	7.691***	4.144***	4.477***	35.043***
	(0.349)	(0.778)	(0.762)	(6.712)
Observations	7,714	7,714	7,714	7,714
Firm-level FE	No	No	Yes	Yes
Country-Year FE	No	No	No	Yes

Notes: Column one shows a direct regression with the share of direct exports as dependent variable and the directly imported inputs dummy as independent variable. Column two shows the same regression performed, but including relevant control variables. Column three includes firm-level fixed effects. Column four adds the country-year fixed effects, completing the fixed effects regression. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3 adds the interaction effect between the two variables of interest, share of foreign inputs and import input dummy, as well as including the 2 variables of interest in the same regression. Initially, as table 3 column 1 shows, both variables as well as the interaction variable are positive and significant. Interesting to see, however, is that the magnitude of the share of foreign inputs is relatively low. According to column 1, a 10 percentage point increase in the share of foreign inputs gives an increase of only 0.37 percentage point in the share of exports. It is thus not surprising that this variable loses its significance when the other control variables and fixed effects are added to the regression. As for the inputs imported dummy, the variable remains highly significant over all four columns.

Table 3: Share of exports simultaneously regressed on both independent variables and their interaction

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports	(3) % of Sales Direct Exports	(4) % of Sales Direct Exports
Directly Imported Input	15.336***	12.372***	12.500***	8.127***
	(1.221)	(1.190)	(1.191)	(1.190)
% Used Inputs Foreign	0.037***	0.033***	0.034***	0.013
	(0.013)	(0.012)	(0.012)	(0.012)
Interaction	0.051**	0.030	0.021	0.047**
	(0.022)	(0.021)	(0.021)	(0.020)
Innovation		0.767	0.739	-0.806
		(0.654)	(0.632)	(0.693)
% Foreign Ownership		0.298***	0.290***	0.249***
		(0.017)	(0.018)	(0.016)
Firm Age		0.034*	0.039**	-0.003
		(0.019)	(0.019)	(0.019)
% High Skill Employees		-0.000	-0.003	0.030**
		(0.012)	(0.012)	(0.013)
Employees		0.016***	0.016***	0.018***
		(0.002)	(0.002)	(0.002)
Constant	5.847***	2.604***	2.911***	32.814***
	(0.639)	(0.908)	(0.900)	(6.674)
Observations	7,714	7,714	7,714	7,714
Firm-level FE	No	No	Yes	Yes
Country-Year FE	No	No	No	Yes

Notes: Column one shows a direct regression with the share of direct exports as dependent variable and both the directly imported inputs dummy and the share of inputs used that were foreign as independent variables. Furthermore, it adds the interaction effect between the two independent variables. Column two shows the same regression performed, but including relevant control variables. Column three includes firm-level fixed effects. Column four adds the country-year fixed effects, completing the fixed effects regression. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

It loses a chunk of its magnitude, but an increase of approximately 8.1 percentage points when importing inputs is still relatively large. As for the interaction effect, we see that importing inputs and using 10% foreign inputs leads only to a modest increase of export share of 0.47 percentage point.

Table 4: Including TFP in the regression

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports	(3) % of Sales Direct Exports	(4) % of Sales Direct Exports
Directly Imported Input	14.395***	12.009***	12.168***	7.960***
	(1.223)	(1.193)	(1.194)	(1.193)
% Used Inputs Foreign	0.046***	0.037***	0.037***	0.014
	(0.013)	(0.012)	(0.012)	(0.012)
Interaction	0.047**	0.029	0.019	0.046**
	(0.022)	(0.021)	(0.021)	(0.020)
Innovation		0.787	0.761	-0.806
		(0.653)	(0.631)	(0.693)
% Foreign Ownership		0.293***	0.285***	0.247***
		(0.018)	(0.018)	(0.017)
Firm Age		0.035*	0.039**	-0.003
		(0.019)	(0.019)	(0.019)
% High Skill Employees		0.001	-0.002	0.032**
		(0.012)	(0.012)	(0.013)
Employees		0.015***	0.016***	0.018***
		(0.002)	(0.002)	(0.002)
(log) TFP	2.710***	1.321***	1.209***	0.659**
	(0.306)	(0.301)	(0.302)	(0.316)
Constant	-4.970***	-2.643*	-1.888	29.860***
	(1.332)	(1.425)	(1.432)	(6.836)
Observations	7,714	7,714	7,714	7,714
Firm-level FE	No	No	Yes	Yes
Country-Year FE	No	No	No	Yes

Notes: Column one shows a direct regression with the share of direct exports as dependent variable and both the directly imported inputs dummy and the share of inputs used that were foreign as independent variables. Furthermore, it adds the interaction effect between the two independent variables and the log of Total Factor Productivity (TFP). Column two shows the same regression performed, but including relevant control variables. Column three includes firm-level fixed effects. Column four adds the country-year fixed effects, completing the fixed effects regression. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For the second part of the analysis, we want to see what effect remains from the two variables of interest and their interaction variable when we include productivity, measured as TFP, in the regression. Table 4 shows the inclusion of the log of TFP for the firms in the regression. Compared to table 3, we see TFP taking away magnitude from the Directly Imported Input

dummy. When looking at column 4, we see that the magnitude of the Directly Imported Input dummy drops by about 2% when including TFP, which can be considered marginal. The magnitude share of foreign inputs used increases slightly, but remains insignificant for all significance levels.

As for the log of TFP itself, we see that column 4 has a significant positive coefficient of 0.659, indicating that when a company doubles its Total Factor Productivity, it will experience an increase in the share of direct exports over total sales of about 0.66 percentage points. While this variable is positive and significant, its true impact on exports remains somewhat unclear, as a direct export share increase of about 0.66 percentage points when a firm doubles its TFP does not seem to be that large given the likelihood of a 100% increase in productivity for a firm. One could argue that there definitely seems to be a positive effect of productivity on the propensity to export, however, when a firm experiences a positive productivity shock. The shock could increase productivity in a way that it, relative to its initial state, more than quadruples a firms' productivity. This could push a firm to become an exporter, increasing the share of direct exports relative to the total sales. Such a productivity shock is more likely to happen for firms that have just started, as these are the firms with more relative growth possibilities compared to firms that have existed for a while. It is likely that the older, larger and more experienced firms already had such a productivity shock, such that the marginal value of a further increase in productivity for the export share is way lower than a firm that has only been established for a few years. Thus, the effect of a possible productivity shock is expected to be higher for small firms, relative to the medium- and large-sized firms.

It is therefore very interesting to see what the effects of possible productivity shocks are on firms that have different sizes. Given the possible explanation for the effect of the log of TFP found in table 4, it is expected that different firm sizes experience the effect of importing inputs, foreign inputs and TFP differently. Therefore, the sample has been split into three groups. Small firms are the firms that employ less than 20 people. Medium-sized firms employ between 20 and 100 workers. Large firms are the firms that have more than 100 employees. Table 5 shows the results of the regressions performed with the samples of the different firm sizes.

Table 5: The effects on export share for different firm sizes

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports	(3) % of Sales Direct Exports
Directly Imported Input	6.625***	11.175***	4.956*
	(1.880)	(1.957)	(2.598)
% Used Inputs Foreign	0.001	0.032	0.048
	(0.012)	(0.021)	(0.042)
Interaction	0.019	-0.053	0.127**
	(0.029)	(0.034)	(0.050)
Innovation	0.648	-2.110*	-0.896
	(0.876)	(1.144)	(1.484)
% Foreign Ownership	0.209***	0.197***	0.205***
	(0.049)	(0.028)	(0.024)
Firm Age	0.006	-0.057*	-0.029
	(0.029)	(0.034)	(0.031)
% High Skill Employees	-0.005	0.055**	0.054*
	(0.015)	(0.023)	(0.029)
(log) TFP	0.858*	-0.010	-0.981
	(0.458)	(0.505)	(0.638)
Constant	-7.215*	18.428	70.152***
	(3.994)	(11.425)	(11.057)
Observations	2,465	2,960	2,289
Firm-level FE	Yes	Yes	Yes
Country-Year FE	Yes	Yes	Yes
Size	Small	Medium	Large

Notes: All three columns represent a fixed effects regression with both firm- and country-year fixed effects. The columns have split samples for different firm sizes. Column 1 includes only small firms, column 2 includes only medium-sized firms and column 3 only includes large firms. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Column 1 in table 5 shows the same regression as table 4 column 4, but had now split the sample so that it only includes small firms. Column 1 shows that a positive significant effect of the log of TFP is found for small firms. This finding is somewhat in accordance with the theory discussed above, as we find a larger effect of TFP shocks for small firms relative to medium and large firms. However, a positive TFP shock does not seem to have a significant effect on the share of exports for medium and large firms as columns 2 and 3 show.

Given the results of all 5 tables, we can conclude that importing inputs significantly increases the propensity to export of a firm. Tables 1 to 4 tell us that importing inputs significantly increases the share of direct exports by about a value between 7.9 and 10.7 percentage points for all firm sizes. Given that a firm can be considered an exporter if it exports 10% or more of its total sales, importing inputs can push a firm entirely into becoming an exporter, indicating that its effect on exporting is quite relevant.

The effect of the share of foreign inputs used on the share of direct exports, however, seems to be insignificant. All coefficients with all fixed effects used, apart from the coefficient in table 2A, have returned an insignificant coefficient for the share of foreign inputs used. This result initially contradicts the theory by Ethier (1982) that exports increase by using foreign inputs as this indicates access to more varieties, as well as the theory that foreign inputs can embed foreign technology (Coe and Helpman, 1995) and that foreign inputs allow better product quality (Pane and Patunru, 2022). In the discussion, a more in-depth analysis on the insignificance of this variable will be given.

Tables 3 and 4 include the interaction effect of the two variables of interest for all firm sizes. With the inclusion of all fixed effects, a similar effect is found in both tables. If a firm uses inputs that are 50% foreign, it will increase the direct export share significantly by about 2.5 percentage points if (any of) these foreign inputs are also imported. Although this is not a major difference maker, it is still significant and can increase a firms' export share.

As for the relevant control variables, all were expected to have a positive significant effect on the share of direct exports. However, table 4 column 4 found no significant effect for innovation and firm age. A 10 percentage point increase in the share of foreign ownership significantly increases the share of direct exports by 2.47 percentage point. A firm with more employees exports significantly more. The impact of the share of high-skill employees remains a bit unclear, as the coefficient in table 4 column 4 is not significant for the 1% level.

When comparing to existing empirical literature focused on the relationship between foreign inputs and imported inputs, the results in this paper mostly match the results found in other empirical papers. Bas and Strauss-Kahn (2014) found that an increase in imported inputs led to an increase in export varieties, which can be considered a similar result to what this paper found about imported inputs and the share of direct exports. Similarly, Feng et al. (2016) found

that the value of imported inputs, as well as the amount of varieties of imported inputs and the number of countries imported from, all significantly increase the value of exports for firms. Furthermore, Pane and Patunru (2022) also found that importing inputs, both value-wise and variety-wise, significantly increase exports. Lastly, Aristei et al. (2013) found that the lagged value of the import dummy, the same dummy variable as this paper uses, also significantly affects exports positively. The papers by Pane and Patunru (2022) and Bass and Strauss-Kahn (2014) both included the effect of their respective import variables on TFP. In accordance to what this paper found in table 1B column 2, both papers found a significant positive effect of their import variable on productivity.

To conclude, all papers previously written on the relationship between imported inputs and exports found the same positive effect that this paper found. Furthermore, Pane and Patunru (2022) and Bass and Strauss-Kahn (2014) found similar effect of their respective import variables on productivity. The effect of the share of foreign inputs used is not named as such in any of the previously mentioned papers. All papers have focused on imported inputs and varieties, so an accurate comparison can not be made for this variable.

5.2: Robustness

The results found in section 5.1 indicate that there is a significant positive relationship between importing inputs and the propensity to export. However, there always remains a possibility that these results are biased, thus not indicating the right relationship or causality between two variables. Hence, this section will conduct tests to test whether the results found in section 5.1 are robust.

The first robustness test is to see whether there is reverse causality. Whereas importing inputs might be endogenous to the share of exports in the same period, it is unlikely that importing inputs in the previous wave is caused by exports today. In order to investigate whether reverse causality exists, lagged variables were constructed in the dataset. This means that the lagged value indicates the value of the variable in the previous wave, three years before the current wave. As theory argues, it is expected that importing inputs affects exporting status (partly) through productivity. As there are multiple factors that delay the instant effect of importing on exporting, such as the slow process of a productivity increase, innovation processes that come from importing inputs and the decision to export, as well as finding suitable trade partners, make it likely that it takes time to go from importing inputs to exporting.

Table 6 shows the effect of respectively the lagged value of importing inputs and the share of foreign inputs used. Consistent with the findings in the results section, we find that the lagged value of importing inputs has a significant effect on the share of direct exports in the next wave, whereas no significant effect was found for the share of foreign inputs used. Furthermore, the other control variables also show similar effects to the ones found in the results. So, even though observations have declined massively, this smaller dataset seems somewhat similar to the one used in the results section, given the similarity of the results. Removing possible endogeneity issues coming from reverse causality, approximately the same results were found, indicating it is unlikely that the regressions in tables 1-5 suffer from this issue.

However, in order to be more sure of this assumption, the lagged effect of the share of direct exports on the two main variables of interest also needs to be investigated. This is shown in table 7.

Table 6: The effect of lagged import and foreign input status on direct export share

VARIABLES	(1) % of Sales Direct Exports	(2) % of Sales Direct Exports
Directly Imported Input $_{w-1}$	6.456*	
	(3.335)	
Innovation $_{w-1}$	-1.841	-0.729
	(3.456)	(3.509)
% Foreign Ownership $_{w-1}$	0.131*	0.129*
	(0.069)	(0.070)
Firm Age $_{w-1}$	-0.123	-0.106
	(0.118)	(0.117)
% High Skill Employees $_{w-1}$	-0.035	-0.025
	(0.070)	(0.071)
Employees $_{w-1}$	0.023***	0.024***
	(0.008)	(0.008)
% Used Inputs Foreign $_{w-1}$		0.057
		(0.055)
Constant	4.741	-2.632
	(7.097)	(8.616)
Observations	387	387
Firm-level FE	Yes	Yes
Country-Year FE	Yes	Yes

Notes: Column one shows a direct fixed-effects regression with the share of direct exports as dependent variable and the lagged value of the directly imported inputs dummy as independent variable. Column two shows the same regression performed, but with the lagged value of the share of foreign inputs used as main independent variable. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As table 7 shows, the lagged value of the share of direct exports has no significant effect on either directly importing inputs or the share of foreign inputs used in the current wave. This is another indication that the results found above are not suffering from any reverse causality bias. This further reinforces the assumption that importing inputs has an effect on the propensity to export, rather than just a correlation or relationship between the two variables and is in line with the findings of Aristei et al. (2013).

Table 7: Reverse causality: The effect of lagged direct exports on import and foreign input share

VARIABLES	(1) Directly Imported Input	(2) % Used Inputs Foreign
% of Sales Direct Exports $_{w-1}$	0.021	0.054
	(0.023)	(0.061)
Innovation $_{w-1}$	1.300	-5.324
	(1.227)	(3.423)
% Foreign Ownership $_{w-1}$	0.028	0.091
	(0.027)	(0.072)
Firm Age $_{w-1}$	0.040	-0.156*
	(0.034)	(0.094)
% High Skill Employees $_{w-1}$	-0.016	-0.108*
	(0.022)	(0.061)
Employees $_{w-1}$	0.006**	0.008*
	(0.003)	(0.005)
Constant	1.487	126.909***
	(8.308)	(7.613)
Observations	344	387
Firm-level FE	Yes	Yes
Country-Year FE	Yes	Yes

Notes: Column one shows a logit fixed-effects regression with the lagged value of the share of direct exports as independent variable and the directly imported inputs dummy as dependent variable. Column two shows an OLS fixed-effects regression performed, but with the share of foreign inputs used as dependent variable. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

In the results section, the share of direct exports was used as dependent variable in order to see the effects that importing inputs and using foreign inputs have on the share of direct exports. However, it could be that this effect only holds when firms do not export at all, increasing from 0% to about 8% after importing inputs (table 4 column 4). One could argue a firm is only considered an exporter when it exports more than, for example, 10% of its total sales. The same argument goes for the variables share of foreign inputs used, the share of foreign ownership and the share of high-skill workers. Hence, table 8 shows a logit regression with the dummies to see whether these thresholds change the interpretation of the results.

Table 8: Dummy variables regression

VARIABLES	(1) Exporter Dummy
Directly Imported Input	1.204***
	(0.355)
Uses Foreign Inputs	0.036
	(0.246)
Interaction	0.375
	(0.330)
Innovation	0.237***
	(0.088)
Foreign Owned	1.242***
	(0.219)
Firm Age	0.007***
	(0.003)
High-Skill Firm	-0.066
	(0.107)
Employees	0.002***
	(0.000)
(log) TFP	0.188***
	(0.044)
Constant	-2.475***
	(0.702)
Observations	7,689
Firm-level FE	Yes
Country-Year FE	Yes

Notes: Column one shows logit regression with the exporter dummy as dependent variable and the dummies directly imported input and uses foreign inputs as main independent variables. Uses foreign inputs equals one when a firm uses 10% or more materials from foreign origin in its production process. All coefficients are given with the standard error given in parentheses. Standard errors are clustered. The stars indicate the significance level: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As seen in table 8, the significance and signs of the results do not change much compared to the results in table 4. As for the magnitude, we see that firms that directly import inputs are 3.33 times more likely to be exporter than non-importing firms. This is quite a significant amount, and only strengthens the finding in table 4 that directly importing inputs has quite a big impact on the export share. Thus, using binary variables confirms what was found when using continuous variables and perhaps even strengthens the effect found of directly importing inputs on exporter status. As for the use of foreign inputs, the effect remains insignificant.

6: Discussion and Conclusion

6.1: Discussion

The main finding of this paper is that directly importing inputs significantly increases the propensity to export. In contrast, no significant positive effect of the share of foreign inputs used on the share of direct exports was found in any of the main regressions. As mentioned above, this initially contradicts the theory by Ethier (1982) that exports increase by using foreign inputs as this indicates access to more varieties, as well as the theory that foreign inputs can embed foreign technology (Coe and Helpman, 1995) and that foreign inputs allow better product quality (Pane and Patunru, 2022). A possible explanation for this result is multicollinearity between two independent variables. As mentioned in the variable explanation section, using foreign inputs does not necessarily mean those were directly imported. However, it is more likely that foreign inputs were imported rather than purchased domestically. Furthermore, imported inputs are more likely to be foreign. Thus, the results might include some collinearity, where part of the effect of the share of foreign inputs is included in the directly imported dummy. Another explanation for the insignificant effect is the interaction variable. As table 3 and 4 show, the interaction variable has a significant positive effect, indicating that the share of foreign inputs used does increase the share of direct exports when the firm has also directly imported inputs.

It remains somewhat debatable whether the share of foreign inputs used positively affects the share of direct exports. However, the finding in table 2A and the explanations provided above make it likely that there is an effect, even if the variable itself is insignificant in the main results (table 3 and 4).

Although this paper found results that were predicted by theories formed on this topic, it suffered from some limitations. First off, due to data incompleteness, the dataset had to be limited from 58899 to 7714 observations. Furthermore, the data only allowed for 387 observations considering the construction of lagged variables. Ideally, the data would have been complete for all 58899 observations, which would have also allowed much more observations with the lagged variables. The use of so few observations for this robustness check gives rise to the question whether the significance of the variables is justified, due to

higher standard errors as a consequence of less observations. A different limitation was the fact that the survey waves were not done yearly. This led to fewer observations of the same firm and led to the lags being 3 years apart, whereas 1 or 2 years would be more preferable.

6.2: Conclusion

To conclude, this paper empirically investigated whether using foreign inputs and directly importing inputs has a significant effect on the share of direct exports for a firm using data from the World Enterprise Survey Data. The panel data consists of firm-level data gathered by the World Bank and comprises of countries in Eastern Europe, Central Asia and North Africa between the period 2008-2020.

Results indicate that directly importing inputs has a positive significant effect on the share of direct exports. This supports the theory of pure knowledge spillovers formed by Verspagen (1997). A large part of this effect goes beyond the productivity part. This supports the theories on product quality improvement (Pane and Patunru, 2022) and decreased cost of innovation (Goldberg et al., 2009). The effect of the share of foreign inputs used remains debatable. No significant effect was found in the main regressions, contradicting theories from Ethier (1982) and Coe and Helpman (1995). However, the positive significant effect might be removed from the regression due to multicollinearity and the interaction variable.

Possible endogeneity issues were addressed by using fixed effects and including control variables in the regression in order to eliminate possible omitted variable bias, whereas a reverse causality test was performed in the robustness section to debunk a potential threat coming from reverse causality.

This paper contributed to existing literature by examining the direct effect of importing inputs and exports for firms with a multi-country dataset, as well as adding variables such as TFP to see what part of the effect goes through productivity. Recommendations for future research are to use annual firm-level panel data, obtained by a different dataset, that is also more complete so that it allows for more (lagged) observations. Due to the limited time scope of this paper, such kind of data gathering was not possible.

Policy wise, knowing that importing inputs significantly increases exports, firms could use this knowledge in their decision-making process whether or not to import inputs. If a firm aims to become exporter, it would thus make sense that the firm tries to import inputs if that opportunity presents itself, as this paper proves that importing inputs significantly increases exports.

Appendix

Table A1: List of all countries included in World Enterprise Survey

Albania
Armenia
Azerbaijan
Belarus
Bosnia & Herzegovina
Bulgaria
Croatia
Czechia
Egypt
Estonia
Georgia
Hungary
Jordan
Kazakhstan
Kosovo
Kyrgyz Republic
Latvia
Lebanon
Lithuania
Moldova
Mongolia
Montenegro
Morocco
North Macedonia
Poland
Romania
Russia
Serbia
Slovakia
Slovenia
Tajikistan
Tunisia
Turkiye
Ukraine
Uzbekistan
West Bank and Gaza

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