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Imports of Intermediate Inputs and Country Size

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Abstract

The paper analyzes the relationship between country size and the use of imported intermediate inputs by firms in 76 developing countries. Recent evidence indicates that the use of imported inputs can have a large, positive effect on productivity and growth, thus motivating a better understanding of the determinants of foreign inputs. The results confirm that, as is the case with exports, use of imported intermediate inputs is much higher at the extensive and intensive margins in small relative to large countries. The results for imported inputs are comparable in magnitude with those for exports.

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Imports of Intermediate Inputs and Country Size

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1. Introduction

Recent empirical evidence suggests that foreign input use is important for the overall growth and economic development (Amiti and Konings, 2007; Bernard et al., 2007; López, 2006). This could be because imported inputs are of higher quality with embedded foreign technology, and that certain foreign inputs may not be perfectly substitutable by domestic inputs (Gibson and Graciano, 2011).[1] However, this literature is still in its infancy and much needs to be done to understand better various aspects related to the effects and determinants of the use of imported inputs.

The present paper takes one step in this direction by analyzing the relationship between use of imported inputs by firms and country size. A number of studies have examined the consequences of country size for various factors and especially for exports and total trade (see Rose 2006 for an overview). However, the relationship between imported immediate inputs and country size has largely been neglected. The understanding is that a small market size prevents the exploitation of economies of scale, forcing the relatively small countries to trade internationally (Alesina and Wacziarg 1998).

Our results confirm that small countries rely on imported inputs much more than large countries. This holds at the extensive margin - percentage of firms that use imported inputs - as well as along the intensive margin – percentage of material inputs used that is of foreign origin. Intriguingly, the magnitude of the relationship between country size and the use of imported inputs is comparable to what we find for exports in our sample.

[1] For a literature review, see for example Wagner (2012).

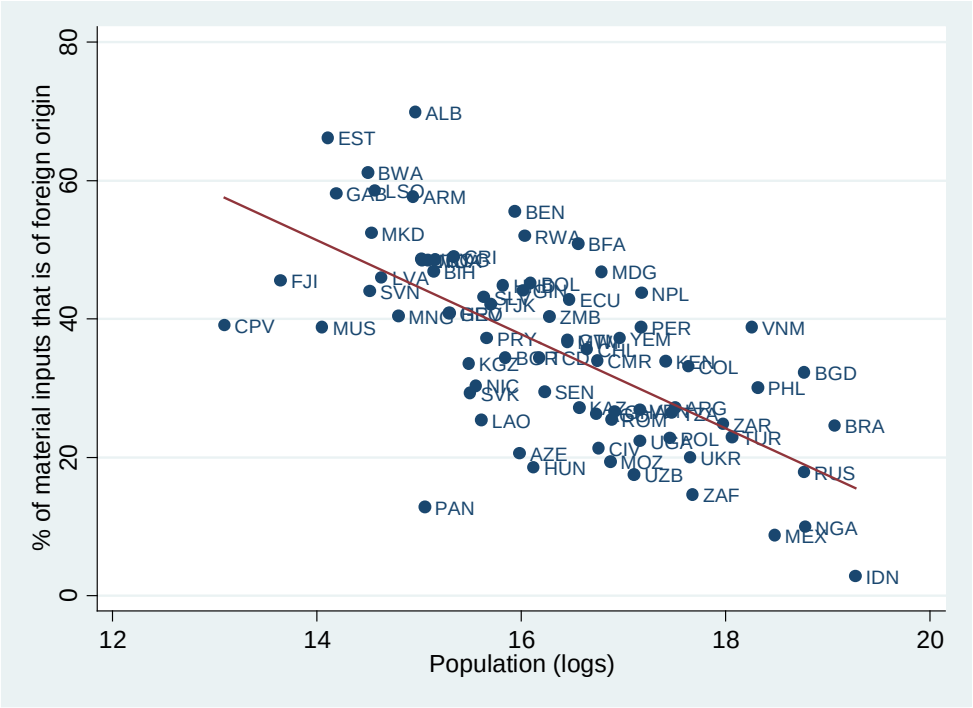
2. Data and main variables

Our main data source is firm-level surveys conducted by the World Bank's Enterprise Surveys (ES) between 2006 and 2011. These surveys employ a common questionnaire and sampling methodology (stratified random sampling) and aim to be representative at the national level of the non-agricultural private sector of the countries. The sample we use includes 19,040 small and large manufacturing firms in 76 developing countries.

We use two dependent variables from ES data. First, a dummy variable equal to 1 if a firm uses foreign inputs in its production process and 0 otherwise (*Import dummy*). Second, the percentage of firm's material inputs that are of foreign origin (*Imports*). In our sample, about 60 percent of the firms use imported inputs. The mean value of *Imports* equals 35.9 (percent) and the standard deviation is 39. Across countries, *Imports* is highest in Albania (69.9 percent) and lowest in Indonesia (2.8 percent).

Our main explanatory variable is country-size measured by the (log of) total population of the country in the year covered by the ES (*Population*). In our sample, *Population* varies between 13.1 (Cape Verde, 0.49 million) and 19.3 (Indonesia, 240 million). The mean value of *Population* equals 16.3 (or 28.9 million people) and the standard deviation is 1.4.

Figure 1: Firms in small countries use more imported inputs than firms in large countries



We note that our dependent variables are defined at the firm-level while the main explanatory variable is defined at the country level. Hence, reverse causality is unlikely to be an issue with our estimation results. However, we control for a number of variables, motivated by existing evidence, to guard against the omitted variable bias problem.

Our firm-level controls taken from ES include the (log of) number of permanent full-time employees at the firm (*Employment*), age of the firm (logs), business climate measures including the percentage of time spent by a firm's senior managers dealing with government regulations (*Time tax*), a dummy variable equal to 1 if the firm was inspected during the last year by tax officials and 0 otherwise (*Inspected*) and the average level of severity (on 0-4 scale) of various obstacles to the firm's current operations as reported by the firms (*Obstacles*). The obstacles include: tax rates, tax administration, obtaining licenses and permits and corruption. We experimented with controls for sector fixed effects but this did not change our results much.

Country-level controls include the year the survey was conducted (*Year*); GDP per capita (log values), PPP adjusted and at constant 2005 international dollars (*Income*) taken from World Development Indicators (WDI), World Bank; weighted average of tariff rates (percent) across all products (*Tariff rate*) taken from WDI; a measure of trade openness, the Heritage Foundation's *Trade Freedom index*; and a dummy variable indicating if the country is landlocked or not (compiled from various sources). For tariff rates and the trade freedom index, average values 2-3 years prior to the survey are taken to expand coverage; for income, values are for the year prior to the survey.

3. Estimation

Regression results are provided in Table 1 (for *Import dummy*) and Table 2 (for *Imports*). Table 1 shows a strong negative association between *Import dummy* and *Population*. Adding various controls to the specification only serves to strengthen this negative association. The estimated marginal effect of a unit increase in *Population* on the likelihood of a firm using imported inputs ranges between a decrease of 5.8 (column 3) to 7.7 (column 7) percentage points, significant at less than the 1 percent level irrespective of the set of controls used. Using the most conservative estimate (column 3), a one standard deviation increase in *Population* is associated with an 8.1 percentage points decrease, and a move from the smallest to the largest country in our sample is associated with a 36 percentage points decrease in the probability of a firm using imported inputs. These are economically large changes given that on average 60 percent of firms in our sample use imported inputs. Larger firms show a higher probability of using imported inputs. However, higher severity of the obstacles (*Obstacles*) is also associated with a higher likelihood

of using imported inputs – a somewhat surprising result probably explained by the fact that faster growing firms are both more likely to use imported inputs and find the obstacles more severe.

Results for *Imports* are qualitatively similar. That is, *Imports* and *Population* are inversely correlated, significant at less than the 1 percent level. Depending on the controls used, a one standard deviation increase in *Population* is associated with a decrease in *Imports* between 9.4 (column 1) to 10.8 (column 6) percentage points. Alternatively, a move from the smallest to the largest country in our sample is associated with a decrease of 41.6 to 47.8 percentage points in the value of *Imports*. These are economically large changes given that the mean value of *Imports* is only 35.9 percent.

4. A comparison with exports

We repeated the results above for exports using similarly constructed dependent variables: a dummy variable indicating if the firm exports or not and the percentage of the firm's annual sales that are exported. As expected, we found that both the export measures are inversely and significantly (at less than the 5 percent level) correlated with *Population*. Somewhat surprisingly, we found that adjusting against the mean values of export and import variables, the magnitude of the relationship between the export variables and country-size was comparable to what we found above for the import variables. For example, including all the aforementioned controls, a one standard deviation increase in *Population* is associated with a decrease in the percentage of the firm's sales that are exported by 3.5 percentage points – or about 0.27 times the average value of the exports to sales ratio. The corresponding result for imports (column 7, Table 2) is a decrease of 10.8 percentage points – or about 0.30 times the average value of *Imports*. While substantial

effort is devoted to understanding the country size and exports relationship, our results suggest that country size is as relevant for imports of inputs as for exports.

5. Conclusion

Paralleling the literature on exports, the paper shows that imports are much higher in the relatively smaller countries. Use of imported inputs is only beginning to find favor with researchers and studies are beginning to highlight the large potential contribution of such imports to overall economic development. We hope that the present paper will encourage more research in this area.

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Table 1: Proportion of firms using imported inputs and country size (marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: *Import dummy*							
Population (logs)	-0.065***	-0.059***	-0.058***	-0.071***	-0.073***	-0.076***	-0.077***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year		0.031**	0.028*	0.030**	0.026*	0.022	0.022
		(0.035)	(0.054)	(0.038)	(0.078)	(0.130)	(0.129)
Income			0.010	-0.003	-0.005	-0.004	0.004
			(0.521)	(0.844)	(0.750)	(0.789)	(0.829)
Employment (logs)				0.119***	0.116***	0.117***	0.119***
				(0.000)	(0.000)	(0.000)	(0.000)
Age of the firm (logs)					0.012	0.011	0.007
					(0.423)	(0.464)	(0.636)
Time tax (%)					0.001*	0.001	0.001
					(0.099)	(0.180)	(0.192)
Inspected (dummy)					-0.003	-0.010	-0.012
					(0.906)	(0.685)	(0.626)
Obstacles						0.035***	0.033***
						(0.005)	(0.010)
Tariff rate (%)							0.011*
							(0.056)
Trade Freedom index							0.002
							(0.246)
Country is landlocked							-0.045
							(0.314)
Pseudo R-squared	0.023	0.027	0.027	0.086	0.088	0.091	0.094
Predicted value	0.600	0.600	0.600	0.612	0.612	0.612	0.612
Observations	19,040	19,040	19,040	19,040	19,040	19,040	19,040

p-values in brackets. All regressions use a constant term (not shown). Estimates shown are marginal effects from logit estimation evaluated at the mean value of the continuous variables. All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%).

Table 2: Imports share in total inputs and country size (OLS)

Dependent variable: *Imports*	(1)	(2)	(3)	(4)	(5)	(6)
Population (logs)	-6.710***	-6.963***	-7.464***	-7.550***	-7.662***	-7.709***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year	0.384	0.972	0.946	0.897	0.710	0.646
	(0.708)	(0.358)	(0.355)	(0.372)	(0.481)	(0.512)
Income		-2.089*	-2.749**	-2.664**	-2.616**	-2.402*
		(0.054)	(0.011)	(0.017)	(0.020)	(0.061)
Employment (logs)			6.326***	6.366***	6.378***	6.450***
			(0.000)	(0.000)	(0.000)	(0.000)
Age of the firm (logs)				-1.031	-1.095	-1.335
				(0.332)	(0.303)	(0.227)
Time tax (%)				0.068	0.057	0.056
				(0.132)	(0.218)	(0.222)
Inspected (dummy)				0.904	0.493	0.472
				(0.624)	(0.780)	(0.789)
Obstacles					1.869**	1.777**
					(0.031)	(0.048)
Tariff rate (%)						0.578
						(0.149)
Trade Freedom index						0.157
						(0.341)
Country is landlocked						-2.715
						(0.339)
Observations	19,040	19,040	19,040	19,040	19,040	19,040
R-squared	0.056	0.059	0.102	0.103	0.105	0.108

p-values in brackets. All regressions use a constant term (not shown). All regressions use Huber-White robust standard errors clustered on the country. Significance level is denoted by *** (1%), ** (5%) and * (10%).