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Abstract: This paper uses data on 11 industries in 85 developing countries to show that trade times matter for import and export performance at the firm-level. Firms import more intermediate inputs if import licensing times are shorter. They export more of their production if border clearance times are shorter, but tend to use third party distributors more if clearance times are longer. This is the first time that imports and indirect exports have been considered in the firm-level literature on trade facilitation.

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1   Introduction

There is convincing cross-country evidence that time can be a substantial source of trade costs, and that increased time to export is correlated with weaker trade performance (Djankov et al., 2008; Hummels and Schaur, 2012). However, there is as yet little firm-level evidence on the question. Firm-level data can potentially cast light on the role of time as a trade barrier while controlling for a range of other country- and sector-specific factors that cannot always be eliminated by observables or panel data techniques in a cross-country context.

This paper shows that trade times indeed matter for export and import performance at the firm level, using data from 85 developing countries and 11 sectors. Firms that experience longer time to export tend to export a lower percentage of their output than those with shorter trade times, and are more likely to use a distributor rather than exporting directly. On the import side, the time to obtain an import license is the crucial variable: longer delays substantially reduce the proportion of foreign intermediate inputs used in production.

This paper builds on and extends recent firm-level work on trade facilitation in three main ways. First, the main contributions in this area—Li and Wilson (2009) and Hoekstra (2012)—focus on the export side only, and do not examine the impact of trade times on imports of intermediate goods as well. They also consider only direct exports, and not the links between direct and indirect importing. This paper examines both sets of questions. Second, the two papers cited use an unlinked combination of probit and tobit models to analyze firm-level data on export performance. This paper, by contrast, uses the fractional logit model of Papke and Wooldridge (1996), which is ideally suited to analyzing data that are bounded between zero and unity—such as the percentage of total sales accounted for by exports, and imports as a proportion of total intermediate goods use. Third, this paper uses the full extent of data

available in the World Bank's Enterprise Surveys dataset, not just a subset of African countries (Hoekstra, 2012) or Asian countries (Li and Wilson, 2009).

The paper proceeds as follows. The next section discusses the dataset and provides preliminary evidence that trade times matter for export and import performance. Section 3 presents the empirical model used and discusses results. The final section concludes.

2 Data and Preliminary Analysis

2.1 Dataset

The World Bank's Enterprise Surveys dataset currently has data on over 120,000 firms in 125 mostly developing and transition economies. This paper uses a subset of the Enterprise Surveys data from 2006-2010. No high income countries are included in the survey group, so the dataset is limited to developing countries only. The survey covers both manufacturing and services firms, but the estimation sample here is limited to manufacturing so as to focus on trade times affecting goods. Taking into account this narrowing of the sample and data availability, a total of over 5,000 firms in 85 countries and 11 industries remain in the estimation sample for the favored empirical model for exports.

Each survey covers a cross-section of firms for a single year of data in a given country, with firms selected by stratified random sampling. Some countries are included more than once in the dataset when they are surveyed over multiple years, but it is impossible to determine whether or not individual firms are included multiple times due to the way in which the World Bank assigns anonymous identifiers to firms in each survey. It is therefore not possible to observe entry or exit, or to estimate TFP using techniques that require the availability of true panel data at the firm-level.

The main variables of interest for this analysis are the data on trade and trade times. For exports, each

firm is asked to record the percentage of its total sales that is exported directly and the percentage

exported indirectly (through a third party, such as a distributor). Those firms that export at least part of

their production directly are also asked to give the average number of days it takes for exports to clear

customs after they arrive at their main point of exit (port or airport). For imports, firms provide data on

the percentage of intermediate input use that is accounted for by imports. Importing firms are also

asked to give the average number of days it takes from the time of arrival at the main point of entry

(port or airport) until the goods can be claimed from customs. In addition, firms are asked if they have

applied for an import license over the last two years, and if so, the number of days' delay that

intervened between applying for the license and its being granted. Full details of all data used in the

empirical analysis are in Table 1.

Table 1: Variables, definitions, and sources.

Variable	Definition	Year	Source
% Direct Exports	Percentage of an establishment's total sales accounted for by direct exports	Various	Enterprise Surveys question d3b
% Imports	Percentage of an establishment's total material inputs and supplies of foreign origin in the last fiscal year	Various	Enterprise Surveys questions d12b
% Indirect Exports	Percentage of an establishment's total sales accounted for by indirect exports (i.e., sold domestically to a third party that exports the products)	Various	Enterprise Surveys question d3c
Foreign	Dummy variable equal to unity for establishments that are owned more than 50% by foreign private individuals, companies, or organizations	Various	Enterprise Surveys question b2b
Log(Capacity Utilization)	Logarithm of the establishment's current output in comparison with its maximum possible output over the last year	Various	Enterprise Surveys question f1
Log(Capital Intensity)	Logarithm of the net book value of total assets per employee	Various	Enterprise Surveys questions l1, l6, n6a, and n6b
Log(Employees)	Logarithm of the number of permanent and temporary or seasonal full time employees in the last fiscal year	Various	Enterprise Surveys questions l1 and l6
Log(Labor	Logarithm of total sales per employee in the last	Various	Enterprise Surveys

2.2   Preliminary Analysis

Before moving to fully-specified econometric models in the next section, it is useful to examine the

correlations in the data graphically to see what evidence there is that trade times matter for export and

import performance. Figure 1 shows that a longer delay in applying for an import license is associated

with a smaller proportion of intermediate inputs being imported. This is the first time that such a

connection has been brought out in the empirical literature. Figure 2 shows that the pattern is the same

for exports: longer export times are indeed associated with a smaller proportion of total sales being

exported, which is in line with the cross-country evidence referred to above, as well as the firm-level

results of Hoekstra (2012) and Li and Wilson (2009).

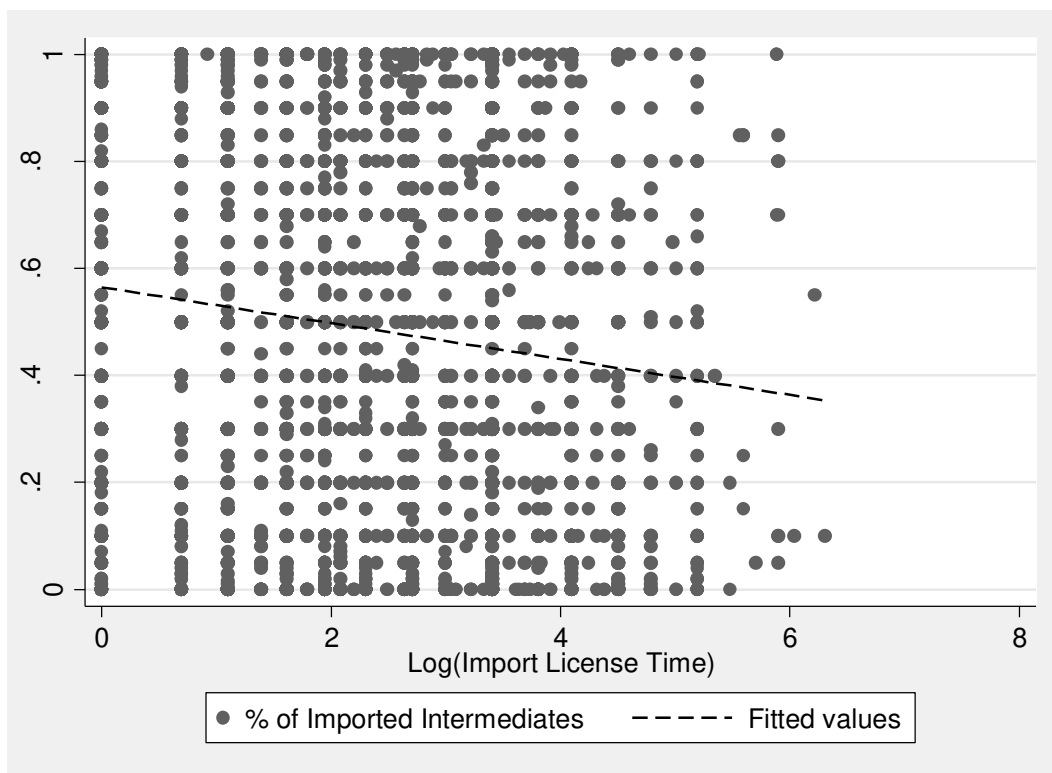**Figure 1: Percentage of intermediate inputs that are imported exported versus import license time.**
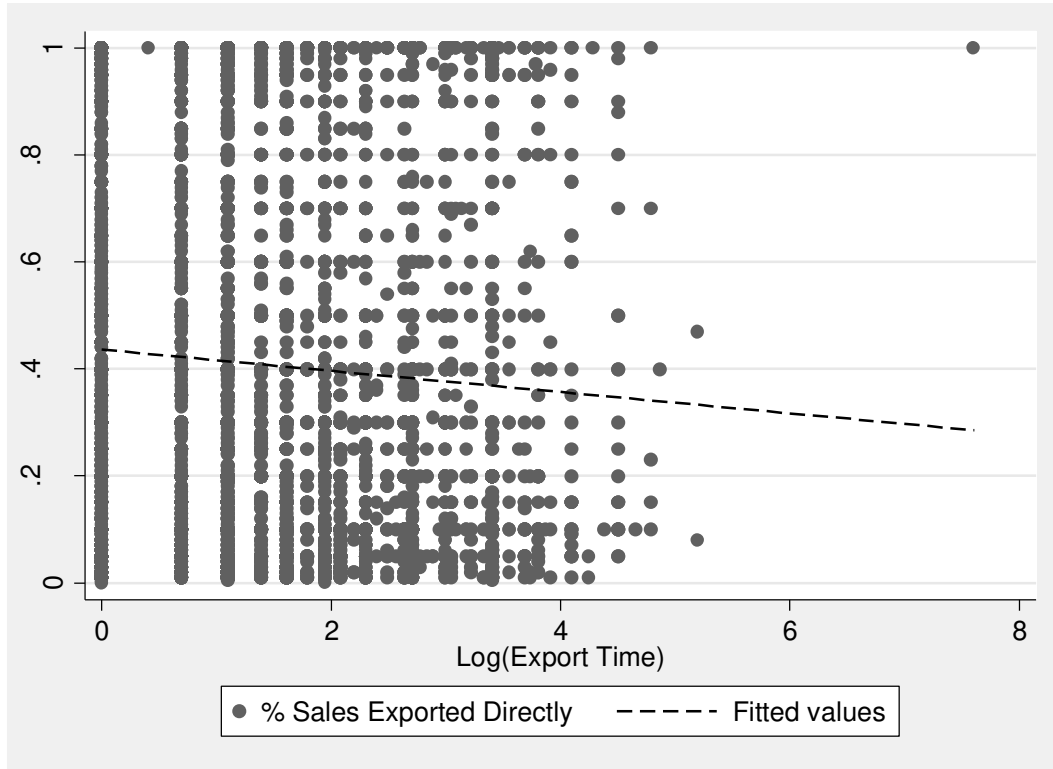
Figure 2: Percentage of sales directly exported versus export time.

3   Empirical Model and Results

The empirical models for exports and imports take the following forms:

$$\% \text{ Imports} = \sum_{c}\sum_{s}\sum_{t} d_{cst} + b_0 \log(Import\ Time_{fcst}) + b_1 \log(Import\ Licnse\ Time_{fcst})$$

$$+ \sum_{i=2} b_i Controls_{fcst} + e_{fcst}$$

$$\% \text{ Direct Exports} = \sum_{c}\sum_{s}\sum_{t} d_{cst} + b_0 \log(Export\ Time_{fcst}) + \sum_{i=1} b_i Controls_{fcst} + e_{fcst}$$

$$\% \text{ Indirect Exports} = \sum_{c}\sum_{s}\sum_{t} d_{cst} + b_0 \log(Export\ Time_{fcst}) + \sum_{i=1} b_i Controls_{fcst} + e_{fcst}$$

where variables are defined as in Table1, d indicates a full set of fixed effects by country-sector-year, e is a standard error term, and controls refers to a set of firm-level control variables to account for other potential influences on firm export performance. The set of controls includes labor productivity, foreign ownership, capital intensity, and capacity utilization and ISO certification as proxies for management competence. Due to the structure of the dataset—in which each firm only provides data for a single year—it is not possible to include firm-level fixed effects, or to estimate TFP using conventional methods that require firm-level panel data. However, fixed effects at the country-sector-year level account for factors that are common to all firms within a given country-sector-year combination, such as tariffs and other sectoral regulations. Since the dependent variables are all percentages bounded between zero and unity, estimation uses the fractional logit model of Papke and Wooldridge (1996), which was specifically developed to deal with this kind of data.

Regression results are in Table 2. The first three columns present results using export and import times as the only independent variables. The last three columns include additional firm-level control variables, as set out above.

Results for imports in column 1 show that it is primarily licensing time, rather than customs clearance time, which matters for the ability of firms to access imported intermediates: the coefficient on the former is negative and 5% statistically significant, whereas the coefficient on the latter is negative but not statistically significant. Of course, these two measures are correlated (rho = 0.197), which could partly explain the lack of precision of the clearance time estimate. By contrast, Hoekstra (2012) and Li and Wilson (2009) both find that import clearance times matter for export performance. When import data are considered separately, however, it can be seen that it is primarily the administrative requirements associated with licensing that hold back performance. Column 4 confirms that this result holds even when additional firm-level control variables are added to the model.

Considering direct exports next, it is clear that the econometric evidence confirms the insight from the graphical analysis above: longer time to export is associated with a lower percentage of direct exports (column 2), and the effect is quantitatively and qualitatively robust to the inclusion of control variables (column 5). In both regressions, export time has a negative and statistically significant coefficient, and their magnitudes are very similar in the two cases. These results confirm the previous firm-level findings of Hoekstra (2012) and Li and Wilson (2009) for Africa and Asia respectively.

As noted above, previous work has not examined indirect as opposed to direct exports. Columns 3 and 6 provide results for these data. Interestingly, the coefficient on export time is positive and statistically significant in both regressions. Its magnitude is very similar in the baseline regression and in the regression with additional controls. A possible explanation for the positive coefficient is that when firms are faced with long times for direct exports—which is what the export time variable measures—they sometimes respond by outsourcing the exporting process to a specialized firm that can presumably handle the goods more rapidly. Longer export times are therefore associated with lower direct exports (columns 2 and 5) but higher indirect exports (columns 3 and 6).

Table 2: Regression results.

	(1) % Imports	(2) % Direct Exports	(3) % Indirect Exports	(4) % Imports	(5) % Direct Exports	(6) % Indirect Exports
Log(Import Time)	-0.023			-0.024		
	(0.383)			(0.412)		
Log(Import License Time)	-0.049**			-0.055**		
	(0.017)			(0.014)		
Log(Export Time)		-0.073***	0.092*		-0.070**	0.105*
		(0.002)	(0.051)		(0.021)	(0.076)
Log(Employees)				-0.046	0.060**	-0.128***
				(0.113)	(0.024)	(0.009)
Log(Capital Intensity)				0.044**	-0.006	-0.023
				(0.035)	(0.689)	(0.498)

Log(Capacity Utilization)				-0.054	-0.051	-0.061
				(0.538)	(0.454)	(0.656)
Foreign				0.313***	0.508***	-0.434**
				(0.001)	(0.000)	(0.016)
ISO				0.075	0.074	0.245*
				(0.208)	(0.237)	(0.085)
Observations	3285	7404	7404	2573	5369	5370
R2	0.390	0.028	0.000	0.388	0.030	0.001

4 Conclusion

This paper has shown that licensing times matter for the ability of firms to access imported intermediates, and that clearance times matter for firm-level export performance. In addition, there is evidence that clearance times affect firms' choice to export directly or through a third party: longer clearance times make use of a third-party distributor more likely.

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