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Boosting Manufacturing Firms' Exports? The role of trade facilitation in Africa

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RUTH HOEKSTRA

BOOSTING MANUFACTURING FIRMS' EXPORTS?
THE ROLE OF TRADE FACILITATION IN AFRICA



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Ruth Hoekstra

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Abstract

Facilitating trade is essential for Africa's economic development and further integration into the world economy, as business in Africa still suffers from behind-the-border barriers to trade. Using firm level data from the World Bank's Enterprise surveys covering more than 6,500 manufacturing firms, this paper empirically investigates the determinants of African firms' export decisions with a special focus on trade facilitation measures like the energy or telecommunications infrastructure. Overall, trade facilitation can increase African firms' probability to participate in international trade. Furthermore, lower trade barriers are associated with a higher propensity to export, i.e. stimulate the growth of exports.

Key words: Trade Facilitation, Trade Barriers, Africa, Firm-level Data, Export Probability

JEL codes: F13, F15, O24

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1 INTRODUCTION

International trade has increased immensely over the last decades due to tariff reductions and liberalization attempts. More trade leads to more border-crossing products (and services), challenging customs requirements and issues concerning the timing and effectiveness of their processing. The obstacles and costs due to ineffective border procedures are less visible than tariff levels, but can account for significant shares of the value of the goods traded. A reduction in overall trade costs by one percent would lead to an increase in world-wide income of more than USD 40 billion, with developing countries being the main beneficiaries (OECD 2009).

Trade costs matter, as Anderson and van Wincoop (2004) have also shown. They find the total tax equivalent of trade costs including transport, border-related, and local distribution costs for industrialized countries to be 170 percent. This figure is even higher for developing countries – by a factor of two or more, depending on the type of cost. Each additional day that a product is delayed prior to being shipped reduces trade by more than one percent (Djankov et al. 2010). Djankov et al. (2010) find for example that Uganda’s exports would be expected to increase 31 percent if the within-country trading time was reduced from 58 to 27 days (the median of their sample).

African¹ business still suffers from barriers to trade like those related to trade regulations, transport infrastructure, and the business environment which negatively impact overall trade flows and slow down development, even though Africa has experienced spurting economic growth rates at five percent on average over the last ten years with the private sector showing signs of dynamism (World Bank 2012a). However, looking at Africa’s share in world GDP, it is still languishing somewhere around two and a half percent, and its trade performance vis-à-vis the world has been rather disappointing, too, with a share of world export that has dropped from five percent in the 1970s to around three percent today (World Bank 2012a).

Transaction costs at the border as well as behind the border are considered to be particularly high in African countries. For example, it takes about 44 days for a regular export transaction in Ethiopia and 48 days Angola, while it only takes 14 days in Thailand or the Philippines. On average, it takes about three times as long for exports to clear customs in sub-Saharan Africa than in OECD countries (World Bank 2012b). Africa is confronted with higher trade costs, poorer national governance structures and lower trade than other regions in the world. How can the trade potential and the private sector be strengthened, thus potentially translating economic growth rates into development? This paper argues that specific trade facilitating measures can boost Africa’s trade performance in helping firms raise exports.

Trade facilitation takes center stage in finding a successful strategy to improve developing countries’ export performance, referring to a broad range of measures that aim at reducing trade costs. According to a widely used definition by the World Trade Organization, trade facilitation denotes measures that explicitly work towards the “simplification and harmonization of international trade procedures” where trade procedures are the “activities, practices and formalities involved in collecting, presenting,

1 In this paper, ‘Africa’ refers to sub-Saharan Africa. Both terms are used interchangeably.

communicating and processing data and other information required for the movement of goods in international trade” (WTO 2012). In this rather narrow sense, trade facilitation relates to on-the-border trade procedures like licensing procedures, transport formalities, and insurance.

However, developing countries’ successful integration into the world economy increasingly depends on the realization of complex, behind-the-border measures that include anything from customs to institutions and regulatory reform. Trade facilitation in this broader sense aims at the improvement of transport and telecommunications infrastructure, the removal of other non-tariff trade barriers and government corruption, the modernization of customs administration, export marketing and promotion, and governments’ regulatory activity in trade. Other factors, such as access to finance and energy have also been recognized to matter for facilitating trade (Portugal-Perez and Wilson 2012).

Generally, questions on the negative impact of trade costs on the one hand and the effectiveness of trade facilitation to remedy these costs on the other hand have been raised within academia and among policy makers. In this regard, a new empirical literature emerged within the last decades that started examining trade at the firm level. What factors prevent firms from exporting, despite considerable business opportunities abroad? Or are there factors that might drive them to export (more)? How does firm behavior relate to export performance?

Some stylized facts hold across a number of countries and different specifications. Exporting firms are in the minority; they are more productive and usually serve both the domestic and international markets (Bernard et al. 2003). Furthermore, firm size is a robust determinant of the decision to export (Rankin et al. 2006). Exporters benefit from economies of scale and from foreign technology and knowledge spillovers. However, exporting is costly, too, as there are significant barriers to enter export markets which may prevent firms from exporting.

Theoretically, models incorporating firm productivity heterogeneity have shown that not all firms trade as there is a fixed investment required to enter export markets in addition to variable costs associated with the exporting activities, and that only the most productive firms can overcome this fixed cost and find it profitable to export (Melitz 2003).² According to this view, productive firms self-select into exporting. However, the self-selection theory has been contested by the assumption that firms’ productivity increases once they start exporting because they learn from being exposed to advanced technologies and business practices in foreign markets which allow for narrowing productivity disparities.

Empirical findings tend to support the assumption that exporters have superior productivity because more productive firms become exporters in the first place. For Africa, however, it has been shown that exporters have large productivity gains through

2 Firms only start exporting if their net profits from exporting also cover the iceberg type trade costs they are faced with. This minimum profit level defines the productivity threshold for firms’ entry into export markets. Typically, exporters are more productive than other firms as high trade barriers ensure that the productivity cut off point for exporting is higher than that for production for the domestic market.

learning by exporting. Rankin et al. (2006) find that the evidence for self-selection into exporting is very weak for Africa. Van Biesebroeck (2005) shows for the 1990s that African exporters are more productive and increase their productivity advantage after entering into the export market, thus rather learning-through-exporting than self-selecting into export markets due to productivity advantages.

The determinants why many African firms still do not export – the share of manufacturing exporters is 14 percent in the sample – can be associated with high export barriers, which are due to a multitude of factors like red tape at borders and inefficient customs procedures, weak institutions and bad governance, an unfavorable business climate and regulatory environment, the high cost of and poor access to finance, underdeveloped physical and telecommunications' infrastructure, unreliable energy supply, and insufficient knowledge about international markets.

Theory predicts that lowering these types of trade costs, e.g., through trade facilitation measures, would make it profitable even for low-productivity firms to become exporters. Trade facilitation cannot only increase domestic productivity within a country, but also promote the entry of new firms into export markets, i.e. increase firms' propensity to export. Furthermore, lower trade costs may also lead to a higher export intensity and stimulate the growth of exports.

Previous empirical literature on the impact of trade facilitation on export performance can be divided in macro-data and micro-data studies, the first dealing with the relationship between country-level trade facilitation (indicators) and aggregate trade flows, the latter being concerned with evidence on trade facilitation and export participation of individual firms. At the country-level, a positive association between trade facilitation measures and aggregate export volumes is well documented for developing countries.³ At the firm-level, several papers study the determinants of exports, and have found economic benefits of reducing trade transaction costs. However, the relationship between trade facilitation and trade flows has not been studied as extensively as at country level and is mostly focused on firms in single countries or regions due to data availability.

For South America and Asia, Dollar et al. (2006) show that exports and foreign direct investment are higher where the investment climate is better. For Asia, it has been found that trade facilitation indicators are associated with both a higher probability and propensity of exporting, and that improving policy predictability matters more for small and medium-sized firms than improving the transport infrastructure (Li and Wilson 2009). For Ecuador, Correa et al. (2007) find that technology matters, but infrastructure does not for both firm export probability and how much an exporter sells abroad.

3 Trade facilitation reforms improve the export performance (Portugal-Perez and Wilson 2012) and can also help to promote export diversification in developing countries (Dennis and Shepherd 2011). For Africa, Freund and Rocha (2011) show that long delays in trade and weak institutional features explain much of Africa's weak export performance. Poor infrastructure is an important factor for Africa's weak export performance and high transport costs (Limão and Venables 2001), which are higher in Africa than in other developing countries (Portugal-Perez and Wilson 2008). Wilson et al. (2005) show that improvements in domestic indicators like port efficiency, the customs and regulatory environment and e-business infrastructure halfway to the world average (according to their sample) would raise sub-Saharan African exports by almost ten percent.

In Africa,⁴ firms operate in poorer institutions settings and are faced by a more adverse economic geography than firms in other regions (Elbadawi et al. 2006). They are located further away from potential export markets and have worse supplier access. Eifert et al. (2008) estimate firm-level revenue and value-added functions for six sectors in 17 African countries, demonstrating that firm performance is sensitive to the cost of indirect inputs. Spatareanu and Manole (2010) investigate the relationship between investment climate variables and firms' exporting decisions from 24 African countries, emphasizing the importance of foreign networks.

This paper builds on the findings of previous studies. While most empirical work to date focuses on other regions (i.e. Asia) or smaller subsamples in Africa, this paper builds on a large sample of manufacturing firms covering 37 African countries thereby capturing the export and development diversity of the region more adequately than studies on smaller samples. Several methodological approaches are combined to empirically investigate the determinants of African firms' exporting behavior with a special focus on trade facilitation measures. The paper also assesses whether trade facilitation/lower trade barriers can increase a firm's intensity to export, i.e. how much it exports.

I hypothesize that firms' responsiveness to different trade facilitating measures can be derived from the type and strength of obstacles affecting the firms' (export) operations: When measured by objective indicators, those obstacles perceived highest by African firms supposedly diminish firms' probability and propensity to export the most. Additionally, I check for important locational factors, e.g., whether firms have a higher probability of export market participation if a large market is proximate (i.e., if they are located in capital cities) or whether firms located in landlocked cities/regions are at disadvantage even if the country itself is not landlocked.

The paper is structured as follows: Section 2 describes the research design. In the empirical analysis in Section 3, I find that trade facilitation is associated with an increase in African firms' probability to participate in international trade, and that trade facilitation also matters for how much firms export. Section 4 includes an instrumental variable approach showing that the results depend on the specific trade facilitation variables, and tests the locational factors. The final section concludes.

4 Bigsten and Söderbom (2006) provide an overview on Manufacturing Enterprise Survey use.

2 RESEARCH DESIGN

2.1 Data and Variables

Data come from the Enterprise Surveys database by the World Bank (World Bank 2012c) and cover 37 countries in sub-Saharan Africa.⁵ Enterprise Surveys are firm-level surveys of a representative sample of an economy's private sector, covering a broad range of business environment topics and obstacles to firm growth and performance. Private contractors on behalf of the World Bank collect the data from face-to-face interviews with companies' top managers and business owners all over the world. Manufacturing and service sector firms with five or more employees that are in cities/regions of major economic activity are included in the surveys, while firms with 100 percent government ownership are not eligible to participate.

Cross-sectional standardized survey data is available for 40 countries in sub-Saharan Africa. This paper uses data on 6,538 manufacturing firms from 37 countries in sub-Saharan Africa which were interviewed at one point between 2006 and 2009.⁶ I use only manufacturing firms because manufacturers are intensive users of trade facilitating services, and are thus particular at disadvantage due to high transaction costs when exporting.⁷ In case firms were re-interviewed using the same global methodology (in Angola, Botswana, the Democratic Republic Congo and Mali), the interview year falling in the period 2006-2009 was chosen to minimize the time span covered and enhance comparability between firms in different countries. Overall, the sample provides a wide regional coverage across sub-Saharan Africa. The analysis offers new insights to the private manufacturing sector, which is still quite underdeveloped in Africa, but holds a huge potential concerning job creation, spillover effects, technological progress and skill development, higher productivity (gains) and capital accumulation.

About 14 percent of all manufacturing firms are exporters, with wide variation across countries. Export participation is highest in Lesotho and Kenya with 42 and 37 percent, respectively, while the share is quite low in countries like Angola and Sierra Leone, countries in which private sector development might be disincentivized due to their heavy dependence on oil, diamonds, and mineral exports. The majority of exporters supply both the domestic and foreign market, on average exporting 37 percent of their sales.

The differences between exporters and non-exporters in the sample of African countries are consistent with the results in the literature: The average exporting firm is more than six times larger than those firms which only supply the domestic market; they are older and more experienced and have on average three times the share of foreign ownership than non-exporters. The majority of exporters come from the sectors food, garments, metals and machinery and other manufacturing, while the most export-oriented sectors,

5 See Appendix A.1 for the country sample.

6 Firms from three countries for which data are available are not used in the analysis: Liberia due to a lack of exporting firms, and Zimbabwe and the Central African Republic, because interviews in these countries were conducted in 2011 only, limiting comparability to earlier surveys to a great extent.

7 Considering firms from both the manufacturing and service sector would almost double sample size. However, it would be difficult to apply trade facilitation measures to service sectors like hotels and restaurants or retail and wholesale trade, the latter only being concerned with distributional activities.

i.e. those sectors with the highest number of exporters, are leather, textiles and electronics.⁸

The Enterprise Surveys also ask survey respondents to identify, out of a list of 15, the biggest obstacle to the operations of their firm, capturing firms' perceptions on different aspects of the business climate. The following Table 1 summarizes how many firms choose each of the 15 elements, ranked according to exporter perception.

Tab. 1: Most serious obstacle affecting a firm's operation, percent of exporters and non exporters

Most serious obstacle	Exporters %	Non-exporters %
Electricity	28.36	38.98
Access to finance	10.53	17.29
Transport	8.91	4.57
Crime, theft and disorder	7.99	6.42
Inadequately educated workforce	7.29	2.38
Tax rates	7.29	6.08
Practices of competitors in the informal sector	7.06	7.85
Corruption	5.9	3.64
Customs and trade regulations	3.82	1.38
Political instability	3.01	2.67
Labor regulations	2.78	1.06
Access to land	2.66	3.66
Tax administration	2.66	1.94
Business licensing and permits	1.16	1.58
Courts	0.58	0.5
Total	100	100

By far, the obstacles perceived highest by most firms are electricity and access to finance, followed by transport for exporters, which is almost twice as high as for non-exporters, and by practices of competitors in the informal sector for non-exporters. Exporters also identify crime, theft and disorder, an inadequately educated workforce, tax rates and practices of competitors in the informal sector as obstacles to their business activities.

⁸ See Appendix A.2 for the firms' distribution across sectors and Appendix C for descriptive statistics.

The exporters' perceptions do not only help policymakers in prioritizing reform programs, but also in analyzing trade facilitation measures on exporting behavior. In the empirical analysis, only those Enterprise Survey responses are used that are retrieved through objective factual survey questions on a precise share or given fact (does the firm use telecommunications?; Does it have access to finance?; What is the average number of days for imported goods to clear customs?), while the more subjective answers concerning firms' perceptions of the business climate are not included.

Based on the definition of trade facilitation developed in the introduction, I include the following trade facilitation measures in the analysis:⁹

- Access to finance (loans from banks or financial institutions)
- Regulatory quality (time spent by management on government regulations)
- Infrastructure (energy infrastructure, sales lost due to power outages)
- Telecommunications (web and email use)
- Transport obstacles (percent of foreign inputs and supplies)
- Customs efficiency (number of days needed to import/export).

The financial indicator included in the analysis measures the availability of financial services: *Loans* presents the percentage of working capital that is financed by banks or financial institutions. In a business environment that is characterized by instability and strong fluctuations in the business cycle, access to credit is of paramount importance to overcome financing shortages and continuously supply international clients with products. Firms also consider access to finance as one of the major obstacles affecting their operation (compare Table 1). Dollar et al. (2006) find that having an overdraft facility and external loans are indeed determinants of firms' exporting behavior. By using *loans*, I proxy access to finance with the use of finance, assuming that those firms that do not use loans do not have access to loans or were denied them.¹⁰

The quality of governments' regulatory activity in trade is approximated by the variable *regquality*, which measures the time spent by senior management in dealing with government regulations. Good economic governance in areas such as regulations and permits is a precondition for an enabling trading environment, and the more time firms need to spend on regulations, the more burdensome and ineffective governmental regulations are, hindering trade. However, the more a firm deals with government regulations irrespective of how burdensome they are, the more it becomes familiar with rules and requirements, which facilitates trade. Thus, for *regquality*, I expect an ambiguous impact on exports.

The variable *losspowerout* captures the percent of sales lost due to power outages and shows the extent to which firms are confronted with failures in the provision of infrastructure. Poor electricity supply increases costs and barriers to export as it may disrupt production and decrease profitability.

9 See Appendix B for the definition of variables and data sources.

10 As Hainz and Nabokin (2009) point out, this approach might be misleading if there is a non-negligible number of firms that do not use loans, but also do not demand loans, because for studying the access to finance, only the group of firms that demands loans but has restricted access is relevant.

Email and *web* are dummy variables that both concern the use of information and communication technologies in business transactions. They refer to firms' ability to reach international markets at lower cost. Also, by using email and web, information asymmetries and knowledge deficits can be overcome more easily, thus reducing export entry barriers.

The variable *inputforeign* captures a firm's share of imported supplies and thus quantifies the trade activity of firms. The variable is expected to have a positive effect on the propensity to export. If trade and transport obstacles are low, more firms import. They might also have networks abroad which they can rely on. Half of all exporters import, while 25 percent of all firms only producing for the domestic market are importers. 25 percent of all domestically owned firms import, and more than a fifth of small firms still engage in importing activities (21 percent).

The variable *impclear* measures red tape at borders, i.e. how long it takes to clear imports and thus how efficient customs and trade regulations work in a country. *Impclear* is used as a proxy for the efficiency of all border procedures involved when trading goods. When using *impclear*, the sample is restricted to importing firms which provide this information (which are 1,597 firms in total).

The independent variables that control for firm characteristics are age, size, foreign ownership, whether a firm has an internationally recognized quality certificate, and the top manager's years of experience in the same sector. The number of years a firm has been in operation (*age*) refers to a firm's endurance on the market, which may affect the probability to export positively and may also help lessen the negative effect of a burdensome business environment.

Small is a dummy which takes the value 1 if a firm has more than five, but less than 20 employees, and *large* is a dummy which takes the value 1 if a firm has more than 100 employees. There is strong evidence across all studies on African firms' export behavior that size is positively correlated with exporting (for instance, Bigsten et al. 2004; Söderbom and Teal 2003; van Biesebroeck 2005). Rankin et al. (2006) find that the size effect is not due to higher productivity levels or sectoral export composition, and suggest that it is more important than efficiency-based self-selection into export markets.

Foreign10 is a dummy taking the value 1 if at least ten percent of the firm is owned by private foreigners. Foreign ownership is expected to be a robust determinant of export behavior, as shown by Correa et al (2007). (Partly) foreign owned firms have better access to international networks, capital and know-how of their foreign counterparts or parent firms relative to domestic firms. In my sample, three times as many exporters are (partly) foreign owned compared to firms producing for the domestic market only.

Certificate is an index of innovation and high product quality. This dummy variable shows whether a firm has an internationally recognized quality certification which might ease exporting due to better product acceptance abroad and raise productivity levels and overall efficiency in production. While almost half of all exporting firms have an internationally recognized quality certificate, only 10 percent of non-exporters have such documentation. The firm specific human capital and experience are captured by the manager's experience within the sector of operation (*experience*).

As dependent variable, I use an indicator variable (*exp*) for the Probit model that takes the value 1 for firms whose export share of total sales is positive and 0 otherwise. For estimations on export intensity, I use the log of firms' total exports in US dollars (*expvalue*).

2.2 Empirical Strategy

In a first step, I deploy a Probit model to determine the factors influencing the export decision of African firms, with the parameters estimated by maximum likelihood:

$$exp_i = \alpha + \gamma_1 firm\ characteristics_i + \gamma_2 trade\ facilitation_i + D_s + D_c + \varepsilon_i$$

$$\text{with } Pr(exp_i = 1) = Pr(exp_i^* > 0).$$

The true value of an observation is given by an unobserved latent variable exp_i^* . Instead of observing this variable, we only see the binary choice which is equal to 1 if exp_i^* is positive. exp_i is the predicted probability of exporting for firm i , which is calculated as a function of firm characteristics and trade facilitation. Firm characteristics include the age of a firm (*age*), its size (dummy variables *small* and *large*), its foreign ownership status (dummy variable *foreign10*), the firm manager's experience in years (*experience*), whether a firm produces according to international standards (dummy variable *certificate*) and the labor productivity (*salespc_log*).

The trade facilitation variables cover access to financial services (*loans*), telecommunications (dummy variable *web* or *email*), the quality of infrastructure, proxied by energy supply (*losspowerout*), and the regulatory effort (*regquality*). Furthermore, a measure of the efficiency of customs and border procedures is included, proxied by the number of days to import (*impclear*) and a measure of low transport obstacles: whether a firm imports intermediaries and supplies at all (*inputforeign*). D_s and D_c are sector and country dummies which account for sector and country specific effects.¹¹ ε_i stands for the error term.

In a second step, I use a Tobit model to analyze the intensity of exporting, taking into account that exports have a lower bound at zero. The standard solution is to estimate a Tobit model by maximum likelihood. The censored regression model is applied in two different settings, as Wooldridge (2002) points out. In the first setting, the data are truly censored above or below some value: The dependent variable is not observable for part of the population (e.g., top coding income data in surveys is a prominent example of data censoring). In the second setting, the outcome y describing an individual (or firm, in this case) takes on the value 0 with positive probability but is a continuous random variable over strictly positive values.

¹¹ Year dummies are not included due to the cross-sectional nature of the data. The country dummies partly absorb the effect of different survey dates as surveys are carried out by country.

Firms are exporting part of their sales value, thus solving an optimization problem, and for some firms the optimal choice will be the corner solution, $y = 0$. In these cases, instead of labeling the resulting model a censored regression model it is more appropriate to refer to a corner solution model (Wooldridge 2002).¹²

The export intensity is defined as

$$expvalue_log_i = \alpha + \beta_1 firm\ characteristics_i + \beta_2 trade\ facilitation_i + D_s + D_c + \varepsilon_i$$

$$\text{then } expvalue_log_i = 0 \text{ if } expvalue_log_i^* \leq 0$$

$$\text{and } expvalue_log_i = expvalue_log_i^* \text{ if } 0 < expvalue_log_i^*.$$

$expvalue_log_i$ denotes the observed value of the latent dependent variable $expvalue_log_i^*$. Firm characteristics and trade facilitation are the same variables as explained above for the Probit model. D_s and D_c are sector and country dummies which account for sector and country specific effects. ε_i stands for the error term. I report Tobit results and results using Ordinary Least Squares (OLS) for purposes of comparison.

¹² The Probit and Tobit models are similar, although they differ in translating the y^* (exp_i^* and $expvalue_i^*$) into the observed y . In the Tobit model, the value of $y = y^*$ is known when $y^* > 0$, i.e. larger than the lower bound, while in the Probit model we only know if $y^* > 0$, thus making the Tobit parameter estimates more efficient. Tobit accounts for the interdependency of the decision to export and actual exporting, and actually assumes the same data generation process for determining the corner solution as well as the outcome variable. This is in line with my hypothesis that the (same) trade facilitation indicators have an impact on both the export probability and the export intensity.

3 EMPIRICAL RESULTS

Following the model specifications, I now turn to the empirical results. I start with the Probit specifications in Table 2 which displays both coefficients and corresponding marginal effects for four different regressions. Columns 1-2 show the results for the control variables (firm characteristics) as a benchmark. In columns 3-8, the trade facilitation variables are added, with *inputforeign* and *impclear* included in separate regressions (columns 5-6 and 7-8, respectively). I add these two variables separately because they concern the importing behavior of firms and could potentially bias the other trade facilitation variables' results.¹³

By comparing columns 3-4 (without *inputforeign*) with columns 5-6 (including *inputforeign*), we see that coefficients only change marginally, confirming the results. Thus, the potential distortionary impact on the other trade facilitation variables can be ruled out. Furthermore, as sample size is greatly reduced when including *impclear*, it makes sense adding this variable in a separate regression (columns 7-8).

In line with my expectations, the control variables' coefficients (*age*, *small*, *large*, *foreign10*, *experience*, *certificate* and *salespc_log*) have the expected sign and are mostly significant. *Age* is positive and significant (except for regressions including *impclear*), implying that older and thus more experienced firms are more likely to become exporters.

For the two size dummies *small* and *large*, I almost always find highly significant results (at the one percent level) with the expected signs (except for *small* in the regressions including *impclear*). This is consistent with the findings in the literature that large firms can exploit economies of scale, are more productive and more easily bear the sunk costs incurred by firms when exporting, while small firms are less likely to engage in foreign activity due to lower capacities in terms of resources, knowledge, and managerial skill.

The coefficients for *foreign10* and *experience* are positive and significant, except for the regressions including *impclear*. The two factors generally concerned with a firm's experience, *age* and *experience*, both turn out to be insignificant if the variable on customs efficiency as an additional determinant of exporting is included, offsetting their positive impact.

Certificate is positive and highly significant (at the one percent level) throughout all regressions, underlining the importance of international networks and a certain technology level as export drivers. This is consistent with the idea that a quality certification affirms product quality, which can be considered essential for entering export markets. As worked out by theory, labor productivity is positive and significant, although it loses its significance in the fourth regression (column 7).

Turning to my trade facilitation variables, the results support the hypothesis that there is a positive relationship between trade facilitation and African firms' export probability. Throughout many regressions, most trade facilitation variables have the intuitive sign and are significant, with the exception of *impclear*. Access to finance is perceived as the

¹³ Exporting behavior is modeled as a function of firm characteristics and trade facilitation, with the latter comprising aspects of importing behavior. As importing behavior can also be modeled as a function of firm characteristics and export behavior, I add the variables separately to be able to rule out an (biasing) impact of *inputforeign* and *impclear* on the other trade facilitation variables.

biggest obstacle by ten percent of all exporters, and should thus be highly relevant for firms' export behavior. I do find a positive association which is significant only in some regressions (columns 3-4 and 7-8). As a robustness check, I also run regressions with other variables proxying for the access to finance – a dummy variable for having credit and a dummy variable for having an overdraft facility – and they are significant in regressions corresponding to columns 3-4 and 5-6.

Exporting appears to be more common when the telecommunications infrastructure is good (*email*)¹⁴ and when firms spend more time on government regulations (*regquality*). Thus, *regquality* seems to capture firms' expertise in dealing with trade rules, rather than reflecting burdensome procedures at government level. Firms rank electricity as the biggest obstacle, but the variable capturing losses from power outages (*losspowerout*) is only significant when *impclear* is included (columns 7-8).

Inputforeign's coefficient in turn is positive and highly significant, indicating that the export probability is higher when transport obstacles are low and thus imports are higher. The coefficient for *impclear*, proxying the burden of customs procedures, surprisingly is not significant. This measure reflects on-the-border trade facilitation (thus referring to a narrow definition of trade facilitation) and should impact firms' decision to export considerably. However, the insignificance might be due to two reasons. First, sample size is greatly reduced when *impclear* is included. Second, we can only observe the days needed to *import* goods, but would rather be interested in factual information on the burden to export, which is unfortunately not available.

Apart from statistical significance, the economic effect of the trade facilitation variables can be quantified. I calculate the marginal effects of the probability of a positive outcome, approximating the effect on $Pr(exp_i = 1)$ in response to a marginal change in a trade facilitation variable, holding all other variables constant (at the multivariate point of means). Overall, the marginal effects mirror the results of their corresponding coefficients concerning significance and sign.

For a hypothetical firm with average values on firm characteristics, the predicted probability of exporting is about 0.05 percent greater if the firm increases the share of imported inputs and supplies marginally (from the average of 28.8 percent). A marginal decrease from the average of 8 percent in the losses from power outages is associated with a 0.6 percent increase (column 8). For telecommunications, my results indicate a strong influence on exporting: A firm using email (or web) has a 9 to 12 percent higher probability of exporting compared to a firm that does not have access to information technologies. Not surprisingly, the marginal effects of being large, foreign owned, having a certificate and the manager's work experience are also of economic significance.

For the Probit regressions including *impclear*, large firms relative to smaller firms have a 23 percent higher probability of exporting, foreign owned firms compared to domestically owned firms have a 6.3 percent higher probability of exporting and having a certificate implies a 15.6 percent higher chance. The age of a firm does have a positive effect, but it is economically negligible.

14 For all regressions, I also include web instead of email and obtain the same results, with coefficients only changing marginally.

As a further control I include the indicator variable *informality* in the regressions, measuring whether a firm competes against unregistered or informal firms, since firms consider practices of competitors in the informal sector as a major constraint (see Table 1). Informal competition seems to have a negative association with the export decision, but results are not robust to different specifications. For example, including *certificate* renders *informality* statistically insignificant (and including the trade facilitation variables has the same effect). Holding an internationally recognized quality document probably puts firms at a competitive advantage so that informal competition does not have any impact.

Tab. 2: Trade Facilitation and Export Probability, Probit Model

Probit model	(1) Coeff.	(2) ME	(3) Coeff.	(4) ME	(5) Coeff.	(6) ME	(7) Coeff.	(8) ME
VARIABLES	exp	exp	exp	exp	exp	exp	exp	exp
age	0.0027* (1.678)	0.0004* (1.678)	0.0043* (1.866)	0.0005* (1.866)	0.00428* (1.860)	0.0005* (1.860)	0.0021 (0.683)	0.0008 (0.683)
small	-0.529*** (-9.157)	-0.0772*** (-9.157)	-0.395*** (-4.490)	-0.0521*** (-4.490)	-0.379*** (-4.261)	-0.0493*** (-4.261)	-0.139 (-0.967)	-0.0527 (-0.967)
large	0.639*** (10.16)	0.120*** (10.16)	0.627*** (7.757)	0.110*** (7.757)	0.616*** (7.618)	0.107*** (7.618)	0.594*** (5.382)	0.230*** (5.382)
foreign10	0.320*** (5.409)	0.0506*** (5.409)	0.213*** (2.617)	0.0302*** (2.617)	0.177** (2.147)	0.0244** (2.147)	0.162 (1.544)	0.0625 (1.544)
experience	0.0073*** (2.877)	0.0010*** (2.877)	0.0069** (1.997)	0.0009** (1.997)	0.0061* (1.740)	0.0008* (1.740)	0.0078 (1.562)	0.0030 (1.562)
certificate	0.540*** (9.241)	0.0950*** (9.241)	0.526*** (6.627)	0.0873*** (6.627)	0.505*** (6.328)	0.0821*** (6.328)	0.402*** (3.673)	0.156*** (3.673)
salespc_log	0.114*** (5.867)	0.0153*** (5.867)	0.0854*** (3.001)	0.0108*** (3.001)	0.0727** (2.512)	0.0091** (2.512)	0.0338 (0.819)	0.0130 (0.819)
loans			0.0031* (1.751)	0.0004* (1.751)	0.0028 (1.592)	0.0004 (1.592)	0.0046* (1.659)	0.0018* (1.659)
regquality			0.0103*** (3.645)	0.0013*** (3.645)	0.0099*** (3.407)	0.0013*** (3.407)	0.0138*** (3.113)	0.0053*** (3.113)
losspowerout			-0.0049 (-1.240)	-0.0006 (-1.240)	-0.0044 (-1.096)	-0.0006 (-1.096)	-0.0157*** (-2.664)	-0.0060*** (-2.664)
email			0.686*** (7.930)	0.0944*** (7.930)	0.667*** (7.605)	0.0905*** (7.605)	0.325** (2.173)	0.120** (2.173)
inputforeign					0.0039*** (4.172)	0.0005*** (4.172)		
impclear							-0.0075 (-1.621)	-0.0029 (-1.621)
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	6,538	6,538	3,632	3,632	3,632	3,632	928	928
Pseudo R-squared	0.297	0.297	0.361	0.361	0.367	0.367	0.232	0.232
Wald chi2	1190	1190	753.6	753.6	785.2	785.2	240.5	240.5
Log pseudolikelihood	-1828	-1828	-1561	-1561	-988.6	-988.6	-484.4	-484.4
p-value	0.000		0.000		0.000		0.000	

Notes: ***significant at 1% level; **significant at 5% level; *significant at 10% level; t-values, reported in parentheses, are corrected for heteroskedasticity; all regressions include a constant term. Coeff. = estimated coefficients, ME = estimated marginal effects of a positive outcome.

Next, I turn to the Tobit model on the intensity of exporting. Table 3 shows the results for firm-level Ordinary Least Squares (OLS) and Tobit (with Maximum Likelihood, MLE) regressions. Columns 1-2 show the results for the control variables (firm characteristics) as a benchmark. In columns 3-8, the trade facilitation variables are added (following the same modus operandi as in Table 2). Comparing the paired coefficients (OLS and Tobit MLE, columns 1-2, 3-4, 5-6 and 7-8), the Tobit coefficients are much larger throughout. As expected, the corner solution causes the OLS coefficients to be biased towards zero.

The control variables' coefficients (*age*, *small*, *large*, *foreign10*, *experience*, *certificate* and *salespc_log*) have the expected sign and are mostly significant as they do not only matter for entering export markets, but also for how much a firm exports. The results on the trade facilitation variables show that trade facilitation indeed also matters for how much African firms export. The variables referring to time spent on government regulations, telecommunications and transport obstacles all have the expected sign and are statistically significant.

However, as in the Probit regressions, no evidence can be found for a significant linkage between the energy infrastructure and exporting behavior. Furthermore, the Tobit coefficients for *loans* (access to finance) are only significant when none of the importing variables are included (columns 3-4). Deploying more information on exporting than in the Probit model (How much do firms actually export?), the variable *impclear* proxying burdensome customs procedures (measured on the import side) turns out to be negative and significant.

Economically, the effects are of small magnitude, except for the very large telecommunications coefficient. When replacing *email* with *web* in the regressions, the strong effect is confirmed. Recent dynamism in Africa has been attributed to a quite large extent to the impressive growth of telecommunications, often referred to as the "information, communications, and technology revolution" on the continent (World Bank 2011). Using these technologies allows people and firms to connect to markets and overcome information deficits and thus holds the potential for large benefits. The results in this paper show that firms' responsiveness to the telecommunication variable is highest relative to the other trade facilitation variables, confirming its positive association with export activity in Africa.

Tab. 3: Trade Facilitation and Export Intensity, Linear and Tobit Model

	(1) Linear (OLS)	(2) Tobit (MLE)	(3) Linear (OLS)	(4) Tobit (MLE)	(5) Linear (OLS)	(6) Tobit (MLE)	(7) Linear (OLS)	(8) Tobit (MLE)
VARIABLES	expvalue_log	expvalue_log	expvalue_log	expvalue_log	expvalue_log	expvalue_log	expvalue_log	expvalue_log
age	0.0145** (2.465)	0.0363* (1.718)	0.0203** (2.362)	0.0509* (1.940)	0.0206** (2.393)	0.0530** (2.012)	0.0110 (0.787)	0.0195 (0.714)
small	-0.826*** (-7.204)	-8.358*** (-9.977)	-0.549*** (-3.574)	-5.955*** (-5.077)	-0.499*** (-3.228)	-5.721*** (-4.846)	-0.689 (-1.465)	-2.103 (-1.444)
large	3.803*** (13.46)	9.243*** (11.22)	3.729*** (10.29)	8.116*** (8.414)	3.694*** (10.24)	7.930*** (8.309)	3.568*** (6.819)	6.105*** (6.085)
foreign10	1.114*** (5.775)	4.510*** (5.750)	1.131*** (3.971)	2.736*** (2.884)	1.043*** (3.660)	2.310** (2.425)	0.904** (2.067)	1.812** (1.984)
experience	0.00740 (1.079)	0.107*** (3.094)	0.0067 (0.687)	0.0935** (2.229)	0.0045 (0.460)	0.0807* (1.916)	0.0315 (1.543)	0.0809* (1.827)
certificate	1.805*** (8.522)	7.514*** (9.691)	1.726*** (5.839)	6.458*** (6.906)	1.672*** (5.658)	6.202*** (6.641)	1.671*** (3.484)	3.599*** (3.738)
salespc_log	0.332*** (6.632)	1.960*** (7.218)	0.332*** (4.470)	1.493*** (4.255)	0.304*** (4.056)	1.352*** (3.801)	0.529*** (2.942)	0.875** (2.311)
loans			0.0147** (2.319)	0.0344* (1.677)	0.0140** (2.204)	0.0321 (1.560)	0.0191 (1.628)	0.0369 (1.621)
regquality			0.0260*** (3.206)	0.130*** (3.895)	0.0257*** (3.134)	0.124*** (3.616)	0.0524*** (2.956)	0.124*** (3.205)
losspowerout			-0.0125* (-1.769)	-0.0572 (-1.104)	-0.0121* (-1.704)	-0.0495 (-0.954)	-0.0546** (-2.452)	-0.148** (-2.468)
email			1.032*** (6.195)	9.645*** (8.256)	0.976*** (5.829)	9.334*** (7.909)	0.982** (1.994)	3.615** (2.365)
inputforeign					0.0090*** (3.725)	0.0459*** (3.924)		
impclear							-0.0333* (-1.949)	-0.0741* (-1.657)
Sector dummies	yes	yes	yes	yes	yes	yes	yes	yes
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes
Observations	6,538	6,538	3,632	3,632	3,632	3,632	928	928
(Pseudo) R-squared	0.303	0.146	0.357	0.176	0.354	0.174	0.339	0.0893
Log pseudolikelihood	-18013	-4840	-10107	-2882	-10116	-2890	-2894	-1756
Root MSE	3.820		3.940		3.949		5.627	

Notes: ***significant at 1% level; **significant at 5% level; *significant at 10% level; t-values, reported in parentheses, are corrected for heteroskedasticity; all regressions include a constant term. The samples correspond to the Probit regression samples.

4 FURTHER EMPIRICAL RESULTS

4.1 Instrumental Variable (IV) Regressions

To check the robustness of the results, the models are re-estimated (Probit and Tobit, in comparison to a linear model with OLS), this time taking account of endogeneity in trade facilitation by including instruments for each of my trade facilitation variables. The trade facilitation variables are based on experiences by individual firms, although they are supposed to be externally determined. Also, survey data generally is prone to measurement error and selection bias. By using a control-function approach in which residuals from a first stage reduced form for the continuous endogenous regressor are introduced as covariates in the second stage structural model, I am able to correct for biases that arise due to selection and/or endogeneity.¹⁵

The trade facilitation variables are included one at a time and instrumented with their sector-region averages. For example, I take the average of *losspowerout* for firms manufacturing metals and machinery in Kaduna, a region in central Nigeria. This sector-regional mean is deployed as an instrument for the trade facilitation indicator observed by individual firms, supposing that this averaged trade facilitation indicator is relevant for all firms of that industry in Kaduna.

The argument is further that sector-region averages as instruments for trade facilitation indicators at firm-level explain variation in firm performance, but individual firm performance has no impact on the average indicator. For example, if a firm exports more, it is more likely to spend more time on government regulations (*regquality*). In this case, the sector-region average can be considered exogenous to the firm's exporting decision.

However, as exporting firms are around six times larger than firms supplying the domestic market, they potentially dominate production and exporting in their sectors. If this is the case, exporting firms do have an impact on the respective sector-region averages, violating the instruments' validity, which requires it to be uncorrelated with the unobservable determinants of the dependent variable. In order to safeguard the instruments' validity, a firm's own influence is excluded from its reported average by subtracting the individual firm's value from the respective sector-region average assigned to this individual firm.

Table 4 displays the results from the Instrumental Variable (IV) outcome regressions for the six trade facilitation variables. All regressions include the same control variables as displayed in Table 2 and 3. This time, the results are reported in columns rather than rows. By including the trade facilitation variables separately in each regression, I am able to look at one (causal) question at a time and allow for an easy interpretation of results.¹⁶ The number of firms is restricted to the same sample used in the Probit and Tobit regressions in Table 2 and 3, columns 5-6. For the regressions with *impclear* in the last

¹⁵ The estimation with endogenous regressors involves running a linear regression of the endogenous variable on the instrumental variable and all other regressors, and then estimating the Probit/Tobit model by including the residuals from the reduced form equation which function as correction terms.

¹⁶ Furthermore, adding multiple endogenous regressors leads to convergence problems with MLE.

column of Table 4, the sample is adjusted accordingly (matching the sample in Table 2 and 3, columns 7-8).¹⁷

In contrast to the firm level regressions, *loans* and *regquality* are not significant. When taking endogeneity into account, it seems that firms' exporting behavior is not responsive to access to finance or the time spent on government regulations. However, it may be that the IV model choice is not appropriate for these regressions, as I cannot reject the null hypothesis of exogeneity (correlation between the error terms in the structural equation and the reduced-form equation for the endogenous variable), as reported by the Wald test of exogeneity.¹⁸ Thus, for *loans*, *regquality* and also *impclear*, using the sector-regions as instruments for the trade facilitation variable might not be the appropriate decision. As there is no test for weak instruments for IV Probit or IV Tobit, I can only check this for the two-stage Least Squares (2SLS) model, and do not find evidence for a weak-instrument problem, with the exception of the regression including *impclear*.¹⁹

For the other three variables *losspowerout*, *email* and *inputforeign*, I find statistically and economically significant results, substantiating their impact on firms' export behavior. Note that using IV in Probit and Tobit regressions, it is assumed that the endogenous regressor is continuous. It is therefore not applicable for the discrete variables *email* or *web*, therefore the coefficient for *email* is only reported for the IV Two-stage Least Squares (2SLS) model. As in the firm-level regressions, the impact of telecommunications is largest by far.

¹⁷ The number of firms is slightly smaller for the IV regressions due to missing observations for the instrumental variables. Generally, results only change marginally when the sample is not restricted.

¹⁸ For MLE with a single endogenous variable, the test is a Wald test that for the two error terms the correlation parameter $\rho = 0$.

¹⁹ The R-squared is reasonably high, and the F-statistic is large and significant (above the commonly accepted threshold of 10), except for the regression including *impclear*, and, just missing the threshold, *regquality*.

Tab. 4: Instrumental Variable Regressions on Trade Facilitation

VARIABLES	(1) loans	(2) regquality	(3) losspowerout	(4) email	(5) inputforeign	(6) impclear
IV Probit (MLE)						
Coeff.	0.0568**	0.0197	-0.0525***		0.0215***	-0.0358
	(2.296)	(0.478)	(-2.708)		(5.598)	(-0.611)
ME	0.0188**	0.0054	-0.0143**		0.0055***	-0.0122
	(2.30)	(0.46)	(-2.31)		(3.98)	(-0.55)
Observations	3,570	3,570	3,570		3,570	905
Wald test of exog.	1.34	0.04	4.63		11.44	0.22
Prob > chi2 (exog)	0.246	0.835	0.0314		0.0007	0.641
IV Linear (2SLS)	0.222	-0.00230	-0.0832*	5.058***	0.0778***	-0.131
	(0.836)	(-0.0241)	(-1.754)	(3.338)	(3.777)	(-0.445)
Observations	3,570	3,570	3,570	3,570	3,570	905
IV Tobit (MLE)	1.114	0.332	-0.717**		0.298***	-0.231
	(0.951)	(0.614)	(-1.971)		(3.408)	(-0.401)
Observations	3,570	3,570	3,570		3,570	905
Wald test of exog.	0.83	0.12	3.49		8.05	0.09
Prob > chi2 (exog)	0.36	0.73	0.06		0.004	0.76

Notes: ***significant at 1% level; **significant at 5% level; *significant at 10% level; t-values, reported in parentheses, are corrected for heteroskedasticity; all regressions include a constant term, sector and country dummies. Coeff. = estimated coefficients, ME = estimated marginal effects of the probability of a positive outcome. IV Probit and IV Tobit are not applicable to the binary regressors *email* or *web*.

4.2 Locational Factors

To check whether locational factors play a role for firms' export market participation, I construct geographical indicators at region/city level for each of the 112 regions included in the sample: *Landlock* (dummy = 1 if region/city is landlocked and would be at disadvantage even if the country itself is not landlocked), *capital* (dummy = 1 if region/city is the capital), and *port* (dummy = 1 if region/city is located at a sea port). It is expected that the proximity to a port and being close to a large market (the capital) have a positive effect. There is better availability of skilled labor, better transportation infrastructure, proximity to research facilities and policy support by regional institutions. I cannot detect this effect in my results.

Landlock, *capital* and *port* are not significant irrespective of including the trade facilitation variables in the regressions or not. This is valid for both the Probit and the IV Probit model; for the latter, the dummy *capital* is negative and significant in one single regression including *loans*. Overall, I have to reject my hypothesis of the negative effect of geographical distance and the positive effect of capital or port proximity.

5 CONCLUSION

As tariffs and other direct border restrictions to trade are decreasing in importance, the decision of firms to export is increasingly contingent on the elimination of behind-the-border restrictions and a trade-enabling environment. This paper confirms the crucial link between trade facilitation measures and export behavior. The results on the trade facilitation variables support the hypothesis that both African firms' export probability and export intensity are positively associated with trade facilitation.

Firms exporting behavior is most responsive to telecommunications, which holds the potential for large future benefits. Many exporters consider transport and the energy infrastructure to be severe obstacles compared to other obstacles affecting firms' operations, and the results confirm that both indeed are negatively related to exporting.

When taking account of the potential endogeneity of the trade facilitation indicators, I do find strong effects for the energy infrastructure, telecommunications and the proxy for transport obstacles on firm's export probability as well as their export intensity, but I cannot corroborate the results for access to finance, regulatory quality and customs efficiency. Geographical factors concerning the city/region where a firm is located in seem to be irrelevant for firms' exporting behavior.

In light of the evidence that trade facilitation matters for manufacturing firms, and that they actually learn from exporting and become more productive, why is not more effort put into facilitating trade? The topic is highly relevant particularly for African countries, where improvements in on-the-border and behind-the-border policies on average yield a higher return in terms of increasing manufacturing export performance than in the rest of the world (Iwanow and Kirkpatrick 2009). In contrast to low cost or even costless liberalization measures (i.e. there are no direct costs from the removal of tariffs) trade facilitation belongs to a resource intensive trade policy which involves institutional change and other pecuniary measures. The lower degree to which a country already has well-functioning border procedures, domestic institutions and human resources, the higher are the associated costs of reforming.

Trade facilitation is part of a general (trade) reform which makes any cost assessment difficult. This can explain why developing countries might be reluctant to commit to trade facilitation in the WTO. Nonetheless, policies encouraging exports, for example those dealing with trade facilitation in its narrower sense like eliminating inefficiencies at borders (ports and airports), streamlining regulatory business procedures and supporting industry clusters, may help African firms become more competitive in the short to medium term. In this regard, effectively delivering Aid for Trade can play an important role in facilitating trade and supporting the private sector in Africa to better harness the benefits from trade.

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APPENDIX

APPENDIX A

A.1 Country Sample and Distribution of Firms across Countries

Country	Year of survey	Number of exporting firms	Number of non-exporting firms	Total number of firms
Angola	2006	3	265	268
Benin	2009	7	32	39
Botswana	2006	22	120	142
Burkina Faso	2009	9	75	84
Burundi	2006	3	136	139
Cameroon	2009	26	82	108
Cape Verde	2009	2	42	44
Chad	2009	7	34	41
Congo	2009	2	18	20
Dem. Rep. Congo	2006	10	180	190
Eritrea	2009	7	49	56
Gabon	2009	4	20	24
Gambia	2006	5	60	65
Ghana	2007	26	265	291
Guinea	2006	15	112	127
Guinea Bissau	2006	6	71	77
Ivory Coast	2009	16	158	174
Kenya	2007	145	250	395
Lesotho	2009	18	25	43
Madagascar	2009	49	121	170
Malawi	2009	11	44	55
Mali	2007	24	272	296
Mauritania	2006	11	112	123
Mauritius	2009	42	113	155
Mozambique	2007	13	308	321
Namibia	2006	30	119	149
Niger	2009	9	23	32
Nigeria	2007	18	885	903
Rwanda	2006	11	57	68
Senegal	2007	36	216	252
Sierra Leone	2009	160	514	674
South Africa	2007	25	76	101
Swaziland	2006	35	245	280
Tanzania	2006	5	18	23
Togo	2009	38	293	331
Uganda	2006	40	238	278
Zambia	2007	3	265	268
Total		890	5,648	6,538

A.2 Distribution of Firms across Sectors, Share of Exporters per Sector

Sector	Total number of firms	Share of exporters (%)
Other manufacturing*	2,144	11.01
Food	1,644	10.34
Garments	1,149	11.75
Metals and machinery	617	18.96
Chemicals and pharmaceuticals	314	28.66
Non-metallic and plastics	239	24.69
Wood and furniture	223	4.48
Textiles	147	36.73
Electronics	50	30.00
Leather	11	36.36
Total	6,538	13.61

*Other manufacturing includes: Tobacco, paper, recorded media, refined petroleum products, non-metallic mineral products, precision instruments, and transport machines.

APPENDIX B

Definition of Variables and Data Sources

Variable	Description
exp	Dummy = 1 if proportion of sales that are exported directly takes a positive value (>0).
expvalue_log	Log exports, calculated from export share and sales, in US dollars, deflated.
age	Age of the firm based on the year in which the firm began operations (survey year minus year firm began operations).
small	Dummy = 1 if establishment has 5-19 workers. Firm size is a composite measure of permanent and temporary workers.
large	Dummy = 1 if establishment has at least 100 workers. Firm size is a composite measure of permanent and temporary workers.
foreign10	Dummy = 1 if at least ten percent of the firm is owned by foreign individuals, companies or organizations.
certificate	Percentage of firms that have an internationally-recognized quality certification, i.e. ISO 9000, 9002 or 14000.
experience	Years of experience of the top manager working in the sector.
salespc_log	Log of sales per worker (labor productivity), calculated from total sales and number of employees (permanent and temporary).
loans	Proportion of the working capital that was borrowed from banks, and from non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies.
email	Dummy = 1 if firm uses email to interact with clients or suppliers.
web	Dummy = 1 if firm uses website for business related activities, i.e. sales, product promotion etc.
regquality	Average percentage of senior management's time that is spent in a typical week dealing with requirements imposed by government regulations (e.g. taxes, customs, labor regulations, licensing and registration), including dealings with officials, completing forms, etc.
losspowerout	Losses as percentage of annual sales that resulted from power outages.
inputforeign	Percentage of material inputs and/or supplies of foreign origin.
impclear	Average number of days from the time imported material inputs or supplies arrived to their point of entry (e.g. port, airport) until the time these goods could be claimed from customs.
informality	Dummy = 1 if firm competes against unregistered or informal firms.
port	Dummy = 1 if firm is located in a region/city at a sea port.
landlock	Dummy = 1 if firm is located in a region/city that is landlocked.
capital	Dummy = 1 if firm is located in a region/city that is the country's capital.

Note: Data source for all variables are the Enterprise Surveys by the World Bank (World Bank 2012c).

APPENDIX C

Descriptive Statistics

Variable	Exporting firms					Non-exporting firms				
	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
export	890	36.39	32.87	0.1	100	5648	0.00	0.00	0	0
expvalue_log	890	12.99	2.62	3.22	24.60	5648	0.00	0.00	0	0
age	890	22.00	17.90	1	117	5648	13.31	12.35	0	190
small	890	0.20	0.40	0	1	5648	0.65	0.48	0	1
large	890	0.44	0.50	0	1	5648	0.07	0.26	0	1
foreign10	890	0.36	0.48	0	1	5648	0.12	0.33	0	1
experience	890	16.88	10.43	0	75	5648	13.23	9.44	0	68
certificate	890	0.41	0.49	0	1	5648	0.11	0.31	0	1
salespc_log	890	10.00	1.98	4.09	18.74	5648	9.08	2.11	0	20.46
loans	887	12.18	22.02	0	100	5636	4.67	15.37	0	100
email	877	0.87	0.33	0	1	5615	0.37	0.48	0	1
web	873	0.46	0.50	0	1	5609	0.13	0.33	0	1
regquality	853	9.46	12.66	0	100	5465	6.07	9.99	0	100
losspowerout	591	6.09	8.99	0	70	3562	8.08	10.24	0	100
inputforeign	856	48.53	38.35	0	100	5163	25.18	35.80	0	100
impclear	551	9.24	12.56	0	120	934	10.82	14.34	0	122
informality	522	0.47	0.50	0	1	3493	0.64	0.48	0	1

Note: Descriptive statistics are for the sample of 6,538 firms from regressions in columns 1-2 in Table 2 and in Table 3, respectively.