

# Trade Facilitation and Exports – Evidence from African Manufacturing Firms

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**Abstract:** Facilitating trade is essential for Africa’s economic development and further integration into the world economy. As artificial trade barriers like tariffs have fallen in recent decades, the significance of other trade costs like those related to trade regulations, transport infrastructure and the business environment has become more evident. Despite high economic growth rates in many African countries and the prevalent dynamism on the continent, business in Africa still suffers from behind-the-border barriers to trade which negatively impact overall trade flows. Given that transaction costs matter, 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. This paper empirically investigates the determinants of African firms’ export decisions with a special focus on trade facilitation measures. I use firm level data to assess the responsiveness of firms’ exporting behavior to various trade facilitation measures and trade restrictions like access to finance. I also include country-level data on trade facilitation in the analysis. Overall, I find that trade facilitation increases 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. Data come from the World Bank’s Enterprise Surveys and cover more than 7,000 manufacturing firms from 37 countries in Sub-Saharan Africa.

Key words: Trade Facilitation, Trade Barriers, Africa, Firm-level Data, Export Probability  
JEL codes: F13, F15

## INTRODUCTION

International trade has increased immensely over the last few years 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 amount to as much as 15 percent of the value of the goods traded, according to OECD estimates (OECD 2005). Each additional day that a product is delayed prior to being shipped reduces trade by more than one percent (Djankov et al. 2010). For example, it takes about 37 days for a regular import transaction in sub-Saharan Africa, while it only takes 14 days in the Philippines. It takes about three times as long for exports to clear customs in Namibia as in OECD countries (World Bank 2012).

Africa’s<sup>1</sup> trade performance has rather been disappointing. Africa’s share of world export has dropped from five percent in the 1970s to around three percent today. Trade costs are considered to be particularly high in African countries. As artificial trade barriers like tariffs have fallen in recent decades, the significance of these other trade costs like those related to trade regulations, transport infrastructure and the business environment has become more evident. Business still suffers from behind-the-border barriers to trade 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. Given that

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<sup>1</sup> In this paper, ‘Africa’ always refers to Sub-Saharan Africa. Both terms are used interchangeably.

transaction costs matter, 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 two decades that started examining trade at individual firm level. What factors prevent firms from exporting, considering that there are considerable business opportunities abroad, or 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).<sup>2</sup> 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 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 manufacturing export share is as low as 14 percent – are 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 bad access to finance, underdeveloped physical and telecommunications' infrastructure, unreliable energy supply, insufficient knowledge about international markets and informal competition. Lower trade costs would encourage low-productivity firms to become exporters if they find it profitable to export. Trade facilitation cannot only increase domestic productivity within a country, but 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.

This paper empirically investigates the determinants of African firms' exporting behavior with a special focus on trade facilitation measures. I use both firm level and country data in a probit model to assess the responsiveness of firms' exporting behavior to various trade facilitation measures and trade restrictions like access to finance. Furthermore, I apply a tobit model to investigate whether trade

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<sup>2</sup> 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.

facilitation/lower trade barriers can increase a firm's intensity to export, i.e. how much it exports. The paper is structured as follows: In the next section, I define trade facilitation and present a brief overview of previous research on the relationship between trade facilitation and exports. Then, the data used and the empirical strategy are described. In the empirical analysis in the next section, 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. The final section concludes.

## TRADE FACILITATION AND A BRIEF LITERATURE REVIEW

Trade facilitation takes center stage in finding a successful strategy in reducing trade costs and improving 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, communicating and processing data required for the movement of goods in international trade. 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).

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 by individual firms.

At country-level, a positive association between trade facilitation measures and aggregate export volumes is well documented for developing countries. Trade facilitation reforms improve the export performance, which is particularly true for investment in infrastructure and regulatory reform (Portugal-Perez and Wilson 2012). Improved trade facilitation can also help to promote export diversification in developing countries (Dennis and Shepherd 2001). For Africa, Freund and Rocha (2011) show that long delays in trade explain much of Africa's weak export performance and that the source for this underperformance lies in weak institutional features, not geography. Poor infrastructure is considered as an important factor for Africa's weak export performance and high transport and trade costs (Limão and Venables 2001), which have been shown to be higher in Africa than in other developing countries (Portugal-Perez and Wilson 2008). Wilson et al. (2005) demonstrate 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. They suggest that trade facilitation is most effective in the area of legal and administrative reforms. Iwanow and Kirkpatrick (2009) estimate a standard gravity model augmented with trade facilitation, regulatory quality, and infrastructure indicators and show that improvements in on-the-border and behind-the-border policies yield a higher return in terms of increasing manufacturing export performance in African countries than in the rest of the world.

At 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 single countries or regions due to data availability. For South America and Asia, Dollar et al. (2006) estimate a probit model, showing that exports and foreign direct investment are higher where the investment climate is better. For Asia, it has been found that trade facilitation indicators increase both probability and propensity of exporting, and that improving policy predictability matters more to small and medium-sized firms than improving the transport infrastructure (Li and Wilson 2009). Correa et al. (2007) estimate a Heckman selection model for Ecuador, finding that technology matters, but infrastructure does not for both firm export probability and how much an exporter sells abroad. In Africa,<sup>3</sup> 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 (2010) investigates 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, using a large sample of manufacturing firms covering 37 African countries which captures the export and development diversity of the region more adequately than studies on smaller regional samples. By using both a probit model and a tobit model with instrumented trade facilitation variables, I combine several methodological approaches to analyze firms' exporting behavior. I hypothesize that firms' responsiveness to different trade facilitating measures can be derived from the ranking of obstacles affecting the firms' operation: Those obstacles perceived highest by African firms supposedly impact firms' probability to export most negatively when measured by objective indicators. Furthermore, I check whether trade facilitation indicators at country level support my results at firm-level, and 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.

## RESEARCH DESIGN

### *Data and Variables*

Data come from the Enterprise Surveys database by the World Bank and cover 37 countries in Sub-Saharan Africa (see Appendix A.1 for the country sample). 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 7,008 manufacturing firms

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<sup>3</sup> For Africa, Bigsten and Söderbom (2006) provide an overview on Manufacturing Enterprise Survey use.

from 37 countries in Sub-Saharan Africa which were interviewed between 2006 and 2009.<sup>4</sup> I use manufacturing firms only because manufacturers are intensive users of trade facilitating services, and are thus particular at disadvantage due to high transaction costs when exporting.<sup>5</sup> In case firms were re-interviewed using the same global methodology (in Angola, Botswana, Dem. Rep. 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-Sahara Africa.

About 14 percent of all manufacturing firms are exporters, with wide variation across countries.<sup>6</sup> Export participation is highest in Lesotho and Kenya with 41 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: Exporting firms are almost 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.<sup>7</sup> The majority of exporters come from the sectors food, garments, metals and machinery and other manufacturing, while the most export-oriented sectors, i.e. those sectors with the highest number of exporters, are Leather, Textiles and Electronics.<sup>8</sup>

The Enterprise Surveys also ask survey respondents to identify, out of a list of 15, which is 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.

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

<b>Most serious obstacle</b>	<b>Exporters %</b>	<b>Non-exporters %</b>
Electricity	28.03	38.39
Access to finance	10.47	17.19
Transport	8.62	4.57
Crime, theft and disorder	7.63	6.31
Practices of competitors in the informal sector	7.42	7.96
Inadequately educated workforce	7.20	2.52
Tax rates	7.09	6.19
Corruption	5.78	3.84
Customs and trade regulations	4.03	1.44
Political instability	3.27	2.90
Labor regulations	2.84	1.01
Tax administration	2.84	1.91
Access to land	2.73	3.68
Business licensing	1.42	1.61
Courts	0.65	0.49
<b>Total</b>	<b>100</b>	<b>100</b>

<sup>4</sup> 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.

<sup>5</sup> 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.

<sup>6</sup> See Appendix A.1 for the surveyed firms' distribution across countries and their exporting status.

<sup>7</sup> See Appendix C for descriptive statistics.

<sup>8</sup> See Appendix A.2 for the firms' distribution across sectors.

By far, the obstacles perceived highest by most firms are electricity and access to finance, followed by transport for exporters, which is 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, practices of competitors in the informal sector, an inadequately educated workforce and tax rates as obstacles to their business activities. These perceptions do not only help policymakers in prioritizing reform programs, but also in analyzing trade facilitation measures on exporting behavior.

The trade facilitation measures used in this analysis are

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

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.

*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 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 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.<sup>9</sup>

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).

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<sup>9</sup> 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.

The variables *expclear* and *impclear* measure red tape at borders, i.e. how long it takes to clear exports and imports and thus how efficient customs and trade regulations work in a country. *Expclear* is only defined for exporters (since it refers to actual days in exporting and not the expectation of clearing time) and thus only enters the model on export intensity. In the probit model, *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 (*expvalue*).

### *Empirical strategy*

In a first step, I estimate a probit model to determine the factors influencing the export decision of African firms:

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

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

where the dependent variable  $exp_i^*$  is a binary variable that takes the value 1 if firm *i* exports. Firm characteristics include the age of a firm (*age*), its size (dummy variables *small* and *large*), its foreign ownership status (dummy variable *foreign10*), whether a firm produces according to international

standards (dummy variable *certificate*) and the firm manager's experience in years (*experience*). 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 year dummies which account for sector and country specific effects.  $\varepsilon_i$  stands for the error term.

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. However, endogeneity might still be an issue. Therefore, I estimate three different variants of including the trade facilitation variables into the probit model: The first includes individual firm-level data of firm characteristics and the trade facilitation variables. For the second variant, I construct sector-region specific averages of all trade facilitation variables. This not only extends coverage to firms operating within the same sectors of each region that have not answered when being surveyed (Li and Wilson 2009), but it could also help alleviate potential endogeneity problems associated with the trade facilitation measures, and clean out erroneous individual survey respondents' perceptions (Clarke 2005; Dollar et al. 2006). For example, I take the average of *losspowerout* for firms manufacturing metals and machinery in Kaduna, Nigeria, and this sector-regional mean enters the regressions, supposing that this averaged trade facilitation indicator is relevant for all firms of that industry in Kaduna. By nature, the sample increases through sector-region-averaging, as firms with previously missing observations on the trade facilitation variables now obtain sector-region values. In a third variant, I include the trade facilitation variables one at a time and instrument them with the sector-region averages established in the second variant. Using an instrumental variable probit model makes sense as the trade facilitation variables are based on experiences by individual firms, although they are supposed to be externally determined. The argument is 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. In this case, the sector-region average can be considered exogenous to the firm's exporting decision.

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. Having a censored dependent variable, the standard solution is to estimate the tobit model by maximum likelihood. The export propensity is defined as

$$expvalue_i^* = \alpha + \beta_1 firm\ characteristics_i + \beta_2 trade\ facilitation_i + D_s + D_c + \varepsilon_i$$

$$\begin{aligned} &\text{then } expvalue_i = 0 \text{ if } expvalue_i^* \leq 0 \\ &\text{and } expvalue_i = expvalue_i^* \text{ if } 0 < expvalue_i^* \end{aligned}$$

As dependent variable, I use the log of firms' total exports (*expvalue*). Firm characteristics and trade facilitation are the same variables as explained above for the probit model. One additional trade facilitation variable is included: *expclear*, the number of days it takes for exported goods to clear customs.  $D_s$  and  $D_c$  are sector and year dummies which account for sector and country specific effects.

$\varepsilon_i$  stands for the error term. I follow the same procedure for the tobit model as before: First, I include the individual firm-level trade facilitation variables, then I include sector-region averages, and finally, I use an instrumental variable tobit model.

## RESULTS

Following the model specifications, I now turn to the empirical results. I start with the probit specifications, which include all control variables and the trade facilitation variables. As sample size is reduced when including *inputforeign* and *impclear*, I add these two variables in separate regressions. Table 2 shows the results for individual firm-level (columns 1-3), sector-region averaged (columns 4-6) and instrumented (columns 7-11) trade facilitation variables.

In line with my expectations, the control variables' coefficients (*age*, *small*, *large*, *foreign10*, *certificate* and *experience*) have the expected sign and are 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. 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. *Foreign10* and *certificate* are positive and highly significant throughout all regressions, underlining the importance of international networks and meeting 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. The coefficient for *experience* is positive and significant, except for the regressions including *impclear*. The two factors generally concerned with a firm's experience, *age* and *experience*, turn out to be insignificant if the variable on customs efficiency as an additional determinant of exporting is included, offsetting their positive impact.

Turning to my trade facilitation variables, the results strongly support the hypothesis that there is a positive relationship between trade facilitation and African firms' export probability. Throughout most regressions, all trade facilitation variables except for access to finance have the intuitive sign and are significant. Exporting is more common when the telecommunications infrastructure is good (*web*)<sup>10</sup> 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.<sup>11</sup> However, the variable is insignificant when it enters the regressions as sector-region average. Firms are more prone to export when losses from power outages are low (*losspowerout*), transport obstacles are low and thus imports are higher (*inputforeign*), and the burden of customs procedures is low (*impclear*).

Access to finance is perceived as the biggest obstacle by ten percent of all exporters, and should thus be highly relevant for firms' export behavior. However, I cannot observe this correlation in my results. *Loans* is only positive and significant in two regressions with individual firm level measures (columns 1 and 3). Thus, the hypothesis that firms' perceptions on the business environment should be

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<sup>10</sup> For all regressions, I also include *email* instead of *web* and obtain the same results, with coefficients only changing marginally.

<sup>11</sup> There seems to be a threshold level up to which the time spent has a positive impact. A dummy variable indicating that at least half of senior management time is spent on government regulations becomes statistically insignificant, while lower time shares of ten and 20 percent are (still) positive and significant.

reflected when using more objective trade facilitation measures in the empirical analysis has to be rejected concerning the access to finance.<sup>12</sup>

Table 2. Trade Facilitation and Exporting probability, probit model

VARIABLES	trade facilitation at firm-level			trade facilitation, sector-region averages			trade facilitation instrumented				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	exp	exp	exp	exp	exp	exp	exp	exp	exp	exp	exp
age	0.00352 (1.589)	0.00395* (1.715)	0.00198 (0.657)	0.00345** (2.161)	0.00351** (2.207)	0.00365** (2.228)	0.00274* (1.726)	0.00312* (1.879)	0.00426** (2.112)	0.00311* (1.913)	0.00188 (0.824)
small	-0.545*** (-6.937)	-0.528*** (-6.388)	-0.205 (-1.519)	-0.533*** (-9.142)	-0.527*** (-9.014)	-0.528*** (-8.712)	-0.550*** (-9.434)	-0.536*** (-8.903)	-0.609*** (-8.246)	-0.502*** (-8.024)	-0.320*** (-3.247)
large	0.608*** (7.651)	0.608*** (7.444)	0.573*** (5.194)	0.638*** (10.13)	0.636*** (10.09)	0.656*** (10.13)	0.646*** (10.41)	0.650*** (10.26)	0.643*** (8.362)	0.618*** (9.537)	0.611*** (6.877)
foreign10	0.307*** (3.977)	0.219*** (2.719)	0.179* (1.736)	0.352*** (5.998)	0.343*** (5.840)	0.345*** (5.748)	0.362*** (6.243)	0.354*** (5.976)	0.319*** (4.304)	0.261*** (4.112)	0.219*** (2.741)
certificate	0.551*** (7.269)	0.542*** (6.852)	0.407*** (3.778)	0.575*** (9.901)	0.571*** (9.793)	0.557*** (9.379)	0.590*** (10.38)	0.609*** (10.52)	0.587*** (7.940)	0.583*** (9.567)	0.354*** (4.295)
experience	0.00667** (2.043)	0.00614* (1.808)	0.00762 (1.556)	0.00645** (2.505)	0.00613** (2.372)	0.00634** (2.375)	0.00685*** (2.693)	0.00701*** (2.739)	0.00679** (2.150)	0.00486* (1.848)	0.00183 (0.483)
loans	0.00360** (2.127)	0.00280 (1.592)	0.00457* (1.721)	0.00181 (0.460)	-8.18e-06 (-0.00201)	0.00248 (0.564)	0.00278 (0.804)				
web	0.412*** (5.304)	0.393*** (4.872)	0.285*** (2.743)	0.455** (2.484)	0.405** (2.165)	0.478** (2.423)					
regquality	0.0105*** (4.071)	0.00954*** (3.406)	0.0111*** (2.657)	0.0144** (2.318)	0.0129** (1.979)	0.0144** (2.013)		0.0159** (2.513)			
losspowerout	-0.00359 (-0.969)	-0.00404 (-1.036)	-0.0162*** (-2.745)	-0.0148*** (-2.842)	-0.0135** (-2.559)	-0.0146** (-2.391)			-0.0253*** (-3.583)		
inputforeign		0.00437*** (4.882)			0.00511*** (3.112)					0.00691*** (4.288)	
impclear			-0.00805* (-1.775)			-0.00819** (-2.378)					-0.0141** (-2.448)
Observations	4,115	3,657	951	6,540	6,481	5,468	6,726	6,496	4,236	6,142	1,496
R-squared pseudo	0.346	0.349	0.232	0.298	0.299	0.284	0.232	0.235	0.244	0.244	0.222
Log pseudolikelihood	-1094.2037	-1023.5893	-494.79056	-1809.9981	-1800.7585	-1683.9394	-29136.82	-25602.944	-16187.91	-31215.171	-6367.2258
Chi-Square	813.84	782.23	247.28	1159.81	1159.62	1043.32	1207.72	1184.2	859.05	1197.63	330.4
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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, sector dummies and country dummies. Using IV in probit regressions, it is assumed that the endogenous regressor is continuous. It is therefore not applicable for the discrete variables *email* or *web*.

Apart from statistical significance, the economic effect of the trade facilitation variables can be quantified. I calculate the marginal effects for the IV probit regressions holding all other variables at their means, approximating the effect on  $Pr(exp_i = 1)$  if a trade facilitation variable changes marginally. For example, for a hypothetical firm with average values on firm characteristics, the predicted probability of exporting is about one 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 10 days in the number of days needed to import is associated with a 1.4 percent increase in exporting, and a marginal decrease from the average of 8 percent in the losses from power outages with a 2.5 percent increase. The marginal effects of these measures in the probit regressions with sector-region averaged variables become smaller. The other trade facilitation measures seem to partly absorb their influence. Telecommunications does have a strong influence on exporting: A firm using web or email has a five 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 and having a certificate are also of economic significance. For the probit regressions with sector-region averages including *impclear*, large firms relative to smaller firms have a 14 percent higher probability of exporting, foreign owned firms compared to domestically owned firms have a

<sup>12</sup> An alternative explanation is that the variable is misspecified and actually does not measure the access of finance, but merely the use of it. See short discussion in footnote 9 of this paper.

seven percent higher probability of exporting and having a certificate implies an eleven percent higher chance.<sup>13</sup>

Next, I turn to the tobit model on the intensity of exporting. Table 3 shows the results for individual firm-level (columns 1-4), sector-region averaged (columns 5-8) and instrumented (columns 9-14) trade facilitation variables. As expected, the control variables' coefficients (*age*, *small*, *large*, *foreign10*, *certificate* and *experience*) 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.

Table 3. Trade Facilitation and Exporting Intensity, tobit model

VARIABLES	trade facilitation at firm-level				trade facilitation, sector-region averages				trade facilitation instrumented					
	(1) expvalue	(2) expvalue	(3) expvalue	(4) expvalue	(5) expvalue	(6) expvalue	(7) expvalue	(8) expvalue	(9) expvalue	(10) expvalue	(11) expvalue	(12) expvalue	(13) expvalue	(14) expvalue
age	0.0470* (1.744)	0.0529*** (7.279)	0.0224*** (3.078)	0.00862** (2.063)	0.0504** (2.352)	0.0508** (2.381)	0.0498** (2.321)	0.0522** (2.486)	0.0454** (2.110)	0.0518** (2.312)	0.0597** (2.237)	0.0515** (2.385)	0.0273 (1.139)	0.00574 (1.643)
small	-8.576*** (-7.858)	-8.180*** (-32.09)	-3.078*** (-12.72)	-1.884*** (-8.672)	-8.641*** (-10.00)	-8.522*** (-9.838)	-8.330*** (-9.544)	-8.498*** (-9.943)	-8.866*** (-10.22)	-8.598*** (-9.725)	-9.819*** (-9.118)	-7.967*** (-8.823)	-4.587*** (-4.061)	-1.454*** (-7.983)
large	8.291*** (8.268)	8.093*** (33.59)	5.911*** (23.94)	1.554*** (10.00)	9.273*** (10.95)	9.220*** (10.92)	9.234*** (10.95)	8.711*** (10.48)	9.456*** (11.30)	9.449*** (11.15)	9.246*** (9.302)	8.766*** (10.33)	6.823*** (7.569)	1.848*** (14.12)
foreign10	4.321*** (4.546)	3.164*** (13.88)	2.201*** (9.427)	0.776*** (4.543)	5.158*** (6.536)	5.014*** (6.369)	4.963*** (6.322)	5.233*** (6.784)	5.329*** (6.794)	5.155*** (6.480)	4.666*** (4.835)	3.833*** (4.652)	2.692*** (3.322)	0.777*** (5.812)
certificate	7.079*** (7.468)	6.861*** (29.25)	3.701*** (15.15)	0.190 (1.202)	8.132*** (10.27)	8.051*** (10.16)	7.696*** (9.795)	7.566*** (9.717)	8.351*** (10.73)	8.602*** (10.97)	7.930*** (8.222)	8.078*** (10.10)	3.863*** (4.561)	0.474*** (3.499)
experience	0.0982** (2.345)	0.0839*** (7.510)	0.0822*** (7.233)	0.00506 (0.744)	0.104*** (2.895)	0.100*** (2.802)	0.102*** (2.847)	0.102*** (2.892)	0.103*** (2.873)	0.104*** (2.939)	0.108** (2.494)	0.0716** (2.005)	0.0273 (0.683)	0.000251 (0.0448)
loans	0.0442** (2.090)	0.0339*** (7.565)	0.0395*** (8.037)	0.00397 (1.103)	0.0320 (0.563)	0.00652 (0.112)	0.0371 (0.604)	0.0194 (0.286)	0.0407 (0.825)					
web	5.238*** (5.274)	4.839*** (19.89)	2.573*** (10.42)	0.232 (1.489)	6.151*** (2.383)	5.454*** (2.081)	6.266*** (2.322)	6.873** (2.348)						
regquality	0.155*** (4.697)	0.138*** (16.33)	0.125*** (12.56)	0.00189 (0.304)	0.245*** (2.728)	0.219** (2.346)	0.240** (2.406)	0.146 (1.355)		0.253*** (2.720)				
losspowerout	-0.0481 (-0.935)	-0.0504*** (-4.537)	-0.161*** (-12.61)	-0.0212** (-2.348)	-0.201*** (-2.591)	-0.185** (-2.362)	-0.187** (-2.163)	-0.124 (-1.315)						
inputforeign		0.0569*** (19.21)				0.0675*** (2.977)						0.0964*** (4.262)		
impclear			-0.0762*** (-8.470)				-0.116** (-2.322)							-0.156** (-2.255)
expclear				0.00185 (0.233)				-0.0915 (-1.267)						-0.00521 (-0.388)
Observations	4,092	3,791	969	555	6,467	6,408	5,425	4,748	6,642	6,419	4,199	6,068	1,508	847
R-squared pseudo	0.167	0.172	0.0979	0.222	0.145	0.145	0.136	0.128						

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 dummies and country dummies. Using IV in tobit regressions, it is assumed that the endogenous regressor is continuous. It is therefore not applicable for the discrete variables *email* or *web*.

The results on the trade facilitation variables show that trade facilitation indeed also matters for how much African firms export. The variables referring to infrastructure, telecommunications, transport obstacles and customs efficiency (on the import side) all have the intuitive sign and are mostly statistically significant. When replacing *web* with *email* in all regressions, representing access to telecommunications, 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, overcome information deficits and 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 influence on export activity in Africa.

I include one further variable, *expclear*, which indicates the number of days it takes for goods to clear customs (columns 4, 8 and 14). The *expclear* coefficient is not significant, and even positive in

<sup>13</sup> For the instrumental variable probit regressions, these values are even higher, but this could be due to the fact that only one trade facilitation variable at a time is included. See Appendix D.1 for marginal effects of all trade facilitation variables.

the firm-level regressions. However, results might be biased as sample size is greatly reduced when this trade facilitation measure is included. As in the probit regressions, *loans* as a proxy for access to finance is only significant in the individual firm-level regressions. Firm's exporting behavior does not seem to be responsive to access to finance although it is one of the highest ranked obstacles.

For both the probit and tobit model, I ran several robustness checks. To compare results of the different variants of specifying trade facilitation, the sample size of all regressions is reduced to the number of observations available at firm level, i.e. I run the regressions with sector-regional trade facilitation measures and sector-region instruments on the same sample of individual firms. All coefficients retain their significance and sign and have even higher values. As adjusting sample size does not alter the results, but implies a great trade off concerning sample size, results for all observations available are shown throughout.

For the tobit regressions, I use export share as dependent variable, which is the export share of a firm's total sales, and find that results only change marginally.

As firms consider practices of competitors in the informal sector as a major constraint (see Table 1), I include the indicator variable *informality* in the regressions, measuring whether a firm competes against unregistered or informal firms. Informal competition seems to have a negative association with the export decision, but results are not robust to different specifications.<sup>14</sup> For example, including *certificate* renders *informality* insignificant. Holding an internationally recognized quality document probably puts firms at a competitive advantage so that informal competition does not have any impact.

To substantiate the effect of trade facilitation, country level variables are included in the analysis.<sup>15</sup> I use objective country-level governance measures. The World Bank's World Governance Indicators provide six governance related indicators: Voice and Accountability (*voiceacc*), Regulatory Quality (*regqual*), Government Effectiveness (*goveff*), Control of Corruption (*controlcorr*), Political Stability and Absence of Violence (*polstab*), and Rule of Law (*rulelaw*).<sup>16</sup> They are aggregate indicators combining enterprise, citizen and expert survey answers within countries, measured on a scale from -2.5 to +2.5, with higher scores designating better governance. I expect that there is a positive relationship between the level of governance in a given country and the export propensity of firms located in this country, and that the two indicators *goveff* and *regqual* represent best the efficiency in customs administration and other trade-related governmental services because they deal explicitly with the quality of public services and the governments' ability to formulate and implement sound policies. I use these indicators because my concept of trade facilitation in its broader sense is related to and encompasses aspects of good governance and high-quality institutions.

In the regressions with individual firm-level trade facilitation, all six indicators have positive and significant coefficients. In the regressions with sector-region averaged trade facilitation measures, *voiceacc*, *regqual* and *goveff* are positive and significant; the other three indicators are not. It seems that firms in countries with higher scores on good governance concerning regulations and public services are more likely to enter export markets.<sup>17</sup> It is not possible to control for country fixed effects in the regressions with country-level indicators. Thus, the results need to be interpreted with caution as the governance variables might also capture country specific differences not necessarily related to

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<sup>14</sup> Results are not shown.

<sup>15</sup> See Appendix D.2 for probit regressions with country variables.

<sup>16</sup> See Appendix B for variable definitions.

<sup>17</sup> Results are less robust when looking at the export intensity, estimating a tobit model. I only find positive and significant effects for the coefficients of *voiceacc*, *regqual* and *goveff* for the variants including trade facilitation at firm level. In the variant with sector-region averaged trade facilitation, I do not find significant results for the governance indicators.

good governance. Nevertheless, the results support the general finding that trade facilitation in its broader sense is important for the decision to export.

Furthermore, 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: *Port* (dummy = 1 if region/city is located at a sea port), *landlock* (dummy = 1 if region/city is landlocked and would be at disadvantage even if the country itself is not landlocked) and *capital* (dummy = 1 if region/city is the capital). 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. *Port* and *capital* are not significant irrespective of including the trade facilitation variables in the regressions or not. The dummy *landlock* is negative and significant when the trade facilitation variables are not included, implying a negative effect of geographical distance. However, once trade facilitation is controlled for, the dummy becomes insignificant.

## CONCLUSION

As tariffs and other direct border restrictions to trade are decreasing in importance, the exporting decision of firms 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 exporting. The results on the trade facilitation variables support the hypothesis that trade facilitation and both African firms' export probability and their export intensity are positively associated. For all trade facilitation variables except the days needed for export goods to clear customs, I find significant effects. For access to finance, the evidence is less robust, too. Firms exporting behavior is most responsive to telecommunications, which holds the potential for large 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.

Trade facilitation indicators on the regulatory environment at country level support the results at firm-level. Firms in countries with better governance and regulatory services are more likely to export. In contrast, geographical factors concerning the city/region a firm is located in seem to be irrelevant for firms' exporting decisions.

In light of the evidence that high export barriers hinder African firms from exporting, but that they actually learn from exporting and become more productive, why is not more effort put into facilitating trade? 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 and can explain the fact that developing countries might be reluctant to commit to trade facilitation in the WTO. Nonetheless, policies encouraging exports, i.e. 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 supporting the private sector to better harness the benefits from trade.

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## 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	268	271
Benin	2009	9	41	50
Botswana	2006	24	121	145
Burkina Faso	2009	10	87	97
Burundi	2006	3	136	139
Cameroon	2009	27	89	116
Cape Verde	2009	2	63	65
Chad	2009	7	39	46
Congo	2009	3	35	38
Dem. Rep. Congo	2006	10	181	191
Eritrea	2009	10	89	99
Gabon	2009	6	27	33
Gambia	2006	5	61	66
Ghana	2007	26	266	292
Guinea	2006	15	122	137
Guinea Bissau	2006	6	75	81
Ivory Coast	2009	20	173	193
Kenya	2007	145	251	396
Lesotho	2009	25	36	61
Madagascar	2009	52	151	203
Malawi	2009	15	55	70
Mali	2007	24	277	301
Mauritania	2006	12	115	127
Mauritius	2009	48	135	183
Mozambique	2007	16	320	336
Namibia	2006	32	120	152
Niger	2009	11	37	48
Nigeria	2007	20	928	948
Rwanda	2006	11	57	68
Senegal	2007	40	219	259
Sierra Leone	2009	1	67	68
South Africa	2007	160	518	678
Swaziland	2006	27	78	105
Tanzania	2006	36	249	285
Togo	2009	8	20	28
Uganda	2006	38	295	333
Zambia	2007	43	257	300
<b>Total</b>		950	6,058	7,008

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

Sector	Total number of firms	Share of exporters (%)
Other manufacturing*	2,243	11.01
Food	1,783	10.49
Garments	1,222	11.95
Metals and machinery	662	18.58
Chemicals and pharmaceuticals	341	27.57
Non-metallic and plastics	273	23.08
Wood and furniture	246	4.07
Textiles	169	33.73
Electronics	57	31.58
Leather	12	41.67
<b>Total</b>	7,008	13.56

\*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	Data Source
<b>exp</b>	Dummy = 1 if proportion of sales that are exported directly (export) takes a positive value (>0).	Enterprise Surveys, World Bank
<b>expvalue</b>	Log exports, calculated from export share and sales, in US dollars, deflated.	
<b>age</b>	Age of the firm based on the year in which the firm began operations (survey year – firm began operations).	
<b>small</b>	Dummy = 1 if establishment has 5-19 workers. Firm size is a composite measure of permanent and temporary workers.	
<b>large</b>	Dummy = 1 if establishment has at least 100 workers. Firm size is a composite measure of permanent and temporary workers.	
<b>foreign10</b>	Dummy = 1 if at least ten percent of the firm is owned by foreign individuals, companies or organizations.	
<b>certificate</b>	Percentage of firms that have an internationally-recognized quality certification, i.e. ISO 9000, 9002 or 14000.	
<b>experience</b>	Years of experience of the top manager working in the sector.	
<b>loans</b>	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.	
<b>email</b>	Dummy = 1 if firm uses email to interact with clients or suppliers.	
<b>web</b>	Dummy = 1 if firm uses website for business related activities, i.e. sales, product promotion etc.	
<b>regquality</b>	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.	
<b>losspowerout</b>	Losses as percentage of annual sales that resulted from power outages.	
<b>inputforeign</b>	Percentage of material inputs and/or supplies of foreign origin.	
<b>expclear</b>	Average number of days from the time the export goods arrived at their main point of exit (e.g., port, airport) until the time these goods cleared customs.	
<b>impclear</b>	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.	
<b>informality</b>	Dummy = 1 if firm competes against unregistered or informal firms.	
<b>port</b>	Dummy = 1 if firm is located in a region/city at a sea port.	generated from
<b>landlock</b>	Dummy = 1 if firm is located in a region/city that is landlocked.	Enterprise Surveys,
<b>capital</b>	Dummy = 1 if firm is located in a region/city that is the country's capital.	World Bank
<b>voiceacc</b>	Indicator Voice and Accountability (from respective survey year), reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Worldwide Governance Indicators, World Bank
<b>polstab</b>	Indicator Political Stability and Absence of Violence (from respective survey year), reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means.	
<b>goveff</b>	Indicator Government Effectiveness (from respective survey year), reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	
<b>regqual</b>	Indicator Regulatory Quality (from respective survey year), reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	
<b>controlcorr</b>	Indicator Control of Corruption (from respective survey year), reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	
<b>rulelaw</b>	Indicator Rule of Law (from respective survey year), reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	

APPENDIX C  
Descriptive Statistics

Variable	Exporting firms					Non-exporting firms				
	Observations	Mean	Standard Deviation	Min	Max	Observations	Mean	Standard Deviation	Min	Max
<b>export</b>	950	37.40	33.52	0.10	100	6058	0	0	0	0
<b>expvalue</b>	932	69000000	1580000000	23.96	48100000000	5971	0	0	0	0
<b>age</b>	945	21.91	18.01	1	117	6010	13.41	12.47	0	190
<b>small</b>	950	0.19	0.39	0	1	6058	0.65	0.48	0	1
<b>large</b>	950	0.44	0.50	0	1	6058	0.07	0.26	0	1
<b>foreign10</b>	947	0.37	0.48	0	1	6049	0.13	0.33	0	1
<b>certificate</b>	923	0.43	0.49	0	1	5920	0.11	0.31	0	1
<b>experience</b>	945	16.92	10.42	0	75	6019	13.31	9.48	0	68
<b>loans</b>	943	12.35	22.31	0	100	6032	4.95	15.88	0	100
<b>email</b>	935	0.88	0.33	0	1	6015	0.38	0.48	0	1
<b>web</b>	929	0.47	0.50	0	1	6008	0.13	0.33	0	1
<b>regquality</b>	905	9.44	12.54	0	100	5808	6.29	10.57	0	100
<b>losspowerout</b>	620	6.08	8.89	0	70	3754	8.24	10.50	0	100
<b>inputforeign</b>	909	49.21	38.62	0	100	5456	25.61	36.14	0	100
<b>expclear</b>	891	6.41	9.51	0	90					
<b>impclear</b>	584	9.17	12.33	0	120	1013	11.24	14.91	0	122
<b>informality</b>	572	0.47	0.50	0	1	3850	0.64	0.48	0	1
<b>voiceacc</b>	950	-0.13	0.66	-2.16	0.85	6058	-0.34	0.67	-2.16	0.85
<b>regqual</b>	950	-0.21	0.55	-2.27	0.85	6058	-0.47	0.57	-2.27	0.85
<b>goveff</b>	950	-0.30	0.64	-1.75	0.72	6058	-0.58	0.62	-1.75	0.72
<b>controlcorr</b>	950	-0.33	0.58	-1.54	0.88	6058	-0.54	0.57	-1.54	0.88
<b>polstab</b>	950	-0.31	0.77	-2.48	0.89	6058	-0.61	0.96	-2.48	0.89
<b>rulelaw</b>	950	-0.42	0.60	-1.75	0.94	6058	-0.62	0.60	-1.75	0.94

APPENDIX D

D.1 Marginal effects for trade facilitation variables

Trade facilitation variable	dy/dx	Std. Err.	z	P>z	[95% Conf. Interval]
<b>loans</b>	0.0027788	0.0034557	0.8	0.421	-0.0039942 0.0095518
<b>regquality</b>	0.0159481	0.0063455	2.51	0.012	0.0035111 0.028385
<b>losspowerout</b>	-0.0253108	0.0070649	-3.58	0.000	-0.0391578 -0.0114638
<b>inputforeign</b>	0.0069127	0.001612	4.29	0.000	0.0037533 0.0100722
<b>impclear</b>	-0.0141157	0.0057662	-2.45	0.014	-0.0254173 -0.0028142

Note: Marginal effects calculated at the means for separate probit regressions with instrumented trade facilitation variables, including all variables on firm characteristics. All regressions include a constant term, sector dummies and country dummies.

D.2 Trade Facilitation and Exporting, probit model, country-level variables

VARIABLES	trade facilitation at firm level						trade facilitation, sector-region averages					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	exp	exp	exp	exp	exp	exp	exp	exp	exp	exp	exp	exp
age	0.00636*** (2.764)	0.00602*** (2.606)	0.00641*** (2.782)	0.00669*** (2.893)	0.00662*** (2.888)	0.00666*** (2.878)	0.00484*** (3.073)	0.00477*** (3.032)	0.00484*** (3.079)	0.00491*** (3.119)	0.00491*** (3.120)	0.00491*** (3.121)
small	-0.531*** (-7.016)	-0.515*** (-6.787)	-0.527*** (-6.960)	-0.536*** (-7.097)	-0.538*** (-7.133)	-0.539*** (-7.129)	-0.538*** (-9.675)	-0.536*** (-9.636)	-0.538*** (-9.677)	-0.542*** (-9.744)	-0.543*** (-9.771)	-0.542*** (-9.751)
large	0.644*** (8.184)	0.638*** (8.091)	0.637*** (8.091)	0.641*** (8.151)	0.640*** (8.148)	0.643*** (8.174)	0.671*** (10.84)	0.670*** (10.83)	0.668*** (10.80)	0.668*** (10.78)	0.666*** (10.74)	0.668*** (10.78)
foreign10	0.254*** (3.300)	0.250*** (3.263)	0.241*** (3.157)	0.228*** (2.992)	0.227*** (2.978)	0.232*** (3.037)	0.331*** (5.851)	0.329*** (5.824)	0.326*** (5.769)	0.323*** (5.719)	0.324*** (5.727)	0.323*** (5.726)
certificate	0.434*** (5.704)	0.428*** (5.616)	0.436*** (5.716)	0.448*** (5.896)	0.451*** (5.965)	0.445*** (5.854)	0.526*** (9.268)	0.526*** (9.278)	0.527*** (9.278)	0.531*** (9.346)	0.533*** (9.379)	0.530*** (9.334)
experience	0.00470 (1.414)	0.00440 (1.333)	0.00488 (1.481)	0.00528 (1.603)	0.00524 (1.591)	0.00518 (1.573)	0.00527** (2.115)	0.00527** (2.121)	0.00538** (2.168)	0.00556** (2.243)	0.00568** (2.283)	0.00553** (2.227)
loans	0.00489*** (2.918)	0.00461*** (2.757)	0.00511*** (3.042)	0.00537*** (3.190)	0.00528*** (3.138)	0.00530*** (3.152)	0.00471* (1.694)	0.00416 (1.500)	0.00523* (1.902)	0.00583** (2.120)	0.00609** (2.212)	0.00565** (2.038)
web	0.340*** (4.426)	0.321*** (4.172)	0.334*** (4.328)	0.346*** (4.498)	0.354*** (4.664)	0.348*** (4.552)	0.321** (2.172)	0.259* (1.713)	0.299* (1.928)	0.370** (2.452)	0.402*** (2.724)	0.370** (2.489)
regquality	0.00876*** (3.418)	0.00878*** (3.485)	0.00846*** (3.325)	0.00804*** (3.159)	0.00826*** (3.248)	0.00833*** (3.270)	0.00445 (0.972)	0.00396 (0.869)	0.00407 (0.893)	0.00329 (0.723)	0.00285 (0.616)	0.00351 (0.766)
losspowerout	-0.00342 (-1.002)	-0.00282 (-0.825)	-0.00395 (-1.157)	-0.00457 (-1.337)	-0.00397 (-1.146)	-0.00440 (-1.290)	-0.00923** (-2.238)	-0.00811* (-1.949)	-0.00993** (-2.403)	-0.0115*** (-2.763)	-0.0126*** (-2.903)	-0.0113*** (-2.730)
inputforeign	0.00554*** (6.961)	0.00553*** (7.060)	0.00540*** (6.852)	0.00515*** (6.596)	0.00494*** (6.320)	0.00514*** (6.591)	0.00763*** (6.935)	0.00751*** (6.949)	0.00745*** (6.863)	0.00714*** (6.623)	0.00723*** (6.511)	0.00712*** (6.595)
voiceacc	0.184*** (3.420)						0.0928** (2.285)					
regqual		0.335*** (5.147)						0.157*** (3.069)				
goveff			0.156*** (2.877)						0.0762* (1.816)			
controlcorr				0.112* (1.946)						0.0232 (0.539)		
polstab					0.0775** (2.237)						-0.0105 (-0.355)	
rulelaw						0.124** (2.159)						0.0296 (0.686)
Observations	3,817	3,817	3,817	3,817	3,817	3,817	6,481	6,481	6,481	6,481	6,481	6,481
R-squared pseudo	0.310	0.314	0.309	0.308	0.308	0.308	0.264	0.265	0.264	0.263	0.263	0.263
Log pseudolikelihood	-1103.006	-1096.8277	-1104.8473	-1106.8438	-1106.361	-1106.3673	-1890.2611	-1888.0031	-1891.2204	-1892.6542	-1892.7346	-1892.5549
Chi-Square	804.39	815.54	804.22	801.33	795.88	799.35	1148.69	1152.31	1148.44	1147.3	1146.44	1147.05
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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 and sector dummies.