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Trade Facilitation and the Extensive and Intensive Margins of Trade

Maria Persson*

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Abstract

The objective of this paper is to see where inefficient cross-border trade procedures, i.e. the trade procedures that trade facilitation is meant to lower, matter the most. Do the effects on the extensive margin (the range of goods being traded) or the intensive margin (how much that is traded of a certain good) dominate, or are the two margins affected in the same way? Very detailed, 8-digit, data on imports to EU countries from developing countries in 2005 is used to decompose trade into its extensive and intensive margins at the industry level. Thereafter, a fractional logit approach is employed to estimate how inefficient export and import procedures affect the extensive margin in relation to the intensive margin. Inefficient trade procedures are proxied by the number of days needed to export or import a good, using data from the World Bank's *Doing Business Database*. To summarize the results, inefficient import and export procedures have a significantly negative effect on the extensive margin share, i.e. the extensive margin divided with the sum of the extensive and intensive margins, which is interpreted as saying that the extensive margin effects dominate. Further, evidence is found that these negative effects are declining with the level of inefficiencies. Lastly, there are significant differences between industries in how the extensive margin share is affected by inefficient procedures. These results are consistent with recent developments in the heterogeneous firm trade theory literature.

JEL Classification: C21, F13, O24

Keywords: Extensive and Intensive Margin; Trade Facilitation; Export Diversification; Heterogeneous Firm Trade Theory; Industry Effects

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* Lund University, Department of Economics, P.O. Box 7082, SE-220 07 Lund, Sweden; e-mail: maria.persson@nek.lu.se. The paper was partly written while the author was visiting the *Leverhulme Centre for Research on Globalisation and Economic Policy* (GEP) at the University of Nottingham. The author thanks Richard Kneller, Yves Bourdet, Joakim Gullstrand and Karin Olofsdotter for helpful comments and suggestions.

1 Introduction

Over the last few years, the issue of trade facilitation has attracted an increasing amount of attention. Though no generally accepted definition exists, trade facilitation is usually taken to refer to reforms aimed at making complicated and time-consuming cross-border trade procedures less inefficient. In other words, the idea is to cut the often excessive amount of red tape at the border. More formally, The Doha Ministerial Declaration (WTO 2001), for example, refers to trade facilitation as "expediting the movement, release and clearance of goods, including goods in transit". Another popular way to define the issue is to say that it refers to "the simplification and harmonization of international trade procedures", where international 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".[1]

So far, the research that has been done to assess the trade effects of trade facilitation have focused on the implications for total trade. All in the gravity tradition, but using various ways to define and measure trade facilitation and to estimate its results, Wilson *et al* (2003; 2005), Soloaga *et al* (2006), Djankov *et al* (2006), Nordås *et al* (2006), Persson (2008), Lee and Park (2007), Iwanow and Kirkpatrick (2007) and Sadikov (2007) all tend to find significant effects on total trade.[2] However, based on a heterogeneous firm trade model, such as Chaney (2008), one can predict that inefficient cross-border trade procedures not only will affect how much that is traded of a certain good (the intensive margin), but also will have an impact on whether or not goods are traded at all, which implies an effect on the range of goods that is being traded (the

[1] This definition was used by the WTO for some time, and can e.g. be found in Engman (2005). For an overview of the WTO:s view on trade facilitation, see WTO (2007).

[2] For an overview: see Persson (2008). There is also a related CGE literature: OECD (2003), Francois *et al* (2005), Kinnman and Lodefalk (2007), Decreux and Fontagné (2006), Hertel and Keeney (2006) and Dennis (2006) are examples of papers that find substantial gains from trade facilitation. Further, the literature on trade facilitation is linked to the issue of Non-Tariff Barriers to Trade (NTBs), but the latter includes many more obstacles to trade. More generally, trade facilitation belongs to the literature on trade costs – for an overview see Anderson and van Wincoop (2004), and it is also related to the literature on trade and institutions.

extensive margin).[3] This latter effect has been estimated by Dennis and Shepherd (2007), who find a significantly negative relationship between costs to export and the number of product lines being exported by developing countries to the EU. From a macro policy perspective, one might argue that it is very important to establish whether trade facilitation increases trade primarily through the extensive or the intensive margin. It has been suggested that export diversification, which can be interpreted as growth at the extensive margin, could have a positive influence on economic growth through at least three different channels. First, by increasing the number of exported products, it could decrease export earnings instability, which in turn among other things could increase investments by risk-averse producers and reduce macro economic uncertainty. Second, a diversification into manufactures could reduce negative effects of declining terms of trade for primary commodities. Third, new production techniques associated with export diversification could benefit other industries through knowledge spillovers. Empirically, a positive link has been established between export diversification and growth – for an overview of studies and a discussion of the theoretical links, see e.g. Herzer and Nowak-Lehnmann (2006) or Hesse (2007).[4]

Against this background, the main objective in this paper is to see where inefficient cross-border trade procedures matter the most. Do the extensive margin or the intensive margin effects dominate, or are the two margins affected in the same way? I also look at this question from two additional, more detailed perspectives. First, if inefficient trade procedures affect the margins in different ways, does this difference depend on the degree of inefficiencies, or is it constant? Second, are the effects the same for all industries, or is it possible to identify stronger effects in some industries?

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[3] The exact meaning of the terms *extensive margin* and *intensive margin* varies between contexts. In cross-sectional settings, the extensive margin is usually defined as the range of goods that is being exported or the number of exporting firms, while the intensive margin refers to how much that is being exported of each good, or the exported volume for individual firms. When used in time-series contexts, growth at the extensive margin can refer to new goods being exported, old goods being exported to new destinations or a growing number of exporting firms. Growth at the intensive margin correspondingly refers to growing exports of goods that were already being exported or the volume of exports from incumbent exporters.

[4] Cadot *et al* (2007) note that it is not self-evident that diversification should be a policy objective: traditional trade theory does rather point towards specialization. Empirically, Imbs and Wacziarg (2003) have illustrated that diversification follows a U-shaped pattern, where countries first diversify when income per capita levels rise, but then at a later stage in the development process start to specialize again. Cadot *et al* (2007) find the same pattern concerning export diversification.

To answer these questions, I use very detailed (8-digit) data on imports to EU countries from developing countries in 2005 to decompose trade into its extensive and intensive margins, following Hummels and Klenow (2005). Thereafter, I use the extensive margin divided with the sum of the extensive and intensive margins as the dependent variable in a series of estimations to see how this share is affected by inefficient export and import procedures. Three variations of a model are used to capture all three questions posed above. Inefficient trade procedures are proxied by the number of days needed to import or export a good, using data from the World Bank's (2007a) *Doing Business Database*.

To summarize my results, I find that inefficient import and export procedures have a significantly negative effect on the extensive margin share. In other words, while inefficient procedures probably have a negative impact both on the range of goods that is being exported and how much that is exported, the former effect is the stronger one. Further, I find evidence that these negative effects on the extensive margin share are declining: in countries where procedures are fairly efficient, the negative impact on the extensive margin in relation to the intensive margin is large, while these marginal effects are smaller when you reach higher initial levels of border delays. Lastly, I find differences between industries in the way that inefficient procedures affect the extensive margin relative to the intensive margin.

2 Theoretical Framework

A natural theoretical setting for linking inefficient cross-border trade procedures to the extensive and intensive margins of trade is the emerging literature on heterogeneous firm trade theory, with Melitz (2003) being a seminal contribution. I will focus on one interesting extension to this model, Chaney (2008), which allows for many asymmetric countries separated by asymmetric trade barriers. Basically, it is a model of monopolistic competition, but unlike representative firm models such as Krugman (1980), firms are not

identical, but differ in the level of productivity, and in addition, there is a fixed cost of entering the export market.

Referring to Chaney (2008) for a more detailed description, the intuition behind the model is that firms vary by productivity, and due to the existence of fixed and variable costs of exporting, only more productive firms will find it profitable to export. Importantly, the profitability of exports varies by destination, so that it is more profitable to export to markets with for example high demand, low variable trade costs and lower fixed costs. For every export destination *i*, there is a threshold level of productivity which yields zero profits from exports for firms in country *j*. All firms in *j* with a higher productivity than this will have positive profits from exporting to *i*. Therefore, only a subset of domestic firms will be exporters, but this subset varies with the characteristics of the foreign market.

Defining the intensive margin as exports per existing exporter and the extensive margin as the set of exporting firms,[5] a reduction in *variable* trade costs will affect both margins positively, by making each existing exporter export more, and by increasing the number of exporters, since the threshold productivity level will drop. On the other hand, a reduction in *fixed* trade costs will not affect the intensive margin (the existing exporters have already paid this cost), but it will induce new firms to enter the export market. In other words, it will have a positive effect on the extensive margin.

Chaney (2008) does not specifically refer to burdensome cross-border trade procedures, but against the background of his model, these procedures can reasonably be seen as having elements of both fixed and variable costs. Once a firm has started to export, it will in time learn to bring the right kinds of documents, collect the relevant signatures in time etc, making the border crossing smoother. This means that initial costs to become an exporter are higher than they will be in the long run, and the costs associated with acquiring the relevant know-how can be seen as fixed.[6] However, the firm will not be able to avoid all costs even in the long run. All else equal, it will take more time to comply with complicated and inefficient procedures, so the goods will

[5] This definition is not used entirely consistently: sometimes the extensive margin is defined as how much new entrants export when trade barriers are reduced.
[6] This cost is irreversible, and could also more accurately be categorized as a *sunk* cost.

remain at the border for a longer period than if the procedures had been more efficient. This waiting will in turn constitute a cost for the firm for example through the depreciation of the goods' value, and this cost is variable. Thus, through their variable parts, costs associated with inefficient trade procedures will affect the intensive margin of trade, because they influence how much existing exporters choose to export. Moreover, the higher the levels of fixed and variable costs stemming from inefficient procedures, the higher the productivity threshold, and correspondingly, the fewer the firms will be productive enough to export. Thus, inefficient procedures will also affect the extensive margin of trade.[7]

Given that trade facilitation, by lowering the level of inefficiency in trade procedures, theoretically should have a positive impact on both margins of trade, which effect is the strongest? Chaney (2008) shows that for a given reduction of trade barriers, the extensive margin effect will be the dominating one. Therefore, my empirical hypothesis is that the extensive margin will respond stronger to more efficient cross-border trade procedures than the intensive margin.

In his model, Chaney (2008) shows that the extensive and intensive margins' sensitivity to trade barriers are affected in opposite directions by the elasticity of substitution. A low elasticity of substitution (highly differentiated goods) implies an extensive margin that is highly sensitive to trade barriers while the intensive margin is not. On the other hand, a high elasticity of substitution (more homogenous goods) makes the intensive margin more sensitive to changes in trade barriers, but it also makes the extensive margin less sensitive. So, the theory leads to the hypothesis that industries where goods are differentiated – one example could be manufactures – should have a stronger extensive margin effect in relation to the intensive margin effect, than industries where goods are less differentiated, say agriculture.

[7] It is important to note that the costs associated with inefficient trade procedures – fixed or variable – will affect both margins both when they take place at the origin and *when they occur at the destination.* With a few exceptions, the literature on trade facilitation has tended to look at only one set of costs at a time.

3 The Margins of Trade – Overview of the Literature

In the literature looking at what determines the size of the extensive and intensive margins, there is only one paper directly related to the issue of trade facilitation. Dennis and Shepherd (2007) use the number of 8-digit product lines for every two-digit sector being exported from developing countries to the EU in 2005, as a measure of export diversification – this being seen as export growth at the extensive margin. The authors estimate a model including measures for the restrictions to entry in the exporting country, costs of exporting, tariffs for both the exporting and the importing country and distance.[8] They find that both entry costs and export costs, the latter being defined as the official fees levied on a 20-foot container leaving the exporting country, have a significantly negative effect on the number of product lines being exported in every 2-digit sector. Neither EU tariffs, nor the exporting country's own tariffs are found to have any significant effect.

In addition to Dennis and Shepherd (2007), there is also a growing literature that, while not related to trade facilitation, is worth mentioning briefly since it deals in various ways with the extensive and intensive margins of trade. Starting with the literature using disaggregated trade data, one interesting strand, to which this paper belongs, calculates measures of export variety, following Feenstra (1994). The approach was most notably used in Hummels and Klenow (2005), where the authors explicitly derive measures of the extensive and intensive margins – see below in the empirical section for a more detailed description. Versions of this methodology, usually focusing on the extensive margin, can also be found in Feenstra and Kee (2007), Broda and Weinstein (2006), Funke and Ruhwedel (2001), Dennis and Shepherd (2007) and Kehoe and Ruhl (2003).

Other ways to use disaggregated trade data to draw inferences on the extensive and/or intensive margins of trade is to count the number of categories in which a country exports; to divide the categories into sets, depending on some criteria such as whether they are exported for the whole time period, or start to be exported at some point in time, and then look at the volumes of trade corresponding to these sets; to use Tobit estimations

[8] Data for the two first variables come from the World Bank's *Doing Business Database*, and the baseline specification also includes GDP and GDP per capita for the exporting country. Note that Dennis and Shepherd (2007) do not include any importer characteristics besides tariffs.

of gravity models (at a disaggregated level) and to construct indicator variables for whether or not there is trade in a given product line, and estimate the probability that trade occurs with some probability model such as logit or probit. Papers that use one or more of these approaches include Dennis and Shephard (2007), Flam and Nordström (2006), Cadot *et al* (2007), Brenton and Newfarmer (2007), Evenett and Venables (2002), Kehoe and Ruhl (2003), Baldwin and Di Nino (2006), Amurgo-Pacheco and Piérola (2007), Debaere and Mostashari (2005) and Baldwin and Harrigan (2007).

Apart from these methods employing disaggregated data, Felbermayr and Kohler (2006; 2007) and Helpman *et al* (2008) use aggregated trade data and gravity models to draw inferences on the extensive and intensive margins of trade. There is also a large literature based on firm-level data. Many papers directly or indirectly deal with the extensive margin by examining what determines whether or not firms export – see Greenaway and Kneller (2007) for an excellent overview. A smaller number of papers explicitly look at both the extensive and the intensive margins: see e.g. Bernard and Jensen (2004), Crozet and Koenig (2007), Bernard *et al* (2007) and Andersson (2007).

To try and summarize the literature, the most striking observation is probably that irrespective of what kind of data or dependent variable that is being used, most papers end up with a set of explanatory variables that by and large can be said to belong in the gravity tradition. Details differ, but most papers will in some way control for economic size, distance and often some form of trade costs. This is not very surprising, considering that the same kind of heterogeneous firm trade model that explains the emergence of the extensive and intensive margins of trade also can be used to derive gravity equations – see e.g. Chaney (2008) and Helpman *et al* (2008).

4 Empirical Methodology

The empirical method is divided into two parts. First, highly disaggregated data on the imports to European Union countries from all developing countries in 2005 are used to decompose these countries' exports into the extensive and intensive margins, following Hummels and Klenow (2005). Importantly, I perform this decomposition at the country-pair-industry level. Second, using the extensive margin divided with the sum of the

extensive and intensive margins as the dependent variable, three different versions of a model are estimated, using the number of days needed to import or export a good as a proxy for the effectiveness of cross-border trade procedures.

4.1 Decomposition

To decompose the bilateral import flows into their extensive and intensive margins, I use the methodology of Hummels and Klenow (2005). In this methodology, one does not compare how many varieties that are imported over time, but instead compare varieties imported from different exporters at a point in time.[9]

Hummels and Klenow define the extensive margin on country *j*'s exports to country *i*, given a reference country *k*, as

$$(1) \qquad EM_{ij} = \frac{\sum_{g \in G_{ij}} p_{ikg} x_{ikg}}{\sum_{g \in G} p_{ikg} x_{ikg}}$$

where G_{ij} is the set of observable categories of goods *g* in which *j* has positive exports to *i*, *G* is the set of categories for which *k* has positive exports to *i* (G_{ij} must be a subset of *G*), and *p* and *x* stand for price and quantity respectively. Choosing the rest of the world as the reference country, the extensive margin is therefore basically defined as the share of country *i*'s imports from products that are exported by *j*. This can be seen a weighted count of *j*'s categories relative to *k*'s categories, where the weights are the importance of a category in *k*'s exports to *i*. If all categories are equally important, EM_{ij} will be the fraction of categories in which *j* exports to *i*.

The intensive margin for *j*'s exports to *i* is defined as

[9] This is one reason for choosing to use this methodology: Since there is hardly any time-series data on the effectiveness of cross-border trade procedures (to measure the potential for trade facilitation), to be able to say something about how these procedures affect the extensive and intensive margins of trade, it is necessary to exploit the cross-sectional variation between countries. Another advantage with this methodology is that is offers a well-defined way to calculate both margins of trade.

$$(2) \qquad IM_{ij} = \frac{\sum_{g \in G_{ij}} p_{ijg} x_{ijg}}{\sum_{g \in G_{ij}} p_{ikg} x_{ikg}}$$

so this is *j*'s nominal exports relative to *k*'s nominal exports in those categories in which *j* exports to *i*.

Using these measures, there are some practical issues that need to be addressed. First, I define the reference country, *k*, to be all developing countries with positive exports to at least one EU country.[10] Second, unlike Hummels and Klenow (2005), who work at the country-pair level, I calculate *EM* and *IM* at a country-pair *industry* level. I formulate seven industries, presented in Table 10, and for each country-pair, I calculate the margin measures separately for each of these seven industries. This way, it becomes possible to separately estimate the effects of burdensome border procedures for different types of goods. To the best of my knowledge, apart from Feenstra and Kee (2007) who do this in the context of NAFTA's effects on the variety of Mexican exports to the US, this has not been done before.[11]

Third, it is important to be clear on how zeroes are to be treated. Just under half of my country-pair-industry observations are such that there is no trade at all between the countries in this particular industry. Obviously, these zeroes are important to include in the investigation, since trade might be absent precisely because trade costs are too high. For the extensive margin, it is not really a problem – no exported product lines implies *EM* will simply be zero, but strictly speaking, the intensive margin is not defined in this case: summing over zero product lines means that the denominator in equation (2) will be zero. I choose to define the intensive margin as zero in these cases. Last, the level of aggregation of the trade data used will influence the value of the extensive margin. I use very disaggregated trade data, but do test how sensitive the results are to the level of

[10] Unlike me, Hummels and Klenow (2005) choose *k* so that, for each market *i*, *k* is all exporters to *i* other than *j*, but it can be argued that it is easier to interpret the results if you have exactly the same reference group for all countries. Feenstra and Kee (2007) make the same choice as me.

[11] Related to this, Sadikov (2007) shows that *total exports* of homogenous and differentiated goods are not affected in the same way by signature requirements at the border.

aggregation in the robustness section below – this turns out not to make any qualitative difference.

Using import data at the 8-digit level to 25 EU countries from 152 developing countries gives me 3,800 country-pairs and almost half a million observations with positive trade flows. Calculating the *EM* and *IM* measures at the industry level yields 26,600 observations.[12]

Table 1. Descriptive Statistics on Developing Countries' Exports to the EU

	Exported Products Total			Exported Products Bilaterally			Number of EU Export Markets		
Income Group	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*	*Mean*	*Min*	*Max*
Low Income	1809	0	40420	74	0	4243	21	9	25
Lower Middle Income	5102	0	89005	206	0	5792	22	6	25
Upper Middle Income	3517	0	25535	143	0	2678	21	3	25
High Income	1439	0	12131	61	0	1786	20	10	25
Least Developed	422	0	4496	19	0	657	19	7	25
All	3229	0	89005	131	0	5792	21	3	25

Source: Author's calculations using data from Eurostat (2007).

Table 1 shows some descriptive statistics concerning developing countries' exports to EU countries. The average developing country exports a total of 3229 products to 21 EU countries, but the average number of products being exported bilaterally is only 131. Least developed countries (LDCs) export markedly few products – an average of only 19 to a single country and not more than 657 to any country. The middle income countries are those with the greatest ranges of export goods.

4.2 Estimation

4.2.1 Estimation Models

As outlined in the introduction, my objective in this paper is to see where inefficient cross-border trade procedures matter the most: Do the extensive margin or the intensive

[12] The trade data are divided into two-digit chapters. Since there is no tariff data for chapter 99 (basically a "not elsewhere specified" category), I remove this chapter. This means disregarding 760 observations out of 499,385 and should have no practical implications. Note that there is only data on border procedures for 23 EU countries and 130 developing countries, so the estimation sample is somewhat smaller.

margin effects dominate, or are the two margins affected in the same way? To be able to empirically assess this question, I construct a dependent variable, the extensive margin share (*EMS*), which is the extensive margin divided by the sum of the extensive and intensive margins, $\frac{EM}{EM+IM}$, which is to be explained by a vector **x** of independent variables.[13] Since the extensive margin share only will take values in the unit interval [0,1], estimation of a linear model for $\mathrm{E}(EMS|\mathbf{x})$ with ordinary least squares (OLS) will suffer from the problem that the fitted values of *EMS* will not necessarily be restricted to the unit interval. Instead, I employ what Wooldridge (2002) refers to as a fractional logit regression. In this approach, following Papke and Wooldridge (1996), $\mathrm{E}(EMS|\mathbf{x})$ is modelled as a logistic function, so it is assumed that

$$\mathrm{E}(EMS|\mathbf{x}) = \exp(\mathbf{x}\beta)/\left[1+\exp(\mathbf{x}\beta)\right]$$

where the vector **x** is $1\times K$ (with the first element being 1) and the vector β is $K\times 1$.[14] For more details, see Papke and Wooldridge (1996) and Wooldridge (2002).

The next question is how to specify $\mathbf{x}\boldsymbol{\beta}$. I start with a simple specification.

(Model I)

$$\begin{aligned}\mathbf{x}_{ijs}\beta = {} & \beta_1 + \beta_2 \ln(proc_i) + \beta_3 \ln(proc_j) + \beta_4 \ln(1+tariff_{ijs}) + \\ & \beta_5 \ln(d_{ij}) + \beta_6 \ln(Y_i Y_j) + \beta_7 \ln\left(\frac{Y_i}{P_i}\right) + \\ & \beta_8 \ln\left(\frac{Y_j}{P_j}\right) + \beta_9 border_{ij} + \beta_{10} lang_{ij} + \beta_{11} colony_{ij} + \\ & \beta_{12} landl_i + \beta_{13} landl_j + \beta_{14} LDC_j + region_j + \mu_s\end{aligned}$$

Building on the theoretical discussion above, in *Model I*, the vector of variables explaining the extensive margin share in industry *s* first and foremost includes the level

[13] It is possible for both margins to be zero. In this case, the extensive margin share is also set at zero.
[14] This is then estimated using quasi-maximum likelihood (QMLE). This methodology is implemented in STATA using the Generalized Linear Models framework: specifically the command used is *glm* with *family(binomial)* and *link(logit)*, and with robust standard errors that are clustered at the country-pair level.

of efficiency of the cross-border trade procedures, *proc*, in both the importing EU country *i* and the exporting developing country *j*. I will use the number of days needed to export or import a good as a proxy for the effectiveness of the cross-border trade procedures. Besides these costs related to cross-border procedures, $tariff_{ijs}$ is the average tariff country *j* exporters face when exporting to country *i* in industry *s*, and the distance d_{ij} between the two countries' capitals is included as a proxy for transportation costs. In terms of the theoretical model, these variables constitute variable costs and could affect both margins of trade. The model also includes other control variables: Y_iY_j is the product of the countries' GDP to control for supply capacity and market size, and the countries' GDP per capita, *Y/P*, is included for the exporter as a proxy for productivity and for the importer to allow for non-homothetic preferences. Further, I include indicator variables for sharing a common border, $border_{ij}$, the same language, $lang_{ij}$, or a joint colonial history, $colony_{ij}$. These are variables that influence the ease with which new trading relationships can be created, so in terms of the theoretical model they primarily affect the level of fixed costs, and should only have an effect on the extensive margin.

In the model, I also control for whether the importer or exporter is landlocked (*landl*), a geographical factor known to increase transportation costs, and whether the exporter is a least developed country (LDC_j) as a further control for the level of development and supply side conditions. Lastly, the model includes regional exporter effects, $region_j$, to control for unobservable factors that affect all exporting companies within a region in the same way,[15] and industry effects, μ_s, to control for all unobserved characteristics that do not vary within industries.[16]

[15] These regions include countries in near geographical proximity that have the same market access to the EU market, thus capturing any tariff effects that the average tariff cannot capture. Including country specific exporter effects is appealing, but they would capture everything that only varies by exporter, i.e. one could not measure the effect of cumbersome cross-border procedures separately. See table 7 below for the division of countries into regions.

[16] Besides the inclusion of costs related to import procedures, the model used closely resembles the model in Dennis and Shepherd (2007), but I control for more variables. Specifically, I add GDP and GDP per capita for the importer which quite reasonably should influence both margins, and several bilateral and importer or exporter specific variables that are known from the gravity literature to influence trade flows. I also add regional exporter effects that will capture some of the unobserved heterogeneity that is always a concern when using cross-sectional models. The model in Dennis and Shepherd (2007) also includes a domestic market entry cost – I include this as an extra control variable in the robustness section below.

In addition to *Model I*, I have two extensions to incorporate more heterogeneity into the model. In the first extension, referred to below as *Model II*, I allow different estimated coefficients depending on how large the border delays are. By creating dummy variables that indicate which interval of border delays the current observation is in, and then interacting these dummy variables with the *proc*-variables, I can say something about how the effect differs over the observed range of border delays.[17] Defining the vector **z** to consist of all explanatory variables except the ones measuring the effectiveness of trade procedures, *Model II* becomes

(Model II)

$$\mathbf{x}_{ijs}\beta = \delta_1 \ln proc_i + \delta_2 INT_2^i \times \ln proc_i + \gamma_1 \ln proc_j + \sum_{t=2}^{4} \gamma_t INT_t^j \times \ln proc_j + \mathbf{z}\alpha$$

In a second extension, *Model III*, I allow for greater heterogeneity by interacting the *proc* variables with the industry dummies, thus estimating separate coefficients for each industry. This model will allow me to formally test whether the effect of inefficient cross-border trade procedures is the same for all industries.

(Model III)

$$\mathbf{x}_{ijs}\beta = \delta_1 \ln proc_i + \sum_{s=2}^{7} \delta_s \mu_s \times \ln proc_i + \gamma_1 \ln proc_j + \sum_{s=2}^{7} \gamma_s \mu_s \times \ln proc_j + \mathbf{z}\alpha$$

4.2.2 Data and Sample

To measure the costs relevant for trade facilitation, I use the number of days needed to export or import a standardized good as a proxy. The data comes from the World Bank's

[17] I divide the range of export border delays into four intervals: INT_1^j: 1-20 days, INT_2^j: 21-40 days, INT_3^j: 41-60 days, and INT_4^j: >60 days. Import delays vary less in the importing EU countries, so these are divided into two intervals: INT_1^i: 1-15 days and INT_2^i: >15 days.

(2007a) *Doing Business Database*. In the *Trading Across Borders* section of this large survey, local freight forwarders, shipping lines, customs brokers and port officials are asked about how much time, documents and costs that would be involved for a hypothetical trading firm to export or import a well-defined, standardized good.[18]

Dennis and Shepherd (2007) use the same database, but while they choose to use the cost variable to measure trade costs related to exporting, I believe that the time variable is a better proxy for what I want to capture: in a broad sense the efficiency of cross-border trade procedures, i.e. the efficiency that reform under the heading of trade facilitation is meant to improve. The motivation for this is that while specific problems giving rise to monetary costs generally also will imply longer waiting, longer waiting can arise for reasons that are not linked to any direct costs. For example, having to collect many signatures or fill out many documents might involve direct costs, but it will also increase the time needed to get the good through customs.[19] Further, by using the official fees as a measure of the relevant trade costs, I would argue that one primarily captures variable costs that are not necessarily related to inefficient cross-border trade procedures. The time measure should be strongly related to the degree of complexities involved in trading across the border, and therefore not only be a better proxy for the general effectiveness of cross-border trade procedures, but also potentially capturing some of the fixed costs that arise due to these procedures.

Using *Generalized System of Preferences* (GSP) eligibility in 2005 as the definition of being a developing country, I have data for 130 developing countries

[18]The hypothetical trading firm that is a private limited liability company, fully domestically owned with a minimum of 100 employees, is located in the country's most populous city but does not operate within an export processing zone (EPZ) or an industrial estate with special export or import privileges, and exports more than 10 percent of its sales to international markets. The good is assumed to be non-hazardous, not to include any military arms or equipment, not to require refrigeration or any special environment, nor any special phytosanitary or environmental safety standards, and to be shipped in a dry-cargo, 20-foot, full container load. Trade is assumed to take place by ocean transportation through the closest or main port from the most populous city (the port may be located in another city or country). For imports, all procedures from the conclusion of a purchase contract to the arrival of the goods at the importer's warehouse is included, and for exports the process starts with the conclusion of a sales contract and ends with the good leaving the port of exit. For more specifics, see World Bank (2007a), or Djankov *et al* (2006).

[19] Note that the correlation between the cost and time variables is not very high: in my sample 0.66 for exporting, and as low as 0.26 for importing.

concerning time needed for exports.[20] Table 4 presents some descriptive data for developing countries. Low-income countries and LDCs have the largest means, but is important to note that there is a lot of within-group variation. Regarding the time needed for imports, I have data for all EU25 countries except Cyprus and Malta. The average time needed to import a good is 14 days, but it ranges from 5 days in Denmark and Estonia to 27 days in Poland. For a list of the included countries, as well as data sources and definitions for the other variables, see tables 7 and 8 below.

Table 2. Days Needed for Exports

	Mean	*Min*	*Max*	*Obs*
Low Income	43	20	82	51
Lower Middle Income	31	15	102	50
Upper Middle Income	22	9	36	24
High Income	17	13	28	5
Least Developed	40	20	78	47
Average	34	9	102	130

Source: Author's calculations using data from the World Bank (2007a) *Doing Business Database*

There are some problems with using this data as an indicator of potential trade facilitation. All goods do not necessarily react the same way to waiting at the border – in other words the level of variable and fixed costs might differ, and larger firms, especially those that export a lot, might further be much better equipped to deal with inefficient procedures, for instance by having specialized staff. One would also expect the time needed for export or import procedures to differ a lot for various destinations and origins. Firms for example operating within export processing zones should also experience less problems with crossing the border. Despite this, I only have one observation for every exporter and importer, and this observation is supposed to measure the time it takes for a large company to export a relatively time-insensitive good. Therefore, the measure must necessarily be a crude one.

However, I would argue that the data can still be used as a reasonable indicator for the general condition of the customs environment. There is likely a high correlation between the time requirements for different kinds of goods and firms, so if border delays

[20] For a few countries, there is no data for 2005, but data is available for 2006 or 2007. Given that there is very little time-series variation in the data (implying that nothing is gained from adding more years to the sample) , when this is the case, I choose to use the latter data to get as full a sample as possible.

for the (fairly large) hypothetical trading firm's standardized good are large, this should mean that most other goods and firms also must wait for a long time at the border, even though the exact number of days will vary.

5 Empirical Results

The full results from a fractional logit estimation of models I and II are presented in table 8 below, and will be commented on. Starting, however, with the most relevant variables, inefficient import and export border procedures, these results are reproduced in table 3 for convenience.

Table 3. Estimation Results for Inefficient Border Procedures

		Regr. Coeff.	*Sum*
Model I	Import Procedures	-0.152	
		[0.002]***	
	Export Procedures	-0.196	
		[0.008]***	
Model II	Import Procedures 1-15 days	-0.637	-0.637
		[0.000]***	[0.000]***
	Imp. Proc. >15 days	0.192	-0.445
		[0.000]***	[0.000]***
	Export Procedures 1-20 days	-0.798	-0.798
		[0.000]***	[0.000]***
	Exp. Proc. 21-40 days	0.124	-0.674
		[0.000]***	[0.000]***
	Exp. Proc. 41-60 days	0.236	-0.562
		[0.000]***	[0.000]***
	Exp. Proc. >60 days	0.202	-0.596
		[0.000]***	[0.000]***

Note: Results from fractional logit estimations of models I and II. The columns show the actual regression coefficients and the sums of the reference interval effect (1-15 days for import procedures and 1-20 days for export procedures) and the interaction effects. Robust p-values (clustered by country-pair) in brackets. Asterisks denote significance at the 1% (***), 5% (**) and 10% (*) levels.

The coefficients resulting from the estimation of *Model I* are negative and highly significant for both import and export procedures. In other words, the reasonable

interpretation must be that inefficient border procedures will decrease the extensive margin more than they decrease the intensive margin.[21]

Allowing separate coefficients for different intervals of border delays through the inclusion of interaction terms, *Model II* is designed to test whether the effect of inefficient border delays on the extensive margin share is constant or changes with rising delays. Interestingly, the coefficients for the interaction terms that show the difference with the reference case of low border delays – one to fifteen days at the destination or between one and twenty days at the origin – are positive and significant. Given the significant and negative coefficient for this reference interval, this means that inefficient import and export procedures are significantly *less negative* for the extensive margin share at higher levels of border delays. However, as illustrated by the negative and significant coefficients in the second column where the main effect and the interaction terms have been summed, the extensive margin effect still dominates even at higher levels of delays.

In addition to these results, I have also estimated a *Model III* where seven industries each have their separate coefficients for inefficient import and export procedures. The results are presented in table 4. In this case, the regression coefficients show how the industry effects differ from the reference industry, which is *Agriculture and Food*, and there is also a column showing summed coefficients.

Starting with the import procedures, with the exception of *Minerals and Chemicals*, there are no significant differences between *Agriculture and Food* and the other industries. When the interaction term coefficients are added to the (slightly insignificant but negative) *Agriculture and Food* coefficient, there is however a negative and significant effect for *Minerals and Chemicals*, *Mining and Metals*, *Machinery and Vehicles*, and *Arms and Other*. Looking also at the export procedure results, all industries except *Minerals and Chemicals* have a significantly more negative coefficient than *Agriculture and Food* (which has an insignificant positive coefficient). These same five industries still have significant negative effects when adding the reference group

[21] The coefficient for inefficient export procedures is larger than the corresponding coefficient for import procedures, which is consistent with the hypothesis that the extensive margin share is more negatively affected by inefficient procedures in the home country: these cannot be avoided if a company wants to enter the world market, while especially inefficient import procedures could be avoided by simply not exporting to that particular destination. However, the difference between the coefficients is not statistically significant, so no strong conclusion can be drawn.

coefficient. The largest effects are found in *Arms and Other*, followed by *Machinery and Vehicles* and *Textiles*.[22]

Table 4. Estimated Trade Facilitation Effects per Industry

	Import Procedures		Export Procedures	
Industry	*Regr. Coef.*	*Sum*	*Regr. Coef*	*Sum*
Agriculture and Food	-0.121	-0.121	0.167	0.167
	[0.116]	[0.116]	[0.122]	[0.122]
Minerals and Chemicals	-0.195	-0.316	-0.035	0.132
	[0.045]**	[0.000]***	[0.778]	[0.222]
Wood and Paper	0.084	-0.037	-0.353	-0.186
	[0.341]	[0.615]	[0.002]***	[0.060]*
Textiles	0.031	-0.09	-0.55	-0.383
	[0.748]	[0.249]	[0.000]***	[0.000]***
Mining and Metals	-0.049	-0.17	-0.342	-0.175
	[0.591]	[0.021]**	[0.002]***	[0.079]*
Machinery and Vehicles	-0.052	-0.173	-0.56	-0.393
	[0.565]	[0.018]**	[0.000]***	[0.000]***
Arms and Other	-0.105	-0.226	-0.627	-0.46
	[0.274]	[0.003]***	[0.000]***	[0.000]***

Note: Results from fractional logit estimations of model III. The columns show the actual regression coefficients and the sums of the reference industry effect (*Agriculture and Food*) and the interaction effects. Robust p-values (clustered by country-pair) in brackets. Asterisks denote significance at the 1% (***), 5% (**) and 10% (*) levels.

Lastly, the results concerning the other variables are also worth mentioning. As can be seen in table 8. The tariff level has a negative coefficient in both models, but is only significant in *Model II*. The distance between the countries significantly negatively affect the extensive margin share, which is interesting since distance is often used as a way to control for variable trade costs – our results therefore suggest that these costs have a stronger effect on the extensive margin. The variable Y_iY_j has two positive and highly significant coefficients: the interpretation being that even though one would expect two large countries to trade more of every good, they will also, to an even higher extent, trade

[22] Disregarding *Agriculture and Food* where there are no significant effects, for all industries except *Minerals and Chemicals*, the coefficients for inefficient export procedures are of a larger magnitude than those for inefficient import procedures. For *Textiles*, *Machinery and Vehicles* and *Arms and Other*, Wald tests indicate that these coefficients are indeed significantly more negative. So, for these industries at least, I do find support for the hypothesis that the extensive margin share is more negatively affected by inefficient procedures in the home country.

a wider range of goods. Very interestingly, the importer's income per capita has a significantly positive effect on the share of the extensive margin, while the exporter's income per capita has a significantly negative effect. So, richer EU countries primarily import a wider range of goods, while richer developing countries tend to export more of fewer goods.[23] Having a common border, sharing the same language or having been in a colonial relationship are all factors that have significantly positive effects on the extensive margin share. This seems very reasonable, since these factors should have a strong impact on the possibilities for a company to find business contacts abroad, while it is less clear why they would affect trade volumes once a trading relationship has been established. Therefore, they should indeed increase the extensive margin in relation to the intensive margin. Being a landlocked importer significantly decreases the extensive margin share, while being a landlocked exporter does not have a significant effect. So, to the extent that landlockedness affects exports (and this has been solidly established in the literature), it affects both margins in a similar way. Lastly, least developed exporters have a significantly negative effect on their extensive margin share. Though perhaps not surprising, this result is somewhat at odds with the negative coefficient on the exporter's GDP per capita, but it may suggest that income does not have a linear effect on the extensive margin share.

5.1 Expected Effects from Trade Facilitation

So far I have shown that the efficiency of import and export procedures matters more for the extensive than the intensive margin, that the effect on the extensive margin share decline with rising inefficiencies, and that the effect is not the same for all industries, which is consistent with the theoretical predictions. Since the coefficients of a fractional logit estimation do not offer any natural interpretation besides the sign and significance (in other words, the marginal effects will depend on the values of **x**), I will now illustrate how the extensive margin share would change following a trade facilitation reform

[23] It is important to remember that we only test which effect is more important. Richer developing countries might reasonably export both a wider range of goods and more of each good, but our results suggest that the latter effect is more important.

involving a one-day reduction of border delays at different starting points. Table five presents the estimated percentage changes in EMS_{ijs} .

Table 5. Estimated Effects from Reform

	Reform	*% change*
Import Procedures	11 to 10 days	4.3
	25 to 24 days	1.2
Export Procedures	11 to 10 days	4.7
	31 to 30 days	1.6
	51 to 50 days	0.8
	71 to 70 days	0.6

Note: The figures give the percentage change in predicted extensive margin share, following a one-day reduction of border delays from various starting points. The predictions are made using average values for all other continuous variables, and using median values for the dichotomous variables.

Consistent with the conclusions drawn from the estimated coefficients, a minus-one-day reform would have the largest effects on the extensive margin share for importing and exporting countries where procedures are already fairly efficient, and the effects then tend to decline. Going from 11 to 10 days of import delays due to inefficient procedures would increase the extensive margin share by 4.2 percent, while the effect of going from 25 to 24 days is only 1.2 percent. A very similar pattern is found for improvements of the export procedures: going from 11 to 10 days would increase the extensive margin share by 4.7 percent, and the effect then falls to 1.5 percent and less for countries starting with less efficient procedures. So, when trade procedures are relatively efficient, the associated costs primarily fall on the extensive margin, but at higher levels of inefficiencies, the margins are more evenly affected.

5.2 Robustness

The results have been submitted to a number of robustness checks – results are presented in table 9 below. First, since the trade data used to construct the trade margins is very detailed, I repeat the estimations with data aggregated at the 6-digit and 4-digit levels. Qualitatively, the results are the same, even though the extensive margin will be larger

the more you aggregate the data, implying that the negative effects on the extensive margin share gets larger as you aggregate. Second, and related to this, I also repeat all estimations at a much more detailed industry level where I define industries according to the CN *section* classification which yields 21 industries – see table 10 below. The results remain very stable.

Third, I allow different effects for low income exporters and middle and high income exporters. Interestingly, while inefficient trade procedures has a significant and negative coefficient for both groups, the significantly negative interaction effect that shows how low-income countries differ from the other countries suggest that the negative effect is even larger in these countries. Fourth, estimating with OLS instead of the fractional logit approach does not change the results. Fifth, to see whether the results are sensitive to which measure is used concerning the efficiency of cross-border trade procedures, I use the costs in US dollars for exporting or importing as an alternative measures. Using the cost variables (also used by Dennis and Shepherd 2007) does not alter the results: both costs to import and costs to export have significantly negative coefficients. Sixth, following Dennis and Shepherd (2007), I include a measure of domestic market entry costs as an extra control variable. This not change anything, and the variable is further not significant. Seventh, I also include the share of agriculture in GDP as a way of controlling for comparative advantage. This does not alter the results. Last, I also include squared income per capita to make sure that the trade procedure results do not capture some non-linear income effect – again the results are not affected, but the significant coefficients for squared income does lend support to the notion that the effect of income on the margins of trade is not linear. To summarize, the results seem very robust, and are not affected by the level of data aggregation, the industry classification, the estimation method, the choice of proxy for inefficient trade procedures or the inclusion of other control variables.

6 Summary and Conclusions

The objective of this paper is to test whether the effect of inefficient cross-border trade procedures is stronger on the extensive or the intensive margin of trade. I use very detailed data on imports to EU-countries from developing countries in 2005 to construct measures for the extensive and intensive margins, and then test in a series of estimations how inefficient import and export border procedures, proxied by the number of days needed at the border, affect the extensive margin share. I find that inefficient import and export procedures have a significantly negative effect on this share. In other words, while inefficient procedures probably have a negative impact both on the range of goods that is being exported and how much that is exported, the former effect is the stronger one. Further, I find evidence that these negative effects are declining: in countries where procedures are fairly efficient, the associated costs primarily fall on the extensive margin, but at higher levels of inefficiencies, the margins are more evenly affected. Lastly, I also find differences between industries in how the extensive margin share is affected by inefficient procedures. While most industries have significantly negative coefficients either for only import or export procedures, or, for three industries, from both, some coefficients are significantly larger than others. For *Textiles*, *Machinery and Vehicles* and *Arms and Other*, the estimated coefficients for inefficient export procedures are particularly large. All in all, my results are therefore consistent with predictions from heterogeneous firm trade theory, as for example Chaney (2008).

As far as I know, this paper is the first to address the question of where the potential effects from trade facilitation are the strongest, or in other words, do inefficient trade procedures primarily affect total trade flows through the extensive or the intensive margin? It is therefore an extension to the previous literature on trade facilitation, where papers such as Wilson *et al* (2003; 2005), Soloaga *et al* (2006), Djankov *et al* (2006), Nordås *et al* (2006), Persson (2008), Lee and Park (2007), Iwanow and Kirkpatrick (2007) and Sadikov (2007) have established that there is indeed a significant link between various measures of trade facilitation and total trade flows, and where Dennis and Shepherd (2007) found evidence of a significant negative association between the

extensive margin of trade and costs to export that can be linked to trade facilitation. The paper also offers a contribution to the field by explicitly estimating the impact that inefficient cross-border trade procedures have on the extensive margin share in different industries, thereby making it possible to identify where the export-diversifying potential from trade facilitation is the strongest.

At this point, a few caveats are in order. The lack of data with real time-series variation concerning the efficiency of cross-border trade procedures means that I cannot use changes in the trade margins to infer the effects of inefficient procedures, but must rely on the cross-sectional variation in the range of goods being traded and the intensity of that trade. This of course makes it more difficult to say anything about causal relationships. Related to this lack of time series data, I also have no choice but to work with cross-sectional estimation methods, and this implies that I cannot control for as much unobservable heterogeneity as I would wish. Accordingly, one should be careful not to overstress the policy conclusions from my findings. Nevertheless, my findings are certainly consistent with the theoretical hypotheses that were derived from Chaney (2008), so these results should at the very least be an interesting starting point for future work.

With the abovementioned caveats, there are some important points to be made from a policy perspective. First, and most importantly, the fact that the extensive margin is even more negatively affected by inefficient cross-border trade procedures than is the intensive margin highlights the export-diversifying potential of trade facilitation. Reducing border delays would increase total exports primarily through the export of new goods, and from this follows that countries engaging in reform could expect not only to increase their exports, but also to get an export that is more diversified. In turn, as has been shown in the literature on export diversification, there is reason to believe that a more diversified export can lead to higher growth. In other words, the fact that trade facilitation works primarily through the extensive margin implies an additional policy implication, with potentially large benefits.

Second, even though they are often strangely neglected in the literature, our findings on import procedures point to an important role to be played by EU-reform. Reformed import procedures in EU countries that are a bit behind best practice could help

diversify developing countries' exports. Interestingly, this might in addition be a relatively easy policy option to pursue, since, even though import competing sectors certainly might benefit from smaller imports due to inefficient procedures, this barrier is not as visible as for example tariffs.

Third, the result that the industry-specific effects of inefficient trade procedures differ gives rise to the question whether trade facilitation reform should be targeted towards certain key industries. To the extent that for example *Machinery and Vehicles* or *Textiles* – two industries with particularly large effects from inefficient export procedures – can be considered to represent promising export sectors, designing cross-border procedures that are easier for traders to comply with in these areas might be a good place to start.

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Table 6. Variables and Data Sources

Variable	*Description and Data Source*
Imports	8-digit imports for 2005 from the Eurostat (2007) *Comext Database*. Downloaded October 2007.
Import and Export Procedures	Time needed to import and export a good – see details in the text. Data from the World Bank (2007a) *Doing Business Database* downloaded October 15, 2007.
Tariff	Average applied tariff at the industry level, calculated using data at the HS2 level from the MAcMap Database, CEPII (2007). See also Bouët *et al* (2004).
GDP	World Bank (2007b) *World Development Indicators* (WDI).
GDP per capita	World Bank (2007b) *World Development Indicators* (WDI).
Distance	Distance in kilometers between capital cities from CEPII (2006).
Border	Importer and exporter share a common border. From CEPII (2006).
Common Language	CEPII (2006).
Colony	Importer and exporter have been in a colonial relationship. From CEPII (2006).
Landlocked	CEPII (2006).
LDC	Country is a least developed country.
Costs to Import or Export	Costs in USD per container – alternative measure of the effectiveness of import and export procedures. Data from the World Bank (2007b) *Doing Business Database* downloaded October 15, 2007.
Domestic Market Entry Cost	The official cost needed to register a firm in percent of per capita income. Data from the World Bank (2007a) *Doing Business Database* downloaded October 15, 2007. See also Djankov *et al* (2002).
Share of Agriculture in GDP	World Bank (2007b) *World Development Indicators* (WDI).

Note: All data are for 2005 unless otherwise stated.

Table 7. Country Sample

Exporting Region	
West Africa	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo
Central Africa	Cameroon, Central African Republic, Chad, Congo Dem. Rep., Congo Rep., Equatorial Guinea, Gabon, São Tomé and Principe
Eastern and Southern Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Uganda, Zambia, Zimbabwe
SADC	Angola, Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Tanzania
Caribbean	Antigua and Barbuda, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago
Pacific	Fiji, Kiribati, Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu
South Asia	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
South-East Asia	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Thailand, Timor-Leste, Vietnam
Eastern Europe and Central Asia	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation, Tajikistan, Ukraine, Uzbekistan
Middle East	Iran, Iraq, Kuwait, Oman, Saudi Arabia, United Arab Emirates, Yemen
Mercosur	Argentina, Brazil, Paraguay, Uruguay
Mediterranean	Algeria, Egypt, Jordan, Lebanon, Morocco, Syrian Arab Republic, Tunisia
Drug	Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru, Venezuela
Other	China, Chile, Mexico, Mongolia
Importing Region	
European Union	Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom

Note: All countries eligible (in 2005) for the EU *Generalized System of Preferences* (GSP) scheme, and for which there is data on export border procedures, are included as developing country exporters. All EU25 countries, except Cyprus and Malta for which their is no import procedure data, are included as importers. In general, every region is constructed so that all countries within the region have the same preferential access to the EU market (the exceptions being "other" and the fact that Pakistan, though eligible for preferences under the GSP special arrangements to combat drug production and trafficking ("Drug") is included in "South Asia" since it is reasonable to assume that it more closely resembles these countries concerning relevant supply side factors).

Table 8. Regression Results

	Model I	*Model II*
Import Procedures	-0.152	-0.637
	[0.002]***	[0.000]***
Imp. Proc. >15 days		0.192
		[0.000]***
Export Procedures	-0.196	-0.798
	[0.008]***	[0.000]***
Exp.Proc. 21-40 days		0.124
		[0.000]***
Exp.Proc. 41-60 days		0.236
		[0.000]***
Exp.Proc. >60 days		0.202
		[0.000]***
EU Tariff	-0.729	-0.858
	[0.114]	[0.062]*
Distance	-0.208	-0.194
	[0.028]**	[0.038]**
yy	0.529	0.528
	[0.000]***	[0.000]***
gdppc importer	0.169	0.142
	[0.000]***	[0.001]***
gdppc exporter	-0.206	-0.189
	[0.000]***	[0.000]***
Common border	0.566	0.642
	[0.086]*	[0.042]**
Shared Language	0.352	0.47
	[0.000]***	[0.000]***
Colonial History	0.589	0.485
	[0.000]***	[0.000]***
Importer Landlocked	-0.267	-0.316
	[0.000]***	[0.000]***
Exporter landlocked	0.025	-0.017
	[0.705]	[0.799]
Exporter LDC	-0.443	-0.448
	[0.000]***	[0.000]***
Constant	-24.261	-21.61
	[0.000]***	[0.000]***
No of observations	20056	20056
Regional exporter effects	*Yes*	*Yes*
Industry effects	*Yes*	*Yes*

Note: Results from fractional logit estimations of models I and II. Robust p-values in brackets (clustered by country-pair). Asterisks denote significance at the 1% (***), 5% (**) and 10% (*) levels.

Table 9. Robustness Checks

	6-digit	*4-digit*	*Section*	*Income Groups*	*OLS*	*Border Costs*	*Entry Cost*	*Agri-culture*	*Income Squared*
Import Procedures	-0.257	-0.348	-0.238	-0.154	-0.032		-0.153	-0.222	-0.288
	[0.000]***	[0.000]***	[0.000]***	[0.001]***	[0.000]***		[0.001]***	[0.000]***	[0.000]***
Export Procedures	-0.35	-0.539	-0.271	-0.161	-0.043		-0.197	-0.136	-0.15
	[0.000]***	[0.000]***	[0.000]***	[0.028]**	[0.001]***		[0.008]***	[0.095]*	[0.042]**
Exp. Proc. Low Income				-0.048					
				[0.050]*					
EU Tariff	-0.27	-0.131	-0.502	-0.745	-0.155	-1.016	-0.725	-0.542	0.282
	[0.570]	[0.801]	[0.059]*	[0.108]	[0.019]**	[0.026]**	[0.116]	[0.268]	[0.541]
Distance	-0.403	-0.562	-0.317	-0.193	-0.038	-0.232	-0.21	-0.246	-0.188
	[0.000]***	[0.000]***	[0.000]***	[0.042]**	[0.013]**	[0.013]**	[0.026]**	[0.015]**	[0.050]**
yy	0.621	0.754	0.579	0.532	0.088	0.515	0.53	0.542	0.508
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
gdppc importer	0.053	-0.117	0.061	0.165	0.016	0.238	0.169	0.196	10.269
	[0.242]	[0.021]**	[0.118]	[0.000]***	[0.014]**	[0.000]***	[0.000]***	[0.002]***	[0.000]***
gdppc exporter	-0.252	-0.313	-0.174	-0.245	-0.032	-0.169	-0.2	-0.139	-1.004
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.011]**	[0.000]***
Common border	1.243	1.815	0.874	0.58	0.096	0.636	0.56	0.561	0.8
	[0.001]***	[0.000]***	[0.003]***	[0.077]*	[0.093]*	[0.047]**	[0.087]*	[0.086]*	[0.017]**
Shared Language	0.401	0.515	0.389	0.354	0.051	0.355	0.352	0.394	0.477
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.002]***	[0.000]***	[0.000]***	[0.001]***	[0.000]***
Colonial History	0.701	0.907	0.62	0.581	0.118	0.547	0.588	0.546	0.541
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Importer Landlocked	-0.261	-0.248	-0.223	-0.264	-0.048	-0.27	-0.267	-0.169	-0.052
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.008]***	[0.381]
Exporter landlocked	-0.044	-0.093	-0.063	0.038	-0.002	0.013	0.029	0.077	-0.043
	[0.509]	[0.185]	[0.309]	[0.558]	[0.841]	[0.840]	[0.659]	[0.268]	[0.510]
Exporter LDC	-0.58	-0.808	-0.535	-0.422	-0.07	-0.462	-0.451	-0.442	-0.532
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
Costs to Import						-0.118			
						[0.096]*			
Costs to Export						-0.117			
						[0.040]**			
Dom. Market Entry Cost							0.011		
							[0.683]		
Imp. Share of Agr.								0.118	
								[0.080]*	
Exp. Share of Agr.								0.13	
								[0.022]**	
gdppc^2 importer									-0.532
									[0.000]***
gdppc^2 exporter									0.055
									[0.000]***
Constant	-23.866	-24.874	-25.882	-24.259	-3.361	-23.589	-24.325	-27.008	-68.16
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***
No of observations	20056	20056	55752	20056	20056	20056	20056	15818	20056

Regional exp. effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

Note: Results from fractional logit estimations of model I. Robust p-values in brackets (clustered by country-pair). Asterisks denote significance at the 1% (***), 5% (**) and 10% (*) levels.

Table 10. Industry Classification

Industry		*Section*	*Chapters*	*Description*
1	Agriculture and Food	I	1-5	Live animals; Animal products
		II	6-14	Vegetable Products
		III	15	Animal or vegetable fats and oils and their cleavage products; Prepared Edible Fats; Animal or vegetable waxes
		IV	16-24	Prepared foodstuffs-, Beverages, spirits and vinegar; Tobacco and manufactured tobacco substitutes
2	Minerals and Chemicals	V	25-27	Mineral products
		VI	28-38	Products of the chemical and allied industries
		VII	39-40	Plastics and articles thereof; Rubber and articles thereof
		VIII	41-43	Raw hides and skins; Leather, furskins and articles thereof; Saddlery and harness; Travel goods, handbags and similar containers; Articles of animal gut (other than silk-worm gut)
3	Wood and Paper	IX	44-46	Wood and articles of wood; Wood Charcoal; Cork and articles of cork; Manufactures of straw, of esparto or of other plaiting materials; Basketware and Wickerwork
		X	47-49	Pulp of wood or of other fibrous cellulosic material; Recovered (waste or scrap) paper and paperboard, Paper and paperboard and articles thereof
4	Textiles	XI	50-63	Textiles and textile articles
		XII	64-67	Footwear, headgear, umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding crops and parts thereof; Prepared feathers and articles made therewith; Artificial Flowers; Articles of human hair
5	Mining and Metals	XIII	68-70	Articles of stone, plaster, cement, asbestos, mica or similar materials; Ceramic products; Glass and glassware
		XIV	71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metals and articles thereof; Imitation jewellery; Coin
		XV	72-83	Base metals and articles of base metal
6	Machinery and vehicles	XVI	84-85	Machinery and mechanical appliances; Electrical Equipment; Parts thereof; Sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles
		XVII	86-89	Vehicles, aircraft, vessels and associated transport equipment
		XVIII	90-92	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; Clocks and watches; Musical instruments; Parts and accessories thereof
7	Arms and other	XIX	93	Arms and ammunition; Parts and accessories thereof
		XX	94-96	Miscellaneous manufactured articles
		XXI	97	Works of art, collectors' pieces and antiques

Note: The division of two-digit chapters into sections follows the HS nomenclature. In the EU Combined Nomenclature (CN), there is a chapter 99 that is not included in the HS nomenclature. Since there is no tariff data available for this chapter, I exclude it from the analysis. This means disregarding 760 out of nearly half a million observations, and should have no practical implications. Note that the division of sections into industries roughly follows Feenstra and Kee (2007).