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Trade Liberalization along the Firm Size Distribution: The Case of the EU-South Korea FTA

Abstract

How do firms of different sizes react to trade liberalization? Leading theories suggest that, amongst continuing exporters, lower trade costs should boost exports of smaller firms by the same or a greater rate than those of larger firms. However, studying the entry into force of the ambitious EU-South Korea Free Trade Agreement (EUKFTA) with French customs data, we find robust evidence to the contrary. Applying a triple-difference framework, we report that the FTA increased sales in the top quartile of continuous exporters by 71 percentage points more than in the bottom quartile. More than 90 percent of that growth premium is driven by a stronger effective reduction in broadly defined non-tariff barriers (NTBs); the remainder by a higher sensitivity to trade costs. These findings have implications for both heterogeneous firm trade models and for the capacity of FTAs to magnify inequality. In contrast, on the entry margins, our results are in line with the literature with the FTA selecting intermediate-sized firms into exporting to South Korea.

JEL-Codes: F130, F140.

Keywords: trade policy, firm heterogeneity, firm size distribution, non-tariff barriers.

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1 Introduction

Free trade agreements (FTAs) are regularly criticized for privileging the interests of the largest firms. Such concerns have contributed to public resistance against mega-regional trade agreements such as the Transatlantic Trade and Investment Partnership (TTIP) and the EU-Canada Comprehensive Economic and Trade Agreement (CETA). Since then, policy-makers have worked to include chapters in FTAs that are dedicated to supporting small and medium enterprises (SMEs). However, for such provisions to be effective, an improved understanding of the distributional effects of modern FTAs and the nature of barriers confronting SMEs is required.

While there is ample research on selection effects from trade liberalization, see, e.g., the survey by Melitz and Redding (2014), evidence on the heterogeneous impact of lower tariffs or non-tariff barriers (NTBs) on *continuing* exporters remains scarce. The latter constitutes another, hitherto under-explored channel through which trade liberalization could further increase pre-existing inequality across firms, with implications for labour markets, social welfare and the design of SME policies. We address this gap in the literature by comparing the magnitude of FTA effects along the size distribution of incumbent exporters and examining these size-differentials over time and across sectors. Using customs data from France, we find robust evidence of size heterogeneity in export growth along the intensive margin of incumbent exporters.

Our main result is that the agreement boosted sales of incumbent exporters (i.e., at the intensive margin) in the top quartile of the size distribution by about 71 percentage points more than firms in the bottom quartile. The result is mostly driven by lower NTBs, but larger firms appear to react more strongly to lower trade costs too.[1] While the result on the intensive margin is at odds with the standard Melitz (2003) model, our findings on exporter entry and the product-level extensive margin are in line with theory: the FTA does indeed increase the likelihood of export participation and the number of products exported by medium-sized firms.

Our key result therefore sheds doubt on the frequent assumption that all firms face identical (variable and fixed) trade costs and demand elasticities. Interestingly, leading models that relax one of these assumptions predict the opposite of what we observe. For example, models featuring linear demand systems such as Melitz and Ottaviano (2008) imply that more productive (and, hence, larger) exporters expand sales by less than their less productive peers when trade costs fall, as they face less elastic demand. Also Arkolakis (2010) predicts that trade liberalization boosts the sales of larger exporters by smaller rates than those of smaller firms because of increasing marginal foreign market penetration costs.

Our intensive margin result would be consistent with a configuration where the FTA lowers trade

[1] In many models with rent-sharing, the wage distribution follows the size distribution Helpman, Itskhoki, and Steven Redding (2010). Hence, our result suggests that the FTA may have increased wage inequality in France.

barriers more strongly for larger firms.[2] For instance, it is conceivable that detailed provisions of FTAs such as rules of origin reflect the interests of dominant firms rather than of smaller firms. Alternatively, our result would emerge if larger firms react more strongly to identical trade cost reductions. This would be the case if, unlike in Arkolakis (2010), marginal market access costs are decreasing in sales, or if taking advantage of the FTA entails recurring investment that firms with larger sales find easier to undertake.[3]

The EUKFTA is an excellent case to study the effects of trade liberalization along the firm size distribution. First, the agreement concerns two sizeable advanced economies and was the largest EU FTA in terms of joint market size when it entered into force in 2011.[4] Second, it is an ambitious agreement that mandated the reduction to zero of 94% of all EU tariff lines and 80% of South Korean tariff lines within the first year. This implies that the size of tariff cuts was largely determined by the pre-existing level of MFN tariffs, alleviating concerns regarding endogeneity. Third, the EUKFTA is still considered the prototype of a deep new-generation trade agreement with ambitious language on NTBs, both at the sectoral (vertical) and the cross-sectoral (horizontal) level; see Mattoo, Rocha, and Ruta (2020).

In terms of methodology, we adopt a triple-difference approach that includes the largest possible set of three-way fixed effects to minimize omitted variable bias and other sources of possible endogeneity.[5] To study the heterogeneous effects of NTB reductions on firms, we employ a novel 'umbrella' approach inspired by the gravity literature (Baier and Bergstrand, 2007). Essentially, this amounts to an events-study technique where the application of the FTA is summarized by an indicator variable. By definition, the indicator variable captures *all* trade effects attributable to NTBs, since tariff cuts are precisely observable so that their effects can be netted out. This strategy bypasses the need to measure the wide range of NTBs addressed by the FTA and therefore complements existing literature that uses specific proxies of NTBs (such as concerns raised by countries about technical barriers to trade or sanitary and phytosanitary measures).

Finally, the long panel dimension of French customs data enables us to deal with another methodological challenge – the anticipation of trade liberalization by firms. Official negotiations over the EUKFTA began in 2007, with the FTA entering into force in 2011. To deal with firm anticipation, we compare export performance in the period after inception of the FTA (2011-2016) to the period prior to official negotiations (2000-2006). In addition, we take an agnostic approach to constructing the control group of countries by including all export markets that are reported in the customs data (besides South Korea).

[2]This could be the case for usually unobservable non-tariff barriers; tariffs in contrast do not vary across firms within products (but larger firms could cluster in product categories facing larger cuts).

[3]Such investment could be related to proving rules of origin which require firms to furnish extensive documentation.

[4]It remained the EU's biggest FTA until 2017 when the EU-Canada Comprehensive Economic and Trade Agreement (CETA) began to be provisionally applied.

[5]Our regressions allow for multiple three-way fixed effects such as firm-product-destination, firm-destination-time and firm-product-time fixed effects.

Our paper is related to several strands of research. First, it extends prior firm-level literature on the impact of trade liberalization by jointly studying the role of tariff and NTB reductions on firms' trading activities. Earlier work such as Iacovone and Javorcik (2010) on NAFTA and Bustos (2011) on MERCOSUR has examined the impact of tariff reductions on a variety of firm outcomes. NTBs and their impact on firms have also been discussed, although separately, in papers such as Fontagné and Orefice (2018) on technical barriers to trade (TBTs) and Fontagné, Orefice, Piermartini, and Rocha (2015) on sanitary and phytosanitary (SPS) measures.[6] Much of this literature has focused on the selection effect (i.e., the extensive margin of trade liberalization) while we have special interest in *differential* size-effects along the intensive margin of continuing exporters.

Our findings also contribute to a small but growing literature that reports the advantages of large firms from NTB reductions; see Fontagné, Orefice, and Piermartini (2020) on border formalities, Carballo et al. (2016) on border entry timings, and Karpaty and Tingvall (2015) on corruption. This paper broadens the analysis to the wide range of NTBs that are addressed by a deep FTA, compares the impact of NTBs to tariffs and studies the variation in NTB effects over time and across sectors. Although our primary focus lies on FTA effects for incumbent exporters, we also provide an extension for the import side.

Third, we contribute to prior research on the trade effects of the EUKFTA. Lakatos and Nilsson (2017) use monthly EU-wide trade data at the 8-digit product level in a gravity-type model. They report an increase of 11.2% in the probability to export and a 10.7% increase in the value of EU exports. We are aware of only one existing study that uses firm-level data to evaluate EUKFTA: Kasteng and Tingvall (2019) use transaction-level import data for Swedish firms for one month (November 2016) to examine preference utilisation rates.[7]

The rest of the paper is structured as follows. Section 2 provides the necessary background for the EUKFTA and discusses the tariff liberalization and NTB reductions envisioned by the agreement. It describes the customs database used and our measure of firm size. Section 3 sets out our empirical methodology for examining the impact of the agreement along the size distribution and shows baseline results. A range of robustness checks are reported in Section 4. Finally, concluding remarks and policy implications are presented in Section 5.

[6] Our work also relates to the large gravity literature on the trade effects of FTAs, which uses aggregate data; see Head and Mayer (2014) or Yotov et al. (2008).

[7] Using a New Quantitative Trade Theory (NQTT) model with multiple countries, multiple sectors and value chains following Caliendo and Parro (2015), European Commission (2017) examine the general equilibrium effects of the EUKFTA using GTAP data upto 2014. They find that the agreement boosted the EU's GDP by approximately €4.4 billion and increased EU exports to South Korea by 42% relative to the benchmark scenario with no FTA.

2 The EU-South Korea FTA

2.1 The EU-South Korea FTA as a Prototypical "New Generation" FTA

The EUKFTA was the first trade agreement signed by the EU with an Asian economy. Formal negotiations were launched in 2007 and after eight official rounds of talks, the agreement was signed in 2010. Following ratification in parliaments, the FTA was applied from July 2011 onwards. Since then, the agreement has become a model for the EU's 'new generation' FTAs, because of its unprecedented scope, depth and speed of liberalization. In that it differs from earlier agreements and is an excellent example for what the literature refers to as a 'deep' trade agreement (see, e.g., Dür, Baccini, and Elsig, 2014; Mattoo, Rocha, and Ruta, 2020). In particular, the commitments under EUKFTA extend beyond tariff reductions to so called WTO-X provisions covering competition policy, intellectual property rights and the movement of capital. The agreement is the EU's first to include a dedicated chapter on sustainable development. The EUKFTA does not feature a special SME-chapter. However, its provisions on transparency and regulatory stability have the intention of supporting SMEs.[8]

The agreement features deep tariff cuts across the board. When the FTA entered into force in 2011, most industries experienced rapid liberalization with duties completely eliminated. In all, South Korea eliminated nearly 64% of its tariff lines immediately, with another 16% of tariff lines being already duty-free. Approximately 1.8% of tariff lines were phased out over 10 years and longer, largely for relatively sensitive products in the agri-food and textiles sectors. As a consequence, for EU exporters, the simple average of South Korean duties fell from 12.1% to 6.2% upon entry in force, and, within five years, the agreement had eliminated 98.7% of duties in trade value for both agricultural and industrial goods (European Commission, 2010). In 2010, the simple average of the EU's applied MFN tariffs faced by South Korean exporters stood at 5.1%. With the FTA's implementation, this was reduced, essentially without phase-in, to approximately 0.5% in 2011.[9]

In our analysis, we will use a complete global matrix of applied bilateral tariffs at the HS 6-digit product level that is drawn from Felbermayr, Teti, and Yalcin (2019). This database includes the phasing-out of tariffs from FTAs and fills in missing MFN tariffs by examining the nearest preceding or succeeding observation. Information on a given product's tariff staging category is drawn from the FTA tariff schedules, available through the WTO's RTA database.

In comparison to tariffs, the precise measurement of NTBs poses several challenges. This stems

[8]Dedicated SME chapters have been introduced in EU or US FTAs such as the EU-Japan Economic Partnership Agreement (EUJEPA) or the US-Mexico-Canada-Agreement (USMCA). They also feature in all agreements currently under negotiation.

[9]Figure 5 in the Appendix A provides details. These tariff cuts are important for the EU-South Korea relationship given the role of goods trade in overall trade between their economies. In 2010, the year before the FTA's implementation, 79% of EU's total exports to and 89% of EU's total imports from South Korea comprised of goods.

from the fact that NTBs group together all frictions to trade other than tariffs and tariff-rate quotas. They include impediments to trade that arise from geographic and historical factors such as distances, cultural norms, languages and institutional frameworks as well as 'behind-the-border' policy measures. The EUKFTA acted upon the latter through a range of provisions. Amongst other trade reforms, South Korea lowered the burden of third-party testing for EU electronics, recognised UNECE as the relevant standard-setting body for motor vehicles and agreed to policy coordination in SPS and TBT measures. The agreement also featured several 'horizontal' clauses that would benefit all sectors, e.g., by improving transparency, availability of information and customs facilitation.[10] In our analysis, we work with an event studies approach to capture the comprehensive effects of NTBs.

We use French data to investigate the agreement. Within the EU, France is amongst the top trade partners of South Korea. In 2016, it accounted for approximately 8.85% of EU's total goods exports to South Korea, ranking fourth after Germany (39.40%), UK (11.91%) and Italy (9.06%). France has also widened its trade surplus in goods with respect to South Korea in recent years. This surplus stood at € 1.57 billion in 2016, a 45% increase over the trade surplus of € 1.08 billion in 2010, the year before the FTA went into effect. Turning to the composition of trade baskets, we note that French exports to South Korea are dominated by manufacturing industries such as machinery, transport, chemicals and plastics. At a more disaggregated level, manufactured goods such as cars and car parts, other aircraft and aircraft parts, packaged medicines and electronics capture substantially high shares in overall exports.

2.2 Data on Trade Flows

To examine the impact of the agreement on firms, we use customs data from France over the period of 2000-2016 (dataset DGDDI, 2018). These data provide information on export sales and import purchases of any French trading firms (denoted by f), disaggregated by destination or source country (d) and product (p) over time (t).[11] Services trade is not included. Since each firm is assigned a time-invariant unique identifier ('SIREN'), it is possible to follow its export and import activities over time. We aggregate transactions from the monthly to yearly level

[10]With data on tariffs and tariff elasticities, European Commission (2017) computes reductions in NTBs that would explain changes in trade flows not accounted for by tariff cuts. They report the highest NTB reduction for EU exports in electronic equipment (25.3%), raw materials (13%) and machinery and equipment (9.3%) sectors. NTBs faced by South Korea's exporters also fell significantly for metals (12.5%), raw materials (9.5%) and agricultural goods (7.8%). NTBs fell even for sectors that did not have dedicated provisions under the FTA. Therefore, their results highlight the role of 'horizontal' clauses that reduce trade frictions more broadly across sectors. Such NTB reductions are crucial as they drive the overwhelming majority of welfare gains in CGE evaluations of deep FTAs – especially when the initial level of tariffs applied on manufactured goods is relatively low, as is the case for EU and South Korea.

[11]The transaction level customs data that support the findings of this study is covered by statistical secrecy and can be accessed only through a previous authorization of the French Custom Administration. The customs data is from the DGDDI (Direction Générale des Douanes et Droits Indirects – a directorate of the French Ministry of Finance). The authorization is granted by the "Comité du secret" of the CNIS (Conseil National de l'Information Statistique). The link to procedures for getting access to the data is: https ://www.comite-du-secret.fr/.

and products from the 8-digit Combined Nomenclature classification to the 6-digit HS 1992 Classification (to match the tariffs data). Due to changes in the reporting threshold in 2011, we follow Bergounhon, Lenoir, and Mejean (2018) by dropping observations where a firm's annual exports or imports amount to less than €1000. In all, the customs data cover approximately 390,000 exporting firms and 413,500 importing firms that trade in nearly 5000 products and with 194 countries.

2.3 Measuring Size

We use the customs data described above to proxy a firm's size by the total of its trade with markets other than South Korea. In principle, the customs data could be merged with a balance sheet survey of firms that contains more conventional measures of size such as revenue, capital stock or employment.[12] However, the balance sheet data has no size information on firms with less than 25 employees. These firms account for more than half of French exporters (Fontagné, Orefice, and Piermartini, 2020). For the current analysis, retaining these firms is important as the objective is to study the differential impact of the FTA along the full size distribution.

Furthermore, using customs data instead of balance sheet information allows us to define size at the firm-product level which is not feasible with balance sheet data. Defining firm size at the product level facilitates the estimation of size-specific tariff elasticities, since tariffs vary at the product-level. For this reason, most of our analysis relies on a firm-product level measure of size. However, we provide sensitivity checks to examine the robustness of results regarding this choice.

Our size measure is therefore measured as the total trade (exports and imports) of a firm across destinations within a HS-6 digit product over the control period (2000-2006), using the GDP deflator (base year 2015) to adjust for price changes and excluding any trade with South Korea. This definition is based on a time window that ends five years before entry into force of the EUKFTA and even before negotiations on the agreement began, thereby taking account the fact that size is endogenous to trade liberalization. Excluding trade with South Korea has the same advantage. Defined in this manner, our size measure is time-invariant. Such a trade-based proxy for size is also supported by prior literature (Melitz and Redding, 2014; Fontagné, Orefice, and Piermartini, 2020).[13]

[12]The Enquete Annuelle d'Enterprise (EAE) is a survey that provides balance sheet information of firms along with the SIREN identifier that enables matching.

[13]Any size measure (whether based on trade flows or balance sheet data) is unlikely to be a perfect measure of productivity as in Melitz (2003) models. Hence, our econometric strategy includes firm-product-time fixed effects to capture any time-varying supply-side shocks such as to firms' technologies and worker skills in a narrowly defined HS-6 digit product category.

2.4 Characteristics of French Exporters to South Korea

Our data include firms that either export to South Korea or import from it or trade both ways with the country. The data also feature firms that never trade with South Korea. Of all French exporting firms in the data, 4.87% exported to South Korea during the control period (2000 to 2006). That share stands at 2.16% when looking at exported firm-product combinations. How different are these firms from each other in terms of our size measure? To examine this, we report summary statistics in Table 1. Within product classes, firms trading both ways with South Korea are (on average) more than 200 times larger than firms not trading with South Korea (comparing lines (i) and (iv) in the table).[14] Firms that export (but not import) to South Korea are still more than 35 times as large, with an average size of €32 million (in 2015 prices). This picture becomes even more pronounced when looking at median ($p50$) values instead of means, with the median size of exporters to South Korea being more than 50 times larger than firms that do not trade with South Korea at all. Within those groups there is a substantial degree of skewness which tends to increase in the size of the groups and is thus smaller amongst firms trading with South Korea than in the full sample. Against the backdrop of existing literature, these results are as expected.[15]

Table 1: Size distribution and trade with South Korea (in million €)

		Number	Mean $\bar{\mu}$	$p25$	$p50$	$p75$	$\bar{\mu}/p50$
(i)	Two-way trade w/Korea	3105	200.875	1.107	8.349	51.513	24.060
(ii)	Exported to Korea	31,712	32.149	0.077	0.737	6.426	43.624
(iii)	Imported from Korea	19,362	10.163	0.035	0.249	1.845	40.815
(iv)	No trade w/Korea	4,385,575	0.859	0.004	0.013	0.064	66.077
(v)	All firm-product pairs	4,439,754	1.263	0.004	0.013	0.067	97.154

Note: This table reports summary statistics for our size measure calculated as the sum of (deflated) exports and imports of a firm in a given HS-6 digit product (excluding trade with South Korea) over the period 2000 to 2006 i.e. before negotiations for the EUKFTA began. It describes the size distribution of firm-product combinations which were i) exported to and imported from South Korea at least once over 2000-2006; ii) exported to but never imported from South Korea; iii) imported from but never exported to South Korea; iv) did not trade with South Korea and; v) traded with any destination over 2000-2006. $p25$, $p50$, and $p75$ denote the 25th, 50th, and 75th percentile of the size (sales) distribution.

French firms exporting to South Korea tend to be diversified across destinations as well as

[14] Amongst the two-way traders, 60% fall within three HS chapters - i) 84 (Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof); ii) 85 (Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles) and; iii) 90 (Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof).

[15] Such size patterns arise in heterogeneous firms models with asymmetric countries. Given comparable high trading costs (both fixed and variable) resulting from geographical and cultural distance to France, only the most efficient firms select into far away markets (Chaney, 2008), and they tend to export their best performing products (Mayer, Melitz, and Ottaviano, 2014). Similarly, the productivity (and size) premium of two-way traders over one-way traders has also been reported in prior literature such as Kasahara and Lapham (2013), who demonstrate the role of import-export complementarities in driving this gap.

products. For instance in 2016, a large proportion of these firms exported not only within the EU but also to economies such as the US (72.2%), China (58.2%), and Japan (56.2%). Out of all firms selling to South Korea in 2016, 19.4% sold two and 24.6% sold more than two HS 6-digit products to South Korea. Hence, there is ample variation across markets and products within French firms that export to South Korea. This feature of the data enables us to use a broad range of firm fixed effects in our regressions.

Next, quite in line with expectations and prior research, we find that multi-product firms, firms serving multiple destinations, and firms serving neighbouring markets like Japan, Taiwan or both are significantly more likely to export to South Korea in the control period (2000 to 2006). Using simple two-period linear probability panel models, Table 11 in the Appendix shows that multi-product firms have a probability of exporting to South Korea that is by about 1.8% higher than that of other firms, multi-destination firms display a premium of 1.1%, and firms exporting to Japan and/or to Taiwan have a 7.4% higher likelihood. The latter observation suggests thinking of Japan and Taiwan as plausible alternative destinations for French exporters to South Korea. After the entry into force of the EUKFTA the likelihood to export to South Korea appears significantly higher for all those firms, with a particularly strong effect amongst firms exporting to Japan and/or Taiwan. These findings reaffirm core predictions in the Melitz (2003) models regarding selection effects.

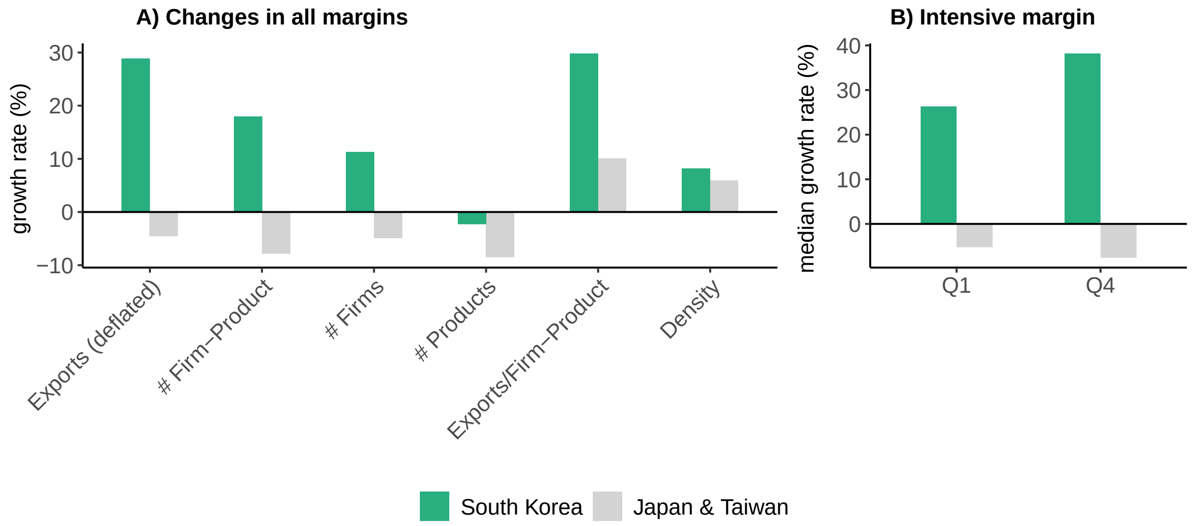
2.5 Effects of the FTA – A First Glance at the Data

To examine the contributions of various margins to overall growth in trade, we follow Bernard et al. (2009) and decompose exports to South Korea into i) unique number of firms; ii) unique number of products; iii) average exports per firm-product pair and; iv) density i.e. the fraction of all possible firm-product pairs for which exports are positive. We compute changes in these margins, where the margins are first averaged across years within two periods (2000-2006 and 2011-2016) and then differenced. Furthermore, we compare exports to South Korea with exports to Japan and Taiwan since they are similarly distant markets that imported comparable baskets of goods from France.[16]

Panel A in Figure 1 depicts changes for these various margins between the control and FTA period. We find that exports to South Korea posted a steep jump following the implementation of the FTA. The contrast with Japan and Taiwan is also striking. Exports to South Korea increased by approximately 29 percentage points, driven by increases in the number of exported firm-product combinations and in the average sales per firm-product combination. In subsequent regressions, we expand the control group to include all other countries in the customs data set and introduce high dimensional product-destination-time and firm-product-destination fixed effects in order to

[16] As shown in Table 11 in Appendix B, there is a high degree of correlation between exporting to South Korea and exporting to either of these two countries prior to adoption of the FTA.

Figure 1: Growth in exports from France



Note: Panel A shows the growth rate in various margins of French exports, where the margins are first averaged across years within the control (2000-2006) and FTA periods (2011-2016) and then differenced. Panel B shows the median of growth rates in sales of firm-product combinations that were exported in both control and FTA periods to all three destinations (South Korea, Japan and Taiwan). The median growth is computed over all firm-product combinations within the bottom quartile ($Q1$) and top quartile ($Q4$) of the size distribution. In both panels, export values are first adjusted by France's GDP deflator drawn from the World Bank Database.

account for a wide range of variables that can influence export outcomes such as demand shocks, macroeconomic conditions, firms' market knowledge and distribution networks.

In Appendix A, we further decompose the change in aggregate exports into the change in sales of continuously exporting firms, entrants and exiting firms (Figure 6). We find that exports to South Korea in the post-FTA period were approximately €5.95 billion higher compared to the control period. This is largely driven by a €7.69 billion increase in the sales of continuous firms. In comparison, firms that newly entered the South Korean market contributed €3.23 billion in additional exports whereas firms that exited the market led to a decline in sales of €4.97 billion. In Japan and Taiwan, total goods exports of French firms shrank as many firms exited over 2011-2016.

These preliminary findings indicate that the EUKFTA provided a substantial boost to French exports to South Korea and that the export growth was overwhelmingly driven by continuous exporters i.e. firms that had already exported to South Korea in the period before the start of the EUKFTA negotiations. Looking at the set of continuously exported firm-product combinations, the top quartile of the size distribution saw an increase in exports to South Korea by 38% (at the median) whereas the bottom quartile grew by approximately 26% (see panel B of Figure 1).[17] In the following sections, we explore this skewness in export growth and compare the role of

[17] This differential also exists when looking at the simple average of growth rates for $Q1$ and $Q4$ exporters.

tariffs and NTB reductions in generating these growth differentials.

Finally, it is worth noting that tariff cuts are identical for all firms within product categories. Of course, it is perfectly possible that product classes populated by larger firms have experienced larger tariff cuts. Table 10 in Appendix A shows, however, that simple averages of tariff reductions within size classes are not biased in favor of large firms.[18]

3 Empirical Methodology

3.1 Specification

To guide our analysis, we use a simple demand function where exports of a French firm f of product p to a destination d at time t can be written as $X_{fpdt} = A_{pdt}(\mathcal{P}_{fpdt})^{-\eta_{fpd}}$. In this expression, buyers in d face the price $\mathcal{P}_{fpdt}$; A_{pdt} is a demand shifter that is common across firms but varies across products, destinations and time and; η_{fpd} is the demand elasticity which we take as time-invariant but specific to the destination and the firm-product combination.

The consumer price depends on tariffs and NTBs such that $\mathcal{P}_{fpdt} = \mathcal{P}_{pdt}\tau_{fpdt}t_{pdt}$ where $\tau_{fpdt} \geq 1$ is an iceberg factor that captures NTBs and $t_{pdt} \geq 1$ is an ad valorem tariff factor which does not vary across firms.[19] Following the gravity literature (see, e.g., Head and Mayer, 2014), we assume that NTBs are affected by FTAs such that $\tau_{fpdt} = \tau^0_{fpdt}\exp(-\zeta_{fpd}FTA_{dt})$, where τ^0_{fpdt} corresponds to the base level of NTBs; FTA_{dt} is a dummy variable taking the value one if France has a free trade agreement with country d at time t, and ζ_{fpd} is the associated coefficient. Substituting and taking logs, we obtain the following:

$$\ln X_{fpdt} = \ln A_{pdt} - \eta_{fpd}\ln t_{pdt} - \eta_{fpd}\ln \mathcal{P}_{pdt} - \eta_{fpd}\ln \tau^0_{fpdt} + \eta_{fpd}\zeta_{fpd}FTA_{dt}. \qquad (1)$$

The EUKFTA would affect this expression through changes in tariffs (t_{pdt}) and through NTBs as captured by FTA_{dt}. In this framework, the tariff elasticity η_{fpd} measures the effect of changes in trade costs (i.e., of tariffs and non-tariff barriers) whereas ζ_{fpd} measures the change in trade costs following the entry into force of an FTA. Provided with a sound estimate of η_{fpd}, it would be possible to back out ζ_{fpd}. Note, however, that clean identification is difficult, because components of Equation (1) such as A_{pdt}, $\mathcal{P}_{fpt}$ or τ^0_{fpdt} are not readily observable. Including appropriate fixed effects is helpful, but risks making identification of ζ_{fpd} impossible.

[18] The evidence is more mixed when weighting tariff cuts by the size measure or firm-level exports to South Korea. Compared to the bottom quartile, medium-sized exporters tend to face smaller tariff cuts while the top exporters enjoy either similar or larger cuts. A better understanding of the structure of tariff cuts as a function of the size distribution is an interesting avenue for further research.

[19] If $\tilde{t} \in (0, 1)$ is the ad valorem tariff rate, then $t = 1 + \tilde{t}$ is the tariff factor.

In this paper, we are interested in the size-specific effects of trade policy. Focusing on the interaction between firm size measures and trade policy variables, we gain degrees of freedom in dealing with unobserved determinants of X_{fpdt}. Following our simple theoretical framework, we adopt a difference-in-differences approach that introduces high dimensional fixed effects that can control for demand shocks A_{fpdt}, the producing firm's costs (as reflected by the factory-gate price $\mathcal{P}_{fpdt}$) and non-actionable NTBs. Our corresponding specification is as follows:

$$\ln X_{fpdt} = \sum_{k=1}^{\mathcal{K}-1} \beta^k (\mathcal{I}_{dt} \times Size^k_{fp}) + \sum_{k=1}^{\mathcal{K}-1} \gamma^k (\ln t_{pdt} \times Size^k_{fp}) + \sum_{k=1}^{\mathcal{K}-1} \delta^k (\mathcal{I}_{dt} \times \ln t_{pdt} \times Size^k_{fp})$$
$$+ \mathbf{Z} + \theta_{fpd} + \theta_{fpt} + \theta_{pdt} + \varepsilon_{fpdt}. \quad (2)$$

We aggregate exports to two periods – a control period (2000-2006) and an FTA-period (2011-2016) – instead of working with yearly data, which raises issues related to the volatility of firm-level data.[20] The treated country is South Korea with all remaining countries in the data forming the control group. Our choice of the control group of countries is hence both expansive and agnostic. The treatment dummy for the agreement $\mathcal{I}_{dt}$ takes the value of 1 for South Korea in the FTA period and 0 otherwise.[21]

In our baseline regressions, we allocate exporters into $\mathcal{K}$ size bins (in robustness checks we also work with a continuous size measure). We interact these size bins with the dummy $\mathcal{I}_{dt}$, taking the category of the smallest exporters as the base category.[22] The associated series of coefficients β^k captures $\eta_{fpd}\zeta_{fpd}$ for the k-th size category relative to the base category. Hence, we cannot equate size specific effects $\eta^k_{fpd}\zeta^k_{fpd}$ to β^k. [23] However, it is clear that potential heterogeneity in estimated β^k coefficients can be due to η^k_{fpd}, ζ^k_{fpd}, or both.

We also add size bin interactions with the applied tariff factor t_{pdt}, distinguishing between an average base effect (applying to any change in tariffs) and EUKFTA-specific tariff changes. With the inclusion of tariff controls in the specification and assuming that our fixed effects capture possible changes in preferences and supply-side determinants, the β^k coefficients provide a clean identification of NTB reductions by construction; i.e., they capture all effects of the FTA on firm exports across the size distribution net of tariffs. This allows us to interpret the β^k coefficients as

[20]We use the French GDP deflator (base year as 2015) to account for changes in output prices within periods. We also estimate equation (1) on yearly data as a robustness check in Section 4. Also note that, in principle, we could collapse the data over the product dimension and study changes in exports at the firm-destination-time level. We do so as a robustness check in Table 13 in Appendix B.

[21]In fact, $\mathcal{I}_{dt}$ is the product of the more general indicator variable FTA_{dt} and a South Korea dummy.

[22]Due to the array of fixed effects present in the model, only $\mathcal{K}-1$ of the bin-specific interaction terms in our model are linearly independent, and so we can estimate bin-specific effects only for $\mathcal{K}-1$ bins. As a default, we omit the category of smallest exporters. As a consequence, the specification cannot inform us about the absolute change in exports within a size bin, but only about the change relative to the base category.

[23]With a continuous size measure, interpretation is more straightforward; see Section 2.3.

the 'catch-all' effect of NTB reductions for a size class.

Our empirical methodology as outlined above therefore departs from prior literature by circumventing the need to define and construct proxies for the wide variety of horizontal and sector-specific NTBs that restrict cross-border trade. This is particularly relevant in the case of deep agreements such as the EUKFTA whose provisions span a large number of behind-the-border issues. This approach also aligns with our main focus – that of examining size heterogeneity from NTB reductions in general and not on the narrower issue of the agreement's implementation which requires computing the precise cuts in different NTBs such as SPS, TBT or red tape that were achieved by the FTA. Moreover, the β^k coefficients in this specification extend beyond policy-driven NTBs as, amongst other things, they also capture the trade effects of reductions in uncertainty. Moreover, the inclusion of tariffs into specification (2) is interesting in itself as it allows us to identify size-specific reactions to tariff changes.

To control for other agreements signed by the EU, equation (2) includes **Z**. This is a vector of interactions between the various size bins and a dummy variable that takes the value of 1 in the second period for all other countries with which the EU implemented FTAs after the control period.[24] Moreover, **Z** includes interactions between these other FTAs, tariffs and size bins to account for any changes in tariff elasticities brought about by other agreements along the firm size distribution. Together, these terms account for any firm-specific demand or supply shocks affecting exports in the control group of countries. We prefer this approach over excluding the EU's new FTA partners from the control group as the latter may bias the estimates of fixed effects, particularly for products that may be heavily traded with those countries.

Our preferred specification includes the richest possible set of fixed effects (firm-product-destination, firm-product-time and product-destination-time) such that the β^k coefficients can still be identified.[25] These fixed effects control for variation in trade margins that could stem from factors other than the FTA such as demand-side shocks, changes in distribution networks, management practices or firm abilities amongst other influences. A causal interpretation of β^k coefficients therefore relies on the relatively weak assumption that θ_{pdt} and θ_{fpt} fixed effects capture any omitted variables relating to demand-side and supply-side shocks respectively. Given the two period structure of the model and the set of fixed effects, the underlying sample is a strongly balanced panel of firm-product-destination triplets. Hence, identification is based purely on variation over time in the intensive margin of firms' exports. Finally, the error term is clustered by firm, product and destination.[26]

An important aspect of our econometric strategy is that the estimated coefficients only indicate

[24]This list of FTAs is drawn from the Design of Trade Agreements (DESTA) database by Dür, Baccini, and Elsig (2014) and reported in Table 9 in Appendix A. In all, 16 agreements were implemented of which the deepest were the EUKFTA, as well as the EU-Georgia (2014) and EU-Moldova (2016) FTAs.

[25]We experiment with less exhaustive sets of fixed effects as well; see below.

[26]Results are robust to this choice.

the *relative* effects of NTB liberalization, i.e. relative to the chosen reference category. They do not reflect the aggregate impact of the agreement on French exports, for which one would need a structurally estimated model. Instead, our focus is on the *differential* impact of NTB reductions on firms' intensive margin along the size distribution.[27] Moreover, any unobservable variables relating to incumbent exporters to South Korea are captured by including firm-product-destination fixed effects. This fixed effect also drops firms which may have lobbied for the FTA but which did not export to South Korea in the control period. By measuring size using trade flows (excluding trade with South Korea) in the control period, we also shut down another potential channel for reverse causality.

3.2 Baseline Results: Impact of the FTA on the Intensive Margin

We report results on the intensive margin in Table 2 below. The most rigorous and our preferred specification following equation (2) is reported in column (1). In columns (2)-(4), we modify the set of fixed effects in order to demonstrate their role in capturing size heterogeneity along the intensive margin. Throughout these estimations, we compare exporters belonging to different quartiles of the size distribution to those in the bottom quartile ($Q1$, the excluded category). Standard errors are clustered by firm, product and destination.[28]

Column (1) reports estimates of size-specific β, γ, and δ coefficients in the upper, middle and lower sections of the table, respectively. The estimates of β coefficients show that the increase in exports due to the FTA is greatest for exporters in the top quartile ($Q4$) of the size distribution. In fact, $Q4$ exporters grew their sales to South Korea by approximately 66 percentage points more relative to those in the bottom quartile. Since we net out the effects of tariffs, we attribute this change to reductions in the costs of NTBs. Quite remarkably, the regression reveals a monotonic pattern: the relative increase in exports due to the NTB reductions continuously falls as size shrinks. These coefficients are not only statistically significant from zero but also differ from each other based on Wald tests.

Moreover, column (1) reveals that $Q4$ exporters also react more strongly to tariff reductions (γ coefficients). For exporters belonging to the top size category, the absolute value of the tariff elasticity is by the amount 1.13 larger than for exporters in the bottom size bin. Exporters in other size categories do not appear to react differently to the smallest exporters to tariff cuts. The final three lines in regression table 2 show estimates of δ coefficients. There is no evidence that changes of tariffs in the EUKFTA produced any different size-specific effects than changes of

[27] An even stricter definition of the intensive margin would be at the 10-digit tariff line level, for sales by a given plant within a firm and to a given buyer in the foreign market. However, this is not feasible in our case due to limitations on the availability of plant and buyer-level information in the customs data as well as the level of aggregation of tariffs (HS 6-digit) in the database by Felbermayr, Teti, and Yalcin (2019).

[28] However, results do not change if standard errors are clustered by different dimensions of the data e.g. firm-product, firm-destination or product-destination. See Table 12 in Appendix B for further details.

tariffs arising in other contexts.[29]

Overall, the results in column (1) indicate that larger French exporters have been able to increase exports to South Korea by more than smaller ones, with the boost from lower NTBs linearly declining with size. Only the largest firms appear to exhibit stronger behavioral responses to trade cost changes, so that, relative to the smallest exporters, the stronger responses of exporters in the second and third quartiles of the size distribution must be entirely due to larger effective reductions in the cost of NTBs.

Table 2: Impact of EUKFTA on firm-level outcomes by size quartiles

Dependent Variable:			ln(exports)		
	(1)	(2)	(3)	(4)	(5)
$\mathcal{I} \times Q4$	0.664***	0.554***	0.469***	0.203*	0.712***
	(0.144)	(0.112)	(0.111)	(0.110)	(0.150)
$\mathcal{I} \times Q3$	0.564***	0.436***	0.458***	0.198*	0.561***
	(0.138)	(0.110)	(0.128)	(0.116)	(0.143)
$\mathcal{I} \times Q2$	0.373**	0.339**	0.406***	0.234*	0.380**
	(0.154)	(0.130)	(0.132)	(0.125)	(0.155)
$\ln t \times Q4$	-1.13***	-0.868***	1.43***	-2.13***	
	(0.413)	(0.320)	(0.355)	(0.397)	
$\ln t \times Q3$	-0.280	-0.198	1.81***	-0.751***	
	(0.314)	(0.272)	(0.364)	(0.241)	
$\ln t \times Q2$	0.181	0.053	1.62***	-0.089	
	(0.337)	(0.246)	(0.339)	(0.200)	
$\mathcal{I} \times \ln t \times Q4$	-1.27	-0.871	-6.46	-0.750	
	(0.979)	(0.816)	(4.09)	(1.14)	
$\mathcal{I} \times \ln t \times Q3$	-1.67*	-1.16	-6.69	-2.17**	
	(0.858)	(0.762)	(4.07)	(1.02)	
$\mathcal{I} \times \ln t \times Q2$	0.704	-0.010	-5.40	0.171	
	(0.868)	(1.00)	(4.16)	(1.28)	
Fixed effects	$\theta_{fpd}, \theta_{fpt}, \theta_{pdt}$	$\theta_{fpd}, \theta_{fpt}, \theta_{dt}$	$\theta_{fpd}, \theta_{ft}, \theta_{pdt}$	$\theta_{fd}, \theta_{fpt}, \theta_{pdt}$	$\theta_{fpd}, \theta_{fpt}, \theta_{pdt}$
Observations	1,758,070	1,758,070	1,758,070	1,758,070	1,758,070
R^2	0.919	0.905	0.920	0.866	0.919

Note: The table above reports regression results for the impact of the EUKFTA along the intensive margin. $\mathcal{I}$ is a dummy variable that takes the value of one for French exports to South Korea from 2011 onwards and the value of zero otherwise. t denotes product-level ad valorem tariff factors. Column (1) contains our baseline results for the intensive margin following the specification in equation (2). In columns (2)-(4), we vary the set of fixed effects and highlight the change in blue. Size is defined at the firm-product level and tariffs at the product-destination-time level. Only continuous exporters are retained i.e. firm-product combinations that report positive exports to a given destination in both control (2000-2006) and FTA (2011-2016) periods. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

[29] Though the coefficient of -1.67 for firms in the $Q3$ bin is significant at the 90% confidence level, it is not robust to clustering choices. See Table 12 in Appendix B.

Next we turn to the role of fixed effects. Column (2) deviates from the main specification by assuming that demand shocks are common across products within destination-time. Therefore we replace θ_{pdt} by the less comprehensive θ_{dt} fixed effects. This change lowers the differential impact of NTB reductions on exporters. Even so, the statistical significance and monotonic ordering of β^k coefficients are retained. In column (3), we assume that supply shocks are common across products within firm-time by replacing θ_{fpt} with only θ_{ft} fixed effects. Doing so generates counter-intuitive estimates on tariff controls which turn positive, unlike the other regression results. This signals the importance of differentiating across products within firms, especially given the dominance of multi-product exporters in France's trade with South Korea. Our results also hold, albeit weakly for NTB reductions, when we replace θ_{fpd} with θ_{fd} fixed effects in column (4). This amounts to presuming that capabilities of a firm in a given destination are common across products. In this case, size heterogeneity in NTB elasticities is further reduced but sharpened for tariff elasticities in comparison to column (1).

Overall, varying the combination of fixed effects does change findings on tariff elasticities to an extent but largely preserves the size advantage of larger exporters to NTB reductions. Therefore, we proceed with the most conservative specification following equation (2) as it features all possible fixed effects to reduce issues arising from omitted variables.

Finally in column (5) of Table 2, we keep all fixed effects but drop tariffs in order to examine the combined effect of the FTA (tariffs and NTBs) on incumbent exporters of differing size. As before, the positive impact of the FTA on the intensive margin is magnified for larger incumbents with sales of top quartile exporters in South Korea growing by 71 percentage points more than of those of bottom quartile exporters. Comparing to column (1) we conclude that more than 90% of the size advantage of top quartile exporters is due to NTBs; their stronger reaction to tariff cuts playing only a minor role.

Our baseline result on the FTA's intensive margin effects is at odds with the workhorse Melitz (2003) model which implies that larger incumbent exports react with similar rates to trade cost changes than smaller ones. This result emerges from the assumption of identical trade cost structures for small and large firms, and/or identical reductions in trade costs, and/or identical elasticities of demand. Our result not only suggest that these assumptions may be problematic but that popular frameworks which depart from the Melitz (2003) assumptions, such as the one by Melitz and Ottaviano (2008) which allows for variable elasticities of demand, or by Arkolakis (2010) which endogenizes foreign market access costs have counterfactual implications, too, since they predict advantages for smaller incumbent exporters. Before discussing possible model modification, though, it is necessary to check the effect of the EUKFTA on the extensive margins. This is why we now turn to the effect of the EUKFTA on market entry and product diversification.

3.3 Market Entry and Product Diversification

Although our focus is on the impact of NTB reductions on the intensive margin of exports, our data does permit us to examine two additional margins - firm entry into exporting and the diversification of export baskets following the agreement. We do so by retaining the two-period structure of our baseline model but moving the analysis to the firm-destination-time dimension as shown by Equation (3) below.

Now, the dependent variable Y_{fdt} corresponds to either a dummy variable for a firm's exporting status or the number of products exported to a given destination d at time t. Correspondingly, we move our measure of size from the firm-product to the firm-wide level by aggregating imports and exports across all products traded by a firm in the control period with all countries except South Korea. In this case, tariffs are averaged across products at the destination-time level and interacted with size bins. The vector of controls **Z** includes interaction terms between size bins and a dummy that takes the value of 1 in the second period for all other countries with which the EU signed FTAs after 2006.[30]

$$\mathrm{Y}_{fdt} = \sum_{k=1}^{\mathcal{K}-1} \beta^k (\mathcal{I}_{dt} \times Size_f^k) + \sum_{k=1}^{\mathcal{K}-1} \gamma^k (\ln t_{dt} \times Size_f^k) + \mathbf{Z} + \theta_{fd} + \theta_{ft} + \theta_{dt} + \varepsilon_{fdt} \tag{3}$$

These regressions include all possible fixed effects (firm-destination, firm-time and destination-time) such that the β^k coefficients can still be estimated. The results are reported in Table 3. In the case of firm entry, identification is based on entrants and exiters as the dependent variable does not vary for continuous exporters to a given destination. In contrast, when examining adjustments to the product basket, only those firms are retained which exported in both periods to a given destination.

For firm entry in columns (1)-(2), we find the β^k coefficients to be negative. This implies that NTB reductions induced new firms into exporting to South Korea and these firms tended to be smaller than firms exiting the market following liberalization. This can also be seen when comparing density plots of firm sizes between continuously exporting firms to South Korea, entrants and exiters (see Figure 7 in Appendix A). We also find that the intermediately sized exporters had higher tariff elasticities for the entry margin than smaller firms, confirming the predictions of the Melitz (2003) model on selection into exporting from the middle of the size distribution. In the case of the product margin reported in column (3), NTB reductions do not generate discernible size effects.

[30]Coefficients on the interaction between $\mathcal{I}_{dt}$, $\ln t_{dt}$ and size bins cannot be identified due to multi-collinearity with γ^k coefficients.

Table 3: Market entry and product diversification

Dependent Variables:	Exporter (0,1)		ln(products)	
Model:	(1)	(2)	(3)	(4)
$\mathcal{I} \times Q4$	-0.048***	-0.050***	0.092	0.055
	(0.014)	(0.014)	(0.058)	(0.059)
$\mathcal{I} \times Q3$	0.019	-0.005	0.086	0.031
	(0.014)	(0.014)	(0.060)	(0.063)
$\mathcal{I} \times Q2$	0.044***	0.025	0.112*	0.079
	(0.015)	(0.016)	(0.060)	(0.065)
$\ln t \times Q4$		-0.039		-0.682*
		(0.145)		(0.351)
$\ln t \times Q3$		-0.488***		-1.00***
		(0.102)		(0.309)
$\ln t \times Q2$		-0.386***		-0.590*
		(0.105)		(0.340)
Fixed-effects	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$
Observations	2,380,810	2,380,810	3,196,118	3,196,118
R^2	0.654	0.654	0.887	0.887

Note: The table above reports regression results for the impact of the EUKFTA for market entry and product margins. $\mathcal{I}$ is a dummy variable that takes the value of one for French exports to South Korea from 2011 onwards and the value of zero otherwise. Columns provide results following the specification in equation (3). Since the dependent variables here are defined at the firm-destination-time level, size is correspondingly computed at the firm level (aggregating across products) and tariffs are averaged across products within a given destination and time period. Standard errors are clustered by firm and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

3.4 Possible Modeling Implications

To summarize our results across these margins, we find that NTB reductions strongly favour large firms along the intensive margin, whereas the effect is absent for for the product margin. In the case of the firm entry margin, our findings closely follow the patterns of Melitz (2003) models.

One way to reconcile theory with data would be to allow for a correlation between exogenous cuts in variable trade costs and firm size. Another approach would be to assume the opposite as Arkolakis (2010), namely, that the marginal foreign market access costs are declining in market share, and that the FTA lowers the level of entry costs for all firms. Such a structure could generate firm entry from the middle of the size distribution, and, at the same time, higher growth rates by the largest firms.[31]

Such assumptions may be rationalized by the fact that larger firms have the capacity to plan and invest towards better leveraging of the benefits of the agreement eg. by hiring specialised consultants and lawyers to meet testing, certification and complex rules of origin requirements. Alternatively, large firms may be lobbying for favourable rules and consequently receiving larger NTB cuts or even larger tariff reductions in their product categories than smaller firms. The latter channel has been examined by recent work such as such as Blanga-Gubbay, Conconi, and Parenti (2020) who use detailed information from lobbying reports and develop a model where only large pro-FTA firms select into lobbying.[32]

4 Robustness Checks and Additional Results

In this section we describe additional robustness checks to our key result: that larger incumbent exporters gained more from NTB reductions under the EUKFTA than smaller exporters. As there is no statistically significant change in tariff elasticities after the entry into force of the EUKFTA, the following tables report only the general tariff elasticities across size bins (while the regressions do include FTA-specific terms).

4.1 Truncating the Size Distribution

First, our baseline results may be affected by the presence of few very large firms. To address this concern, we replicate our preferred specification in column (1) of Table 2 but drop the top 1%, 5% and 10% of firms. Size bins are redefined accordingly on the remaining sample. This allows

[31] Working out the precise conditions under which this can happen is an avenue for future research.

[32] Given that firm identifiers are anonymized in the French customs data, a similar exercise of linking lobbying efforts to size and trade flows is not feasible in our case.

us to test whether the size effect from NTB reductions in our baseline regressions is driven by the largest firms only. As Table 4 shows, NTB reductions continue to favour the largest firms. Similar to our main result, the advantage from size is consistently observed not only for NTB reductions but also for the average base effect of tariff cuts in the case of the top quartile firms. However, these size-specific tariff elasticities slightly diminish with the exclusion of an increasing number of large firms.[33]

Table 4: Impact of NTB reductions and tariff cuts after excluding the largest firms

Dependent Variable:	ln(exports)			
Sample:	All	Drop top 1%	Drop top 5%	Drop top 10%
	(1)	(2)	(3)	(4)
$\mathcal{I} \times Q4$	0.664***	0.639***	0.628***	0.601***
	(0.144)	(0.142)	(0.154)	(0.160)
$\mathcal{I} \times Q3$	0.564***	0.558***	0.504***	0.420***
	(0.138)	(0.140)	(0.154)	(0.161)
$\mathcal{I} \times Q2$	0.373**	0.367**	0.397**	0.369**
	(0.154)	(0.155)	(0.162)	(0.162)
$\ln t \times Q4$	-1.13***	-0.987**	-0.851**	-0.773*
	(0.413)	(0.410)	(0.394)	(0.404)
$\ln t \times Q3$	-0.280	-0.207	-0.281	-0.161
	(0.314)	(0.327)	(0.347)	(0.354)
$\ln t \times Q2$	0.181	0.245	0.224	0.289
	(0.337)	(0.353)	(0.392)	(0.451)
$\mathcal{I} \times \ln t \times Q4$	-1.27	-1.43	-1.53*	-1.11
	(0.979)	(1.00)	(0.793)	(0.907)
$\mathcal{I} \times \ln t \times Q3$	-1.67*	-1.79*	-0.963	-0.971
	(0.858)	(0.912)	(1.11)	(1.26)
$\mathcal{I} \times \ln t \times Q2$	0.704	1.88*	-1.45*	-1.25
	(0.868)	(0.958)	(0.839)	(0.941)
Observations	1,758,070	1,696,706	1,545,340	1,390,912
R^2	0.918	0.917	0.919	0.924

Note: Regression results are based on equation (2), where the dependent variable is exports at the firm-product-destination level aggregated to two periods: 2000-2006 and 2011-2016. $\mathcal{I}$ is a dummy variable that takes the value of one for French exports to South Korea from 2011 onward and the value of zero otherwise. Product-level ad valorem tariff factors are denoted by t. In each of the columns, size bins are recalculated after dropping the top 1%, 5% and 10% of varieties from the sample. Additional controls include interactions between a $\mathcal{I}_{dt}$, tariffs and size bins as well as interactions between size bins and a dummy variable that takes the value of 1 for all other countries with which the EU implemented FTAs after 2006. All regressions include firm-product-time, product-destination-time and firm-product-destination fixed effects. Only continuous exporters are retained i.e. those firm-product combinations that have positive exports in a given destination for each of the two periods. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

[33] This pattern is also seen when we use a continuous measure of size; see Panel A of Table 14 in Appendix B.

4.2 Alternative Size Measures

In our baseline model, we work with size quartiles so that we do not have to assume any functional form linking effects and firm size measures. One obvious alternative would be a linear specification, where we interact the EUKFTA dummy ($\mathcal{I}_{dt}$) with the log of a continuous measure of size (where size continues to be defined as in our baseline regression). As Table 5 shows, we find that the size advantage for NTB reductions holds. Increasing the size of an exporter by one percent increases additional exports to Korea by 0.079 percent. Also tariff cuts continue to have a stronger effect for larger firms, but the relative relevance of NTBs still dominate.

One could also work with two size categories instead of four as in our baseline by interacting the FTA indicator with a dummy for exporters in the top half of the size distribution. Comparing firms above and below the median size, we observe that NTB reductions boosted exports by approximately 33.9 percentage points more in the upper half of the size distribution relative to the the lower half. This pattern of monotonicity is approximately maintained when the effects of NTB reductions under the agreement are estimated at every decile of the size distribution, relative to firms in the bottom decile.[34]

Table 5: Impact of EUKFTA using log size measure and median dummy

Dependent Variable:	ln(exports)			
Size measure:	continuous		median (0,1)	
	(1)	(2)	(3)	(4)
$\mathcal{I} \times size$	0.079***	0.088***	0.339***	0.375***
	(0.009)	(0.010)	(0.064)	(0.061)
$\ln t \times size$	-0.243***		-1.05***	
	(0.065)		(0.342)	
Observations	1,758,070	1,758,070	1,758,070	1,758,070
R^2	0.919	0.919	0.919	0.919

Note: The table above reports regression results for the impact of the EUKFTA along the intensive margin following the specification in equation (2). Firm size is defined within a product class and tariffs at the product-destination-time level. Columns (1)-(2) report results when using the log value of our default size measure. Columns (3)-(4) report results when using $median$ dummy that takes the value of 1 for exporter sizes above the median and 0 otherwise. Only continuous exporters are retained i.e. firm-product-destination triplets with positive exports in both control (2000-2006) and FTA (2011-2016) periods. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

Our findings may also depend on how we define "size" of the exporter. We examine this in Table 6 where each column corresponds to a different proxy of size. For reasons of comparison, column (1) replicates column (1) of Table 2 using the baseline measure of size defined as the

[34] We show these results in Figure 8 in Appendix B. Note that estimates are less precisely estimated as standard errors grow when the distribution is split into an increasing number of bins. Therefore, we prefer the comparison across quartiles in the baseline model.

pre-treatment (2000-2006) sum of exports and imports at the firm-product level across all countries except South Korea; see Section 2.3. Column (2) defines size based on intra-EU trade only, as this provides us with a proxy of domestic performance of French exporters. Column (3) defines size on extra-EU trade to capture the advantage obtained by selling overseas. Finally, column (4) switches to a definition of size that sums exports and imports of a firm over all products traded by the firm in the pre-treatment period.

In columns (2) and (3), the size hierarchies in FTA effects are confirmed indicating that experience in both domestic and foreign markets is relevant for determining size advantage from NTB reductions.[35] Using our intra-EU trade measure, we find that the top quartile exporters increase sales to South Korea by approximately 36.8 percentage points more than the bottom quartile. This is a much smaller premium than the one estimated in column (1) of Table 2. The reason being that the skewness of the size distribution reduces substantially with this measure.

Interestingly, size heterogeneity in tariffs disappears when we employ a firm-wide measure that aggregates over all products. This indicates that the proper estimation of size-specific tariff elasticities requires size to vary at the product-level. For larger exporters to benefit more from tariff cuts it is crucial that they are large in the product categories affected by the cuts and hence, size obtained from selling other goods does not help. One conclusion from this result is that it may well be costs associated to abiding by product-specific rules of origin that drive the size patterns as observed in column (1).

Finally, we can also consider the length of exporters' experience as a relevant proxy for their productivity. To test this, we replace the size bins from equation (2) with $experience$, a dummy based on the number of years the exporter was active in foreign markets over the control period (2000-2006). Table 7 reports the results of this robustness check. The positive and statistically significant coefficients on $\mathcal{I} \times experience$ confirm our prior that experienced exporters gained more from NTB cuts delivered by the EUKFTA. Consistent exporters with more than three years of experience also react more to tariff reductions more generally.

4.3 The Impact of NTB Reductions over Time

Our two-period baseline model reveals that larger firms benefit substantially more from NTB reductions but cannot reveal whether this size advantage grows, diminishes or remains stable over time. To address this issue, we exploit the long time dimension of the French customs data that spans 17 years from 2000-2016. Correspondingly, the specification in equation (2) is expanded by replacing the $\mathcal{I}_{dt}$ dummy with a South Korea dummy (Kor_d) and a series of year dummies. This modification allows us to examine the evolution of the impact of NTB reductions

[35] The statistical significance is maintained when we move from quartiles to the log value of these alternative size proxies; see Panel B of Table 14 in Appendix B.

Table 6: Impact of EUKFTA with varying definitions of size

Dependent Variable:	ln(exports)			
Size measure:	Firm-Product Global	Firm-Product Intra-EU	Firm-Product Extra-EU	Firm Global
	(1)	(2)	(3)	(4)
$\mathcal{I} \times Q4$	0.664***	0.368***	0.645***	0.505***
	(0.144)	(0.091)	(0.135)	(0.137)
$\mathcal{I} \times Q3$	0.564***	0.250***	0.541***	0.437***
	(0.138)	(0.085)	(0.131)	(0.134)
$\mathcal{I} \times Q2$	0.373**	0.288***	0.275**	0.212
	(0.154)	(0.091)	(0.138)	(0.141)
$\ln t \times Q4$	-1.13***	-1.90***	0.256	-0.129
	(0.413)	(0.430)	(0.327)	(0.199)
$\ln t \times Q3$	-0.280	-0.887***	0.531*	-0.160
	(0.314)	(0.269)	(0.300)	(0.217)
$\ln t \times Q2$	0.181	-0.194	0.486	0.091
	(0.337)	(0.236)	(0.362)	(0.202)
Observations	1,758,070	1,564,004	1,652,294	1,758,070
R^2	0.918	0.917	0.916	0.918

Note: Regression results are based on equation (2) where the dependent variable is exports at the firm-product-destination level aggregated to two periods:2000-2006 and 2011-2016. $\mathcal{I}$ is a dummy variable that takes the value of one for French exports to Korea from 2011 onwards and the value of zero otherwise. t denotes product-level ad valorem tariff factors. In each column, firm size is defined differently. Using data only from the control period (2000-2006) and excluding trade with South Korea, these size measures are: column (1): global trade within the firm-product pair (our baseline measure); column (2) intra-EU trade in the firm-product pair; column (3) extra-EU trade in the firm-product pair and; column (4) global trade of the firm across products. Since regressions include firm-product-destination fixed effects, only continuously exported varieties are retained i.e. firm-product pairs that have positive exports in a given destination for each of the two periods. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

Table 7: Exporting experience over 2000-2006

Dependent Variable:		ln(exports)	
Experience:	$>$ 1 year	$>$ 3 years	7 years
	(1)	(2)	(3)
$\mathcal{I} \times experience$	0.436**	0.171**	0.115**
	(0.180)	(0.080)	(0.051)
$\ln t \times experience$	-0.911	-1.12***	-1.11***
	(0.612)	(0.329)	(0.237)
Observations	1,758,070	1,758,070	1,758,070
R^2	0.918	0.918	0.918

Note: Regression results are based on equation (2), where the dependent variable is exports at the firm product and destination level aggregated to two periods: 2000-2006 and 2011-2016. Experience is a dummy that takes the value of 1 for firm-product combinations that were exported more than once (column 1), more than three years (column 2) and in all years (column 3) in the control period spanning 2000-2006. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

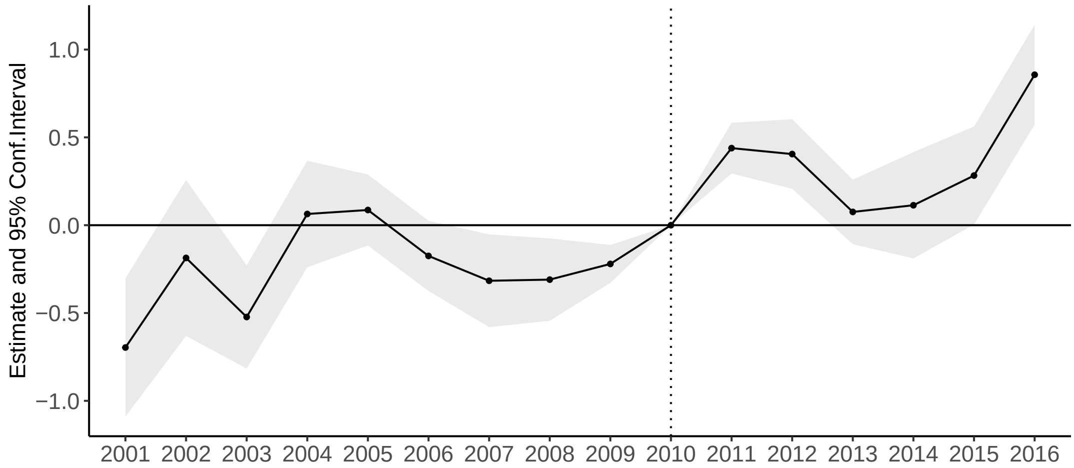
in South Korea on large firms relative to smaller ones. As the agreement was implemented in 2011, we take 2010 as the reference year.

To ensure that our proxy for size remains exogenous, we measure size based on the total trade within firm-product (excluding South Korea) in the first available year (2000) and then drop data from 2000 from the sample. As we are interested primarily in adjustments at the intensive margin, only those firm-product-destination triplets are retained that registered positive exports throughout 2001-2016.[36] As before, we include interactions between tariffs and size bins as well as interactions between size bins, year dummies and other countries with which the EU entered into FTAs over the sample period.

Figure 2 shows the resulting estimates and 95% confidence intervals for the adjustment in exports of the top quartile of varieties relative to the bottom quartile stemming from a reduction in NTBs under the EUKFTA. We observe a clear break following the implementation of the agreement in 2011, with large firms posting substantially higher growth in sales from NTB reductions in comparison to smaller firms. Somewhat surprisingly, this size advantage kicks in immediately upon entry into force of the agreement, as the coefficient turns positive and statistically significant. The coefficient is even higher closer to the end of the sample period, indicating that the size advantage is magnified. Before entry into force of the FTA, coefficients are not positive or statistically different from zero.

[36]Doing so significantly restricts our sample from approximately 227,000 varieties under the two-period model to 24,000 varieties under the model based on yearly observations.

Figure 2: Export growth from NTB reductions - $Q4$ exporters relative to bottom $Q1$ exporters



Note: This graph shows the adjustment in exports of the top quartile ($Q4$) of exporters relative to the bottom quartile, from a reduction in NTBs under the EUKFTA. Following the specification provided by equation (2), it plots coefficients and 95% confidence intervals on the interaction $Kor_d \times Year_t \times Q4$, where Kor_d is a dummy for South Korea and $Q4$ is a dummy variable that takes the value of 1 for varieties in the top quartile of the size distribution and 0 otherwise. The chosen reference year is 2010, the year before the EUKFTA entered into force. A set of firm-product-year, product-destination-year and firm-product-destination fixed effects are included. Standard errors are clustered by destination and year.

4.4 Heterogeneity across Sectors

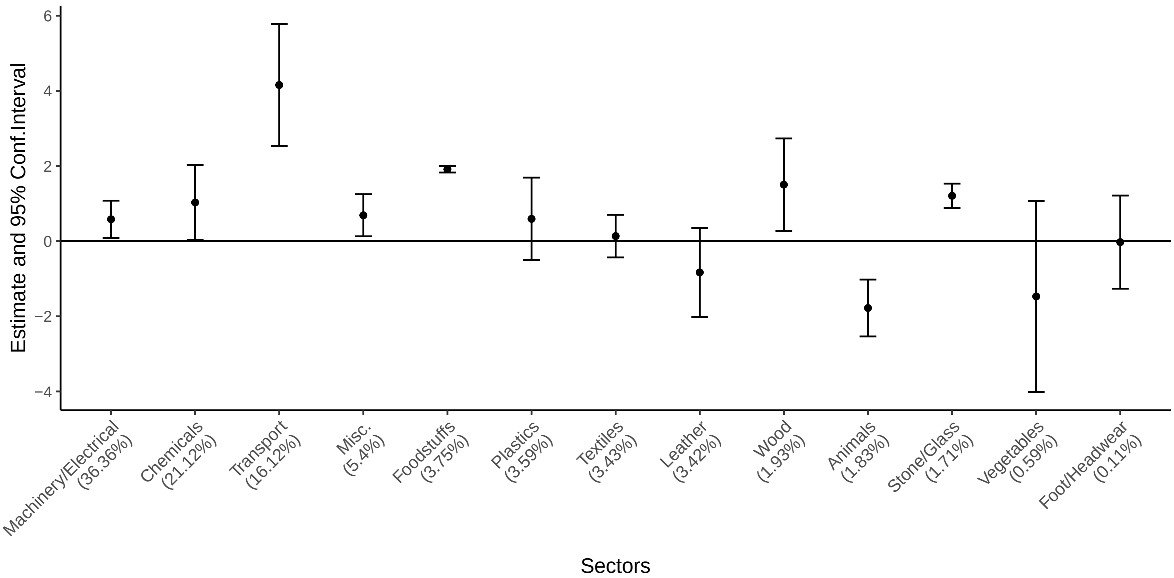
Till now, our analysis has focused on identifying treatment effects of NTB reductions averaged across products. However, the size differential from NTB reductions may be driven by certain sectors. Therefore as a robustness check, we examine this channel by splitting the sample and estimating our baseline regression separately for each sector.[37] Figure 3 shows the estimated values and 95% confidence intervals of the coefficients on $\mathcal{I}_{dt} \times Q4$ interactions for each sector, where the sectors are arranged in decreasing order of their shares in France's exports to South Korea over the control period, 2000-2006.

We observe substantial heterogeneity in estimates across sectors that was masked by our earlier results. For the five sectors machinery /electrical, chemicals, transport goods, miscellaneous goods, and foodstuffs, which together account for more than 80% of export sales to South Korea, top quartile exporters enjoy a statistically significant size advantage over bottom quartile exporters. The wood and stone/glass sectors, although small, behave similarly. Amongst the remaining sectors, only the animal products sector appears to display the opposite pattern whereby smaller exporters benefit more from NTB reductions in comparison to larger ones. Note

[37]Based on sector classification for the Harmonized System (HS) nomenclature provided by WITS.

that the size advantage of top quartile exporters is high in the transport sector, with a point estimate several times bigger than the average. Overall, Figure 3 confirms that size advantage from NTB reductions is not driven by outlier sectors alone but emerges as a systematic feature in the data.[38]

Figure 3: Heterogeneity across sectors - $Q4$ exporters relative to bottom $Q1$ exporters



Note: Following the specification provided by equation (2), this graph plots coefficients and 95% confidence intervals on the interaction term $\mathcal{I}_{dt} \times Q4$ for every sector. The regression for each sector includes similar interaction terms for the second and third quartiles. Standard errors are clustered by product and destination. Sectors are arranged from left to right by the decreasing order of their shares in France's exports to South Korea (in brackets) during the control period.

4.5 Phasing-In of Tariffs

An alternative approach to examining the impact of NTB reductions on the intensive margin of exports is shown in Table 8. By exploiting the tariff schedule of South Korea under the FTA, we split the sample into exports of goods that were already duty free in South Korea in 2010 (MFN=0), those that became duty free upon entry into force of the agreement (EIF) and goods whose tariffs were set to be gradually phased out by South Korea over three, ten or more than ten years. By estimating equation (2) for these categories, we can ascertain whether the FTA had a differential impact depending on the length of phasing out periods.[39]

[38]When looking at tariff elasticities (γ_k), coefficients are statistically different between $Q4$ and $Q1$ exporters at the 90% confidence interval for only some of the sectors eg. miscellaneous products, wood and leather.

[39]In this case, the interactions between the $\mathcal{I}_{dt}$ dummy, tariffs and size bins drop out due to multi-collinearity and are therefore excluded in the estimations reported in Table 8.

Looking at the first column in Table 8, we observe that the exports of already duty-free goods grow more for larger firms than smaller firms following the FTA. Since South Korea applied no tariffs on these products prior to the agreement, we can be certain that the β^k coefficients capture size-specific elasticities from NTB reductions. The effect is particularly strong for the top quartile firms.The size advantage for already duty-free products is also robust to using a continuous measure of exporter size (see Panel C of Table 14 in Appendix B). The lower panel of Table 8 reports general (i.e., not EUKFTA-specific) size-dependent tariff elasticities. The results confirm that larger firms tend to react more strongly to changes in trade costs.[40]

Table 8: Impact of EUKFTA across tariff staging categories

Dependent Variable:	ln(exports)				
Product categories:	MFN=0	EIF	3 years	10 years	11+ years
	(1)	(2)	(3)	(4)	(5)
$\mathcal{I} \times Q4$	1.48***	0.644***	0.741**	0.041	-0.410
	(0.304)	(0.176)	(0.333)	(0.240)	(0.546)
$\mathcal{I} \times Q3$	1.02***	0.539***	0.745**	-0.048	-0.022
	(0.346)	(0.174)	(0.341)	(0.207)	(0.498)
$\mathcal{I} \times Q2$	1.01**	0.292	0.284	-0.036	0.678
	(0.397)	(0.185)	(0.399)	(0.262)	(0.670)
$\ln t \times Q4$	-4.6***	-0.708	-2.78***	-0.137	-0.933
	(1.430)	(0.482)	(0.777)	(1.030)	(1.070)
$\ln t \times Q3$	-3.29**	0.033	-1.52**	0.542	0.583
	(1.430)	(0.414)	(0.752)	(1.010)	(1.230)
$\ln t \times Q2$	-3.42**	0.648	-1.89**	1.13	0.171
	(1.420)	(0.550)	(0.867)	(1.190)	(1.670)
Observations	191,936	893,520	252,892	224,251	43,156
R^2	0.92407	0.91928	0.90826	0.91623	0.92594

Note: Regression results are based on equation (2) where the dependent variable is exports at the firm-product-destination level aggregated to two periods: 2000-2006 and 2011-2016. Using the tariff schedule of South Korea, the sample is split into exports of goods that were already duty free in 2010 (MFN=0) (column (1)), those that became duty free upon entry into force of the agreement (EIF) (column (2)), and goods whose tariffs were set to be gradually phased out by South Korea over three, ten or more than ten years (columns (3), (4), and (5)). $\mathcal{I}_{dt}$ is a dummy that takes the value 1 for South Korea in the the post-treatment window (2011-2016) and 0 otherwise. All regressions include firm-product-time, product-destination-time and firm-product-destination fixed effects. Only continuous exporters are retained i.e. firm-product combinations that report positive exports to a given destination in both control (2000-2006) and FTA (2011-2016) periods. Standard errors are clustered by firm, product and destination. Significance codes: ***: 0.01, **: 0.05, *: 0.1

[40]The elasticities remain identified even if we focus on products for which South Korea applied an MFN tariff of zero before the FTA as import tariffs set by other export destinations of France differ from South Korean tariffs.

4.6 Imports from South Korea

So far, we have studied the impact of the agreement on France's exports to South Korea. However, our data allow us to check whether the size advantage from NTB reductions applies to the France's imports from South Korea as well. Now, the dependent variable is the log value of a firm's import purchases at the product-country-time level and tariffs correspond to duties applied by the EU on its trade partners. In Figure 4, we replicate the dynamic diff-in-diff regression discussed in Section 4.3 for imports to examine the evolution of the size effect over time. Overall, the evidence for a size differential in import growth is less clear, this differential is not observed to be statistically significant when looking at the yearly coefficients in Figure 4. Therefore, the advantage of large firms from NTB reductions under the EUKFTA appears to be driven via exports rather than imports. For tariffs, this is not overly surprising as the EU's level of protection before the FTA was much lower than the South Korean one. Possibly, a similar pattern prevailed regarding NTBs. Also note that the asymmetry between exports and imports is unlikely to be driven by exchange rate movements as the inclusion of destination-time fixed effects into all our specifications effectively nets out the influence of currency revaluations.

Figure 4: Import growth from NTB reductions: Top quartile ($Q4$) importers relative to bottom quartile ($Q1$)

Note: This graph shows the adjustment in import purchases of the top quartile of exporters relative to the bottom quartile, from a reduction in NTBs under the EUKFTA. Following the dynamic counterpart of the specification provided in equation (2), it plots coefficients and 95% confidence intervals on the interaction $Kor_d \times Year_t \times Q4$, where $Q4$ is a dummy variable that takes the value of one for exporters in the top quartile of the size distribution and zero otherwise. The chosen reference year is 2010, the year before the EUKFTA entered into force. A set of firm-product-year, product-destination-year and firm-product-destination fixed effects are included. Standard errors are clustered by destination and year.

5 Conclusion

In this paper, we shed light on the effects of an important new generation agreement along the firm size distribution. We exploit the French firm-level customs data for the period 2000 to 2016 and employ a differences-in-differences strategy to identify treatment effects for different percentiles of the size distribution. We find a new and robust stylized fact: Exporters of different size react differently to reductions in non-tariff-barriers (NTBs). More precisely, we document that French exporters with larger pre-FTA sizes expand their exports to South Korea by larger rates than firms further down the size distribution. This effect is mostly driven by NTBs, i.e., the summary effects of the FTA net of tariff concessions.

This suggests that the NTB provisions of the FTA are not just about reducing the fixed costs of market access for firms, but also – and maybe predominantly – about lowering the variable trade costs for more efficient firms by more than for the less efficient ones. Interestingly, larger firms also seem to react more strongly to reductions in tariff reductions (which are independent of size), a result that is not specific to the EUKFTA and that does only partly explain the overall advantage of large firms.

Our main finding confirms a widely-held prior that FTAs benefit larger firms more than smaller ones. Based on this presumption, many modern FTAs include special provisions that aim at supporting small and medium sized enterprises (SMEs). For example, since the release of the EU's 'Trade for All' strategy in 2015, the EU has included such SME provisions in all new trade agreements. These typically include commitments for the EU and its partners to provide information on the contents of the trade agreement on a dedicated website that has a database searchable by tariff code, with information on tariffs, import requirements, rules of origin, etc. In addition, such chapters provide for SME Contact Points on each side to facilitate bilateral cooperation between governments so that the specific needs of SMEs are adequately addressed.

Such provisions can be readily justified on political economy and on equity grounds. They may be necessary to win the support of SMEs to conclude and ratify modern FTAs. Governments may also wish to spread the gains from trade more widely, as their incidence across firms affects both the distribution of profits and of wages. Whether SME chapters are required to enhance efficiency depends, however, on the details of the mechanism that gives rise to our empirical observation.

If, for exogenous reasons, larger firms face lower iceberg trade costs and if those are complementary to politically induced variable trade costs, our result would simply reflect the technological superiority of larger firms without providing a rationale for policy intervention. Similarly, if higher sales in a foreign market require repeated lumpy payments – for example as additional warehouses need be maintained or a bigger sales organization needs to be financed – larger firms have a natural advantage. The situation could be different, if economies of scale or externalities are involved. This could be the case if learning-by-exporting externalities become stronger with size or if, contrary to Arkolakis (2010), marginal foreign market access costs are decreasing in market shares.

Whether such mechanisms are present and whether they justify political interventions on efficiency grounds, and if yes, which ones, however, depends on details. The case is clearest, if the FTA itself contains elements that make it hard for small firms to benefit from the agreement. For example, it is known that rules-of-origin are costly to document and to abide by. Simplifying them could benefit smaller exporters more than the usual SME chapters while also increasing overall efficiency. Similarly, if size differentials reflect lobbying activity by large firms, it would be advisable to install safeguard against such attempts during the negotiation process. To make further progress, one would need to develop and test structural models that embed such mechanisms.

Moreover, further empirical research should test the effectiveness of existing SME provisions exploiting the fact that an increasing share of FTAs contain such language. Also, it would be important to test for size-specific effects of NTBs and tariffs across the exporter size distribution in other trade agreements and in other countries. Our focus on a representative European agreement – the one between the EU and South Korea – and on French exporters could be the start for a broader and more comprehensive research agenda.

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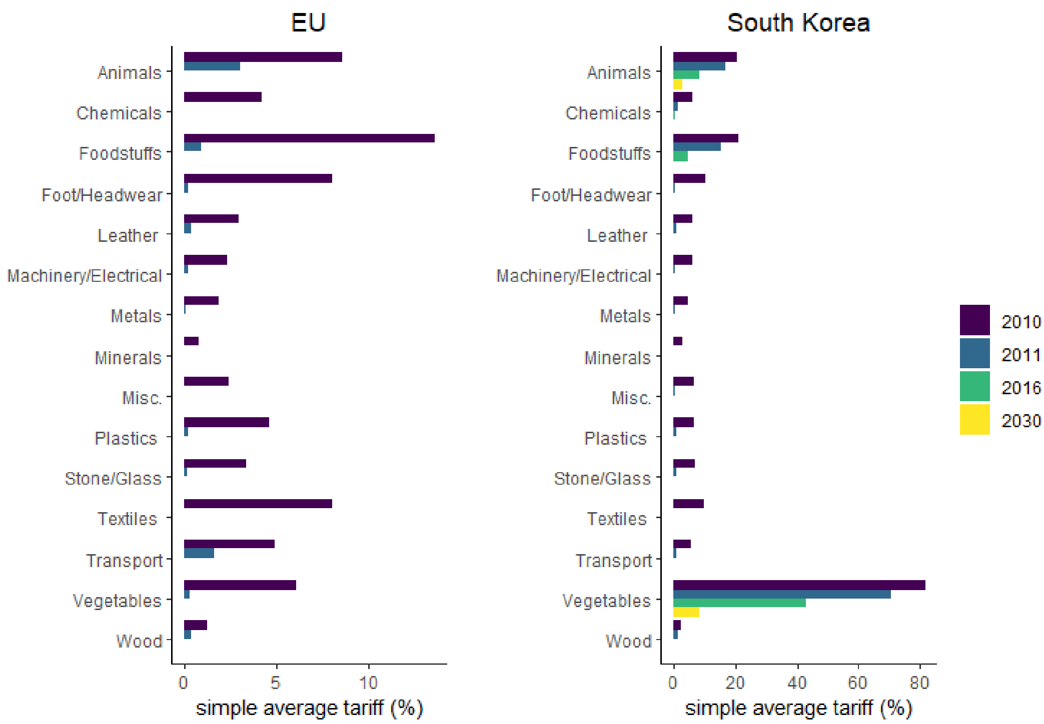
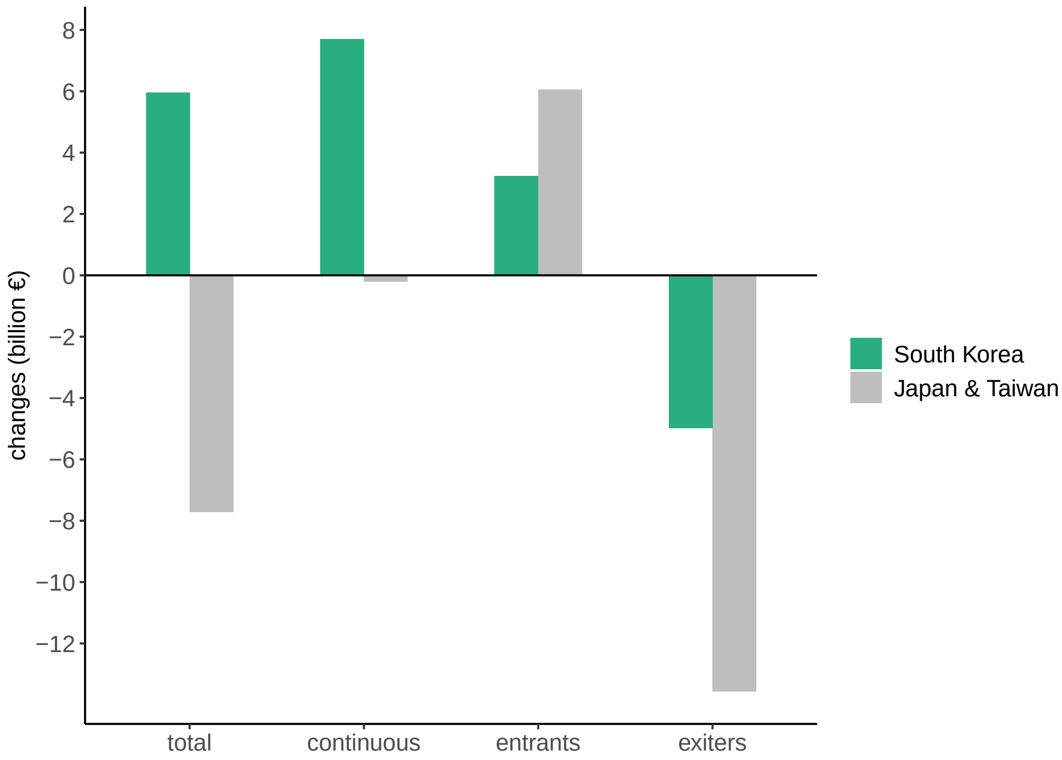
A Appendix: Further Descriptive Statistics

Figure 5: Tariff schedules of the EU and South Korea



Note: The graph depicts changes in average applied tariffs imposed by the EU on South Korean products (left) and by South Korea on EU products (right). These changes are examined over the course of the agreement's transition period, from 2011 to 2030. In 2010, prior to the entry into force of the FTA, applied tariffs corresponded to MFN duties. Considering the differences in tariff levels between the EU and South Korea, the horizontal axes have different scales.

Figure 6: Change in exports by type of firm and destination (billion €)



Note: The figure above shows the absolute change in France's exports between the control (2000-2006) and post-FTA period (2011-2016) and compares this change for South Korea (in green) with that of Japan and Taiwan. Changes are further decomposed into changes in sales of continuous, entrants and exiting firms to that destination. Export values are adjusted by France's GDP deflator drawn from the World Bank Database.

Table 9: EU FTAs entering into force over 2006-2016

Agreement	EIF	depth index	rasch depth
EU Enlargement	2007	5	0.85
CARIFORUM EU EPA	2008	7	1.58
Albania EU SAA	2009	7	1.26
Cote d'Ivoire EU EPA	2009	3	0.26
EU Montenegro SAA	2010	6	1.37
European Economic Area (EEA)	2011	5	0.67
EU Korea	2011	7	2.03
EU Enlargement	2013	5	0.90
EU Serbia SAA	2013	7	1.42
Central America EC	2013	6	1.76
Colombia EC Peru	2013	7	1.89
EU Georgia	2014	7	2.03
Bosnia and Herzegovina EC SAA	2015	4	1.06
EU Kosovo SAA	2015	5	1.18
EU Moldova	2016	7	2.11
EU SADC EPA	2016	4	0.54

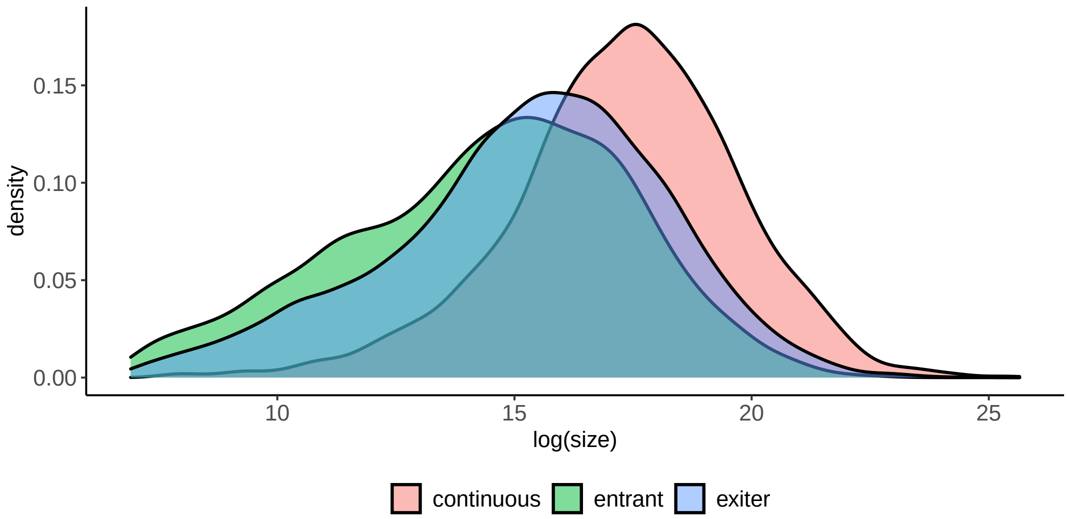
Note: This table lists trade agreements between the EU and other trade partners that entered into force over 2006-2011. Their respective depth indices are drawn from Dür, Baccini, and Elsig (2014).

Table 10: Percentage point reductions in tariffs for French exporters to South Korea

	Simple average	Weighted average	Weighted average
Weights:	–	Exporter size	Korea sales
Q4	7.79	6.26	6.18
Q3	7.47	1.78	3.46
Q2	9.00	1.84	1.70
Q1	6.68	3.27	6.63

Note: This table provides the percentage point change in the simple average and weighted average tariffs faced by continuous French exporters to South Korea, between the control (2000-2006) and FTA period (2011-2016). The averages are computed within quartiles of the size measure as defined in Section 2.3. The weights are taken as the exporter size or the sales of the exporter to South Korea in the control period.

Figure 7: Size distributions by type of firm



Note: This graph plots the kernel densities of size defined at the firm level for firms that i) exported to South Korea in both periods (continuous); ii) that began exporting to South Korea during the post-FTA period (entrant) and; iii) that exited South Korea in the post-FTA period (exiter).

B Appendix: Additional Robustness Checks

Table 11: Characteristics of firms exporting to South Korea

Dependent Variable:	Exporter to Korea (0,1)		
Model:	(1)	(2)	(3)
multi-product	0.018***		
	(0.0007)		
multi-product × FTA	0.006**		
	(0.002)		
multi-destination		0.011***	
		(0.0007)	
multi-destination × FTA		0.010***	
		(0.003)	
exporter to Japan/Taiwan			0.074***
			(0.003)
exporter to Japan/Taiwan × FTA			0.025***
			(0.008)
R^2	0.576	0.576	0.581

Note: Number of observations $N = 1,685,204$. This table reports coefficients from linear probability models. The dependent variable is set equal to 1 if the firm exported to South Korea in the given year and 0 otherwise. To compare the coefficients between the control and post-FTA periods, we interact the explanatory variables with a FTA dummy that equals 1 over 2011-2016. Multi-product and multi-destination are dummy variables at the firm-year level. In column (3), the explanatory variable is a dummy taking taking the value of 1 if the firm exported to Japan or Taiwan in the given year. All regressions include firm and year fixed effects. Standard errors are clustered by firm and year. Significance codes: ***: 0.01, **: 0.05, *: 0.1

Table 12: Impact of EUKFTA: Different clustering methods

Dependent Variable:	ln(exports)			
Model:	(1)	(2)	(3)	(4)
$\mathcal{I} \times Q4$	0.664***	0.664***	0.664***	0.664***
	(0.141)	(0.137)	(0.172)	(0.144)
$\mathcal{I} \times Q3$	0.564***	0.564***	0.564***	0.564***
	(0.136)	(0.134)	(0.172)	(0.138)
$\mathcal{I} \times Q2$	0.373**	0.373**	0.373**	0.373**
	(0.152)	(0.151)	(0.181)	(0.154)
$\ln t \times Q4$	-1.13***	-1.13***	-1.13***	-1.13***
	(0.405)	(0.393)	(0.364)	(0.413)
$\ln t \times Q3$	-0.280	-0.280	-0.280	-0.280
	(0.308)	(0.318)	(0.325)	(0.314)
$\ln t \times Q2$	0.181	0.181	0.181	0.181
	(0.335)	(0.329)	(0.346)	(0.337)
$\mathcal{I} \times \ln t \times Q4$	-1.27	-1.27	-1.27	-1.27
	(0.998)	(0.808)	(1.47)	(0.979)
$\mathcal{I} \times \ln t \times Q3$	-1.67*	-1.67*	-1.67	-1.67*
	(0.908)	(0.903)	(1.38)	(0.858)
$\mathcal{I} \times \ln t \times Q2$	0.704	0.704	0.704	0.704
	(0.891)	(1.47)	(1.28)	(0.868)
Clustering	$p-d$	$f-d$	$f-p$	$f-p-d$
Observations	1,758,070	1,758,070	1,758,070	1,758,070
R^2	0.918	0.918	0.918	0.918

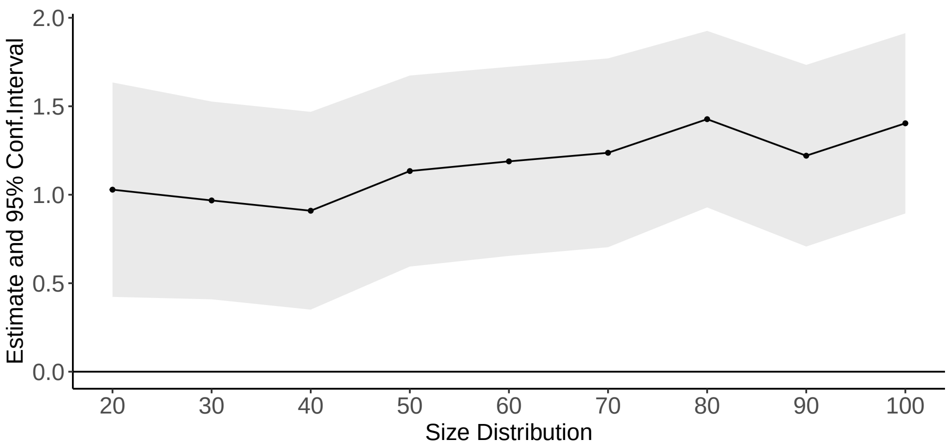
Note: Regressions are estimated for exports at the firm-product-destination level aggregated to two periods: control (2000-2006) and post-FTA (2011-2016). EUKFTA is a dummy that takes the value of 1 for South Korea in the 2011-2016 period. Regressions include firm-product-time, product-destination-time and firm-product-destination fixed effects. Only continuous exporters are retained i.e. firms that have positive exports in a given product-destination for each of the two periods. Standard-errors are clustered by destination and product in column (1), firm and destination in column (2), firm and product in column (3) and firm, product and destination in column (4). Significance codes: ***: 0.01, **: 0.05, *: 0.1

Table 13: Impact of EUKFTA: Aggregating exports to the firm-destination-time level

Dependent Variable:		ln(exports)	
Model:	(1)	(2)	(3)
$\mathcal{I} \times \ln(size)$	0.046***		
	(0.008)		
$\mathcal{I} \times median$		0.103**	
		(0.050)	
$\mathcal{I} \times Q4$			0.240**
			(0.101)
$\mathcal{I} \times Q3$			0.233**
			(0.106)
$\mathcal{I} \times Q2$			0.185*
			(0.106)
$\ln t \times \ln(size)$	-0.302***		
	(0.094)		
$\ln t \times median$		-1.84***	
		(0.385)	
$\ln t \times Q4$			-2.62***
			(0.768)
$\ln t \times Q3$			-1.91***
			(0.581)
$\ln t \times Q2$			-0.724
			(0.598)
Base category	–	$< 50^{th} ptile$	$Q1$
R^2	0.879	0.879	0.879

Note: N = 798,129. This table examines the differential impact of NTB reductions on exports, aggregated across products within firms. Thus, the dependent variable is at the firm-destination-time level. It plots coefficients on the interaction between the EUKFTA dummy with various size bins. The regressions include firm-time, destination-time and firm-destination fixed effects. Only continuous exporters are retained i.e. firms that have positive exports in a given destination in both control and post-FTA periods. Additional controls interactions between size bins and a dummy variable that takes the value of 1 in the second period for all other countries with which the EU implemented FTAs after 2006. The 95% confidence intervals are constructed using two-way clustered (firm & destination) standard errors.

Figure 8: Impact of NTB reductions on intensive margin: Comparison across deciles



Note: Following the specification provided by equation (2), this graph plots coefficients on the interaction between the $\mathcal{I}_{dt}$ (EUKFTA dummy) with size deciles. The base category comprises of exporters in the bottom decile of the size distribution. The 95% confidence intervals are constructed using standard errors clustered by firm, product and destination.

Table 14: Robustness checks with continuous size measure

Dependent Variable:	ln(exports)			
Panel A: Truncating size distribution				
Sample:	Full sample	Drop top 1%	Drop top 5%	Drop top 10%
$\mathcal{I} \times \ln(size)$	0.079***	0.070***	0.070***	0.075
	(0.009)	(0.010)	(0.015)	(0.026)
$\ln t \times \ln(size)$	-0.243***	-0.251***	-0.239***	-0.273
	(0.065)	(0.062)	(0.072)	(0.095)
Observations	1,758,070	1,696,706	1,545,340	1,390,912
R^2	0.919	0.918	0.919	0.924

Panel B: Alternate size measures				
Size measure:	Firm-Product Global	Firm-Product Intra-EU	Firm-Product Extra-EU	Firm Global
$\mathcal{I} \times \ln(size)$	0.079***	0.045***	0.086***	0.075***
	(0.009)	(0.011)	(0.017)	(0.006)
$\ln t \times \ln(size)$	-0.243***	-0.328***	-0.075	-0.070
	(0.065)	(0.071)	(0.082)	(0.063)
Observations	1,758,070	1,564,004	1,652,294	1,758,070
R^2	0.919	0.918	0.917	0.919

Panel C: Tariff staging					
Product categories:	MFN=0	EIF	3 years	10 years	11+ years
$\mathcal{I} \times \ln(size)$	0.171***	0.074***	0.068***	0.042*	-0.058**
	(0.015)	(0.012)	(0.013)	(0.022)	(0.022)
$\ln t \times \ln(size)$	-0.519***	-0.258***	-0.277*	-0.118	-0.173***
	(0.109)	(0.094)	(0.158)	(0.077)	(0.048)
Observations	191,936	893,520	252,892	224,251	43,156
R^2	0.924	0.919	0.908	0.916	0.925

Note: This table replicates the robustness checks reported in Section 4 for a continuous measure of size instead of size bins. Panel A shows how the magnitude of the size advantage varies when the size distribution is truncated, as discussed in Section 4.1. Panel B shows the impact of using alternative measures of exporter size as discussed in Section 4.2. Finally, Panel C reports the size coefficients for products belonging to different tariff staging categories in South Korea's tariff schedule; see Section 4.5 for detailed discussion.

Table 15: Changes in tariffs - Comparisons across size

Dependent Variable:		$\triangle$ tariff	
Model:	(1)	(2)	(3)
log($size$)	-0.0004		
	(0.0003)		
$median$		-0.002	
		(0.003)	
$Q4$			-0.008***
			(0.002)
$Q3$			-0.007**
			(0.003)
$Q2$			-0.010**
			(0.005)
(Intercept)	-0.069***	-0.073***	-0.067***
	(0.005)	(0.003)	(0.002)
Observations	7,662	7,662	7,662
R^2	0.0002	0.0001	0.0008

Note: The dependent variable here is the change in average tariffs applied by South Korea on French exporters, calculated over two periods: 2000-2006 and 2011-2016. Only continuously exporting firms from France to South Korea are retained. Standard errors are clustered by firm and product. In column (3), differences in the coefficients on size quartile dummies are not statistically significant based on Wald tests.

Table 16: Count models: Market entry and product diversification

Dependent Variables:	Exporter (0,1)		# Products	
	(1)	(2)	(3)	(4)
$\mathcal{I} \times Q4$	-0.269*	-0.287*	0.053	0.021
	(0.161)	(0.164)	(0.060)	(0.066)
$\mathcal{I} \times Q3$	0.046	-0.068	0.017	-0.036
	(0.164)	(0.169)	(0.062)	(0.069)
$\mathcal{I} \times Q2$	0.233	0.135	0.080	0.034
	(0.188)	(0.193)	(0.068)	(0.075)
$\ln t \times Q4$		-0.353		-0.553
		(0.422)		(0.376)
$\ln t \times Q3$		-2.35***		-0.930**
		(0.437)		(0.414)
$\ln t \times Q2$		-2.04***		-0.804*
		(0.503)		(0.442)
Estimation	Poisson	Poisson	Neg. Binomial	Neg. Binomial
Fixed effects	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$	$\theta_{fd}, \theta_{ft}, \theta_{dt}$
Observations	1,817,127	1,817,127	3,196,118	3,196,118
Pseudo R^2	0.119	0.120	0.340	0.340
Over-dispersion			32.398	32.402

Note: The table above reports regression results for the impact of the EUKFTA for the market entry and product margins. $\mathcal{I}$ is a dummy variable that takes the value of one for French exports to South Korea from 2011 onwards and the value of zero otherwise. Columns provide results following the specification in equation (3). Since the dependent variables here are defined at the firm-destination-time level, size is correspondingly computed at the firm level (aggregating across products) and tariffs are averaged across products within a given destination and time period. Significance codes: ***: 0.01, **: 0.05, *: 0.1