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Imported inputs, Government Support and Performance of Manufacturing Exporters

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Abstract

We evaluate the effectiveness of trade policy incentive that promotes the use of imported intermediate inputs. Specifically, we examine the performance differences in firm export outcomes for the beneficiaries relative to the non-beneficiaries to Kenya's duty exemption scheme on imported inputs. Using fixed effects to address potential endogeneity, we find a positive and significant performance premium for the importer-exporters who import intermediate inputs through the scheme. This subset of firms outperforms non-beneficiaries in export value and geographic scope of exports, but there is no significant difference in the number of products exported. This result suggests that reducing the costs of inputs can help firms overcome market access costs and potentially expand the destination scope of exports that are in turn, positively associated with greater performance in a country's aggregate exports.

1 Introduction

Access to imported intermediate inputs has been hailed as critical in enhancing firm productivity and performance in exports. A cut in global tariffs has promoted access to a larger variety of higher quality and less expensive inputs, enabling firms to lower their marginal costs and overcome the fixed costs of serving foreign markets (Feng, Li & Swenson, 2016). In addition, most countries go a step further and grant duty relief and exemptions to exporters to enable them use imported intermediate inputs in their production processes. These schemes allow certain goods to be imported duty free provided they are used in the production of goods for export (Thomas & Nash, 1991). The objective is to provide manufacturing exporters with imported inputs at world prices propping up their competitiveness and offsetting the anti-export bias associated with tariff protection on intermediate inputs.

Despite their popularity, little is known about the effectiveness of duty relief and exemption schemes in raising firm level export outcomes in emerging

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economies. Existing schemes are often complex and administered inefficiently imposing high transaction costs on eligible exporters. The problem appears particularly acute in African economies (Clarke, 2005; Collier & Gunning, 1999).

In this paper we use transaction level data to examine the effect of imported intermediate inputs on a firm's export performance and evaluate the effectiveness of Kenya's duty exemption scheme administered by the Tax Remission for Export Office (henceforth TREO) in providing access to imported inputs. Specifically, we ask two questions:

- What is the effect of increased access to imported inputs on firms' export performance?
- Does access to duty exemptions confer additional gains to beneficiaries in terms of export outcomes?

These questions are important for the manufacturing sector in Sub-Saharan African (SSA) countries for two reasons. Firstly, access to imported inputs has been shown to raise firm total factor productivity .(Halpern, Koren & Szeidl, 2015; Kasahara & Rodrigue, 2008), which in turn, boosts export performance (Bas & Strauss-Kahn, 2014). Firms in developing countries have been found to be less productive relative to their counterpart in the developed economies (Tybout, 2000). Access to imported inputs could potentially raise the average productivity for firms in SSA allowing them to better access international markets. Secondly, access to higher quality and less expensive imported inputs lowers the production costs and the fixed costs of entry in export markets (Feng, Li & Swenson, 2016). Africa is remote as a large number of countries are landlocked. Further, their economies are characterised by thin production markets comprised of small manufacturing firms (Bigsten & Soderbom, 2006). This means manufacturing firms in these countries face a greater dependency on imported inputs as well as higher transportation costs. These points underscore the need for trade policy in SSA countries to ease access to imported inputs (Kasahara & Lapman, 2013).

We find three key results. Firstly, there is a positive and significant performance premium for exporters that import intermediate inputs relative to those that do not import. Furthermore, within firms that import and export, an increase in the value of imported inputs is associated with an increase in total export values, an increase in the number of products exported and an expansion in the number of destination countries served.

Secondly, an increase in the number of imported varieties per importer-exporter is associated with an increase in firm export value, the number of products and destination countries served. We find that a 10% increase in the number of imported varieties is, on average associated with a 1.4% increase in the export value and number of products exported and a 0.65% increase in the number of destination countries served.

We interpret these two results in line with the literature showing that access to imported inputs is an avenue for diffusion and adoption of new technology and quality upgrade of exports .(Bas & Strauss-Kahn, 2015; Halpern, Koren &

Szeidl, 2015; Fan, Li & Yeaple, 2015; Kugler & Verhoogen, 2012; Kasahara & Rodrigue, 2008; Amiti & Konings, 2007; Muendler, 2004). Access to imported inputs also makes it possible to produce varieties that correspond adequately to foreign market needs, lowering the fixed costs of entering foreign markets (Bas & Strauss-Kahn, 2014; Amiti & Khandelwal, 2013; Verhoogen, 2008).

These results corroborate those in the international literature where access to imported inputs is shown to raise firm export outcomes indirectly through enhancing productivity (Bas & Strauss-Kahn, 2014; Kugler & Verhoogen, 2012; Grossman & Helpman, 1991; Rivera-Batiz & Romer, 1991; Markusen, 1989) and directly through lowering of costs (Edwards, Sanfilippo & Sundaram, 2016; Feng, Li & Swenson, 2016; Bas & Strauss-Kahn, 2014; Damijan, Konings & Polanec, 2014; Kasahara & Lapham, 2013; Bas, 2012).

Thirdly, importer-exporters that access TREO, have a significant performance premium in export value and geographic diversification but not in product scope relative to periods when they were not TREO beneficiaries. For example, access by importer-exporters to TREO is associated with an increase in export value of 47.1% and a 10.7% increase in export destinations. The effect on export value per firm is uniform across all firms and is not influenced by firm import characteristics. We interpret this result to be consistent with a level shift that one expects in a constant return to scale firm, where tariff reduction shifts down the marginal cost curve by a common percentage. Our results are also in line with studies examining the impact of duty relief and exemptions on the performance of exports (Chi-Chur, Eden & Wusheng, 2006; Clarke, 2005; Ianchovichina, 2004; Chao, Chou & Eden, 2001; Panagariya, 1992).

The rest of this paper is organized as follows: the next section summarizes the incentive framework and its implementation; section 3 presents data and the empirical framework; section 4 undertakes the empirical analysis while section 5 concludes.

2 Kenya's Tariff Exemption and Implementation

The Kenyan duty relief and exemptions scheme on imported intermediate inputs was established in July 2002. The scheme is administered by the Tax Remission for Export Office (TREO) at the National Treasury. It grants full duty exemption to eligible importers of intermediate inputs. Information on amount of duty exempted is compiled and disseminated by TREO together with an audit unit at the Customs Services Department of the Kenya Revenue Authority (KRA).

To be eligible for duty relief and exemption, a firm submits an application to a committee through the Kenya Association of Manufacturers (KAM). The committee is comprised of the National Treasury, Ministry of Trade and Industry, Kenya Revenue Authority, Kenya Bureau of Standards, Kenya Sugar Board, Fresh Produce Exporters Association of Kenya and Kenya Association of Manufacturers. It approves for gazetting only the applications that meet the

requirements of the regulations to the Commissioner of Customs Services contained in the Legal Notice No. 129 of 19/7/2002. These requirements include, belonging to KAM, submission of a detailed actual production plan, giving the input-output ratio, any wastes and by-products. A reconciliation of the duty exempt imports with goods produced and exported after exportation or within nine months of exemption approval or otherwise re-export, apply for a rollover or pay the applicable taxes. In addition, exemptions are only granted against a performance bond to the value of the duties exempted. Table 1 shows the amount of exemptions and the number of firms that have benefited from the scheme over time.

A critical attribute to this incentive is that, once approved, it stays valid for at least nine months and does not get regularly revised as the firm varies its output and export activity. In addition, the Kenyan scheme grants full duty exemption, making it easier to abstract from concerns of potential endogeneity that may arise if partial duty is granted. Cadot, de Melo and Olarreaga (2003) show that if partial duty is exempted there could arise intense industry lobbying on the final tariff rate and exempted proportions on imported inputs resulting in tariffs being endogenous.

There is a common worry in the literature on firm-level performance and tariffs, that if policy makers decide to adjust tariffs in response to lobbying by firms in sectors with low or falling productivity levels, then there will be a spurious negative correlation between tariffs and firm-performance, even though tariffs reduction do not cause positive firm level performance (Bigsten, Gebreeyesus & Soderbom, 2016; Fan, Li & Yeaple, 2015; Bas & Strauss-Kahn, 2015). Fortunately for us, starting in 2005, Kenya's tariffs have been set at the EAC level following entry into force of the EAC Common External Tariffs on 1st January 2005. This suggests, that lobbying power of industrialists to alter tariff rates on imported inputs might not be at play. At the same time, while the policy is fixed and the benefits not subject to lobbying, the selection of bigger firms into using TREO means we cannot escape endogeneity concerns. In the empirical section, we attempt to address these concerns to the extent our data allows.

The magnitude of the gain from TREO depends on the level of input tariffs. Kenya's applied Most Favoured Nation (MFN) tariff rates are in line with the East African Community Common External Tariffs since 1^{st} January 2005. Table 2 provides a description of the MFN tariffs profile for Kenya over the selected years.

The table shows simple average tariffs across 21 sectors over time. The most protected sector in 2004 was footwear at a rate of 30.6% while chemicals had the lowest tariff of 9.8%. Across all sectors (except live animals, arms, miscellaneous, and works of art) tariffs dropped in 2005 and have broadly remained stable over time. This one-off drop was occasioned by the coming into force of the Common External Tariffs (CET) in the context of the East African Customs Union.

In 2012, live animals remain on average the most protected at a rate of 25.4%, while chemicals have the lowest rate of 3.0%. The standard deviation around the mean is high signalling high dispersion of tariffs within sectors. The bottom panel provides the average tariff for Kenya over time, which has reduced

from 16.8% in 2004 to 12.7% in 2010 before a slight increase to 12.9% in 2012. The minimum tariff is zero while the maximum is at 100%. In the appendix we have attached a complete year-on-year trends in inputs tariffs across all the sectors (see Table A-4).

To examine the changes in tariffs on broad imported products, we grouped the products into final, intermediate and capital goods using the United Nations' Broad Economic Classification (BEC) on end use. Figure 1 presents the average ad valorem tariff rates on final, intermediate and capital goods.

It can be observed that there is only action on tariff changes from 2004 to 2005. The average tariff on intermediate goods has decreased from an average rate of 15% in 2004 to around 10% in 2012. At this level, tariffs are still reasonably high suggesting that firms that take-up TREO obtain a saving on the cost of imported inputs.

In summary, the trend in the import tariff is not that important after 2005, rather, it is the level that matters. However, there is also higher variation across sectors and overtime within a sector. This is important, as it allows us to identify the effect of TREO (or tariffs) on export outcomes, while controlling for time and firm fixed effects (Bigsten, Gebreeyesus & Soderbom, 2016).

3 Data and Empirical Framework

3.1 *Data and Construction of Variables*

We use the product level transaction data for Kenya's exporters and importers obtained from the Customs Service Department of the KRA. The data is aggregated to annual flow of exports and imports per firm and ranges from 2004 to 2013. It contains information on the product being exported (or imported) at the eight-digit HS product classification, the identity of the firm, the destination of exports (and origin of imports), the Free on Board (FoB) value for exports and the Cost Insurance and Freight (CIF) value for imports and the quantity being exported or imported. It also shows the duty to be paid (or waived) on imports, which enables us to calculate the average tariff rate per HS6 product-firm in a year.

To classify imports into intermediate, capital and final goods, we follow the recent literature (Feng et al., 2016; Bas, 2012; Pierola et al., 2015) and use the United Nations' Broad Economic Classification (BEC)[1] to identify imports that are classified as intermediate goods. The rest of the analysis related to imports is restricted to imported intermediate goods. This data is used to calculate the average tariff per firm, total firm expenditure on imported intermediate goods, and the variety of imported inputs per firm each year. We similarly use the export transaction data to construct a firm panel of export values, number of export products and number of export destinations over the period 2004-2013.

[1] We use the BEC classification as provided by the United Nations and concord the BEC categories to the 6 digit HS products imported by firms. http://unstats.un.org/unsd/BEC%20classification.htm.

Finally, we merge the firm importer data into the firm exporter panel. This allows us to identify the import status and import characteristics of exporters in each year. Exporters that also import are referred to as *importer-exporters* in the remainder of the paper. Firms that only import are excluded from the database.

Data on access to TREO is obtained from the National Treasury-Kenya, for the sample period of 2004 to 2013. This is a unique panel data containing information on the name of the firm, the CIF value of imports at the 8-digit HS product level, duty to be paid (and hence waived under TREO) and the date the approval was granted. Using the firm name and year, we match firms with TREO access to exporters in the importer-exporter database. The merger between the two databases was close to perfect with only a few observations (0.2%) from the TREO database not matched (see appendix Table A-1). The matched exporting firms are identified as TREO beneficiaries while the remaining firms constitute the non-beneficiaries. Table 3 provides summary statistics for the key variables used in the estimation of results. Details on the construction of the variables are contained in the appendix.

Table 3 shows that the numbers of firm-year observations over the 10-year period are equal to 45,753. The average number of products and number of countries served per exporter in a year is approximately 6.9 and 2.7, respectively. 44% (20,167) of firm-year observations comprise of exporters that also import (importer-exporters) and out of these 11.7% have access to TREO.

The average tariffs per firm are calculated as an average of all tariffs on HS6 products (intermediate goods) that a firm import for use in its final production process in period(t). Our first measure is the unweighted average tariffs per firm (avg.tariff) which is calculated as a ratio of duty liable to value of imported inputs. The second measure is the unweighted average of all MFN tariff rates on HS6 intermediate products that a firm import. The MFN tariff rates are taken from TRAINS website based on the HS6 product level classification. It can be observed that the average tariff rate per firm is 10.94 percent for the first method and 12.26 in the second method. A third and final tariff measure is the weighted average MFN tariff per firm which is calculated using the ratio of a firm's total import of a given HS6 product to the Kenya's total import of the same product over the whole sample period as constant weights. The constant weights are used together with the MFN Ad valorem tariff rate to calculate the weighted average tariffs per firm (Feng et al, 2016). These firm level average tariffs are used to instrument for imported inputs (Bas & Strauss Khan, 2014).

3.2 *Empirical Framework*

The Effect of Imported Inputs on Firm Export Performance

Our empirical approach for studying the effect of imported intermediate inputs on the performance of firms in exports is to regress measures of firm export performance on indicators of firm's import of inputs. We expect that exporters that use imported inputs have a performance advantage relative to those that

do not .(Edwards, Sanfilippo & Sundaram, 2016; Pierola, Fernandes & Farole, 2015; Bas & Strauss-Kahn, 2014; Bas, 2012). We estimate the following regression.

$$\mathbf{Y_{it}} = \beta_0 + \beta_1 \mathbf{M_{it-1}} + \mu_t + \alpha_i + \varepsilon_{it} \tag{1}$$

where $\mathbf{Y_{it}}$ contains indicators of export performance (i.e. real exports value, number of products and destination countries served) per firm i at period t. $\mathbf{M_{it}}$ denotes indicators of firm imports of inputs, i.e. a dummy variable equal to 1 if the exporter imports inputs (importer-exporter dummy) and the log values of imported inputs and the number of imported varieties. We control for firm fixed effects (α_i) and year effects (μ_t) to account, respectively, for the time invariant omitted firm characteristics, as well as time varying aggregate macro factors that may influence export performance but are common across all exporters, such as business cycles. Inclusion of firm FE in away deals with firm selection concerns, where the coefficient on importer-exporter dummy is identified entirely through changes in the firm's import status over time. The regression results for this specification are presented in section 4.2.2 of this paper.

Export Performance Premia for Importer-Exporters that Access TREO

The second question in the paper focuses on analysing the effect of TREO on firm's export outcomes. To examine this, we estimate an extended version of equation (1) that includes TREO dummy as an explanatory variable.

$$\mathbf{Y_{it}} = \beta_0 + \beta_1 \mathbf{M_{it-1}} + \beta_2 TREOdummy_{it-1} + \vartheta_{it} \tag{2}$$

where $\mathbf{Y_{it}}$ and $\mathbf{M_{it}}$ are defined as in equation (1) and $\vartheta_{it} = \mu_t + \alpha_i + \varepsilon_{it}$. TREO is a dummy variable equal 1 if a firm imports inputs under TREO scheme and zero otherwise. We also consider specifications with interaction terms between firm import characteristics and the TREO dummy. We expect $\beta_1 > 0 \, and \, \beta_2 > 0$; β_2 capture the average effect of TREO on firm's export performance. Controlling for firm FE is expected to deal with firm selection concerns, where the coefficient on TREO dummy is identified entirely through changes in the firm's TREO status over-time. The regression results from this formulation are presented in section 4.2.3.

4 Empirical Analysis

4.1 *Descriptive statistics*

We use a kernel density plot to examine the differences in export value for the different types of exporters Figure 2 shows the results.

The kernel density on the left plots the distribution of exports over the sample period comparing the distribution for importer-exporters relative to exporters only. The entire distribution for the importer-exporters is to the right

of the exporters only, indicating that it stochastically dominates the latter. The average log export for the importer-exporters is 6.1 relative to 4.7 for exporters only.

The kernel density plot on the right compares the distribution of export sales for the importer-exporter who are beneficiaries to TREO relative to non-TREO ones. The distribution for the TREO beneficiaries lies to the right with the mean value in logs of 9.6 compared to 5.8 for the non-TREO firms, suggesting that the former performs better across the entire distribution.

Differences in mean products and mean destination countries across exporter types

We make use of the two-sample t-test to assess the differences in means in the product and destination scope between importer-exporters and exporters only and the differences in means for the importer-exporters who use TREO relative to those that do not access TREO. The t-test statistics are calculated using $t = \frac{\bar{X}_T - \bar{X}_C}{SE(\bar{X}_T - \bar{X}_C)}$ where: $\bar{X}_T - \bar{X}_C$ is the difference between group means and SE($\bar{X}_T - \bar{X}_C$) is the standard errors. We start-off with the differences in the number of products per exporter type. Table 4 presents the results on difference in means of the number of products per exporter.

In 2005, the mean number of products per importer-exporters was 8.61 compared to 3.70 for exporters only. The difference in means is 4.91 products and is statistically significant. Across all the years, importer-exporters are larger in the average number of products exported relative to exporters only. Amongst importer-exporters, those that source imported inputs through TREO have higher average number of product relative to non-TREO users, although the differences are not statistically significant.

Table 5 shows that the mean number of destination-countries per exporter ranges from a low of 3.42 (in 2009) to a high of 3.85 (in 2005). Over the same period the mean number of destination-countries for exporters only was 1.9. This indicates that importer-exporters have on average more number of destination countries relative to exporters only. The differences are statistically significant, across all the selected years. Looking amongst importer-exporters, firms that access TREO had an average number of destination countries of between 7.3 in 2009 and 8.2 in 2013, while firms that never access TREO had an average number of countries of 4.3 in 2009 and 4.9 in 2013. We observe that the difference in the number of destination countries between TREO firms and non-TREO firms is large and significant, across all the selected years.

4.2 *Regression Results*

4.2.1 The Effect of Imported Inputs on Firm Export Performance

We start off by regressing our measures of export performance on indicators of firm's import of intermediate inputs as specified in equation (1). The regression results are shown in Table 6.

The results in Table 6 presents the relationship between exporting and importing. Columns (1, 3 and 5) excludes firm fixed effects and show that larger

exporters, more product and higher destination exporters are more likely to also import intermediate inputs. This motivates for inclusion of firm fixed effects so that we only look within firm changes over time to identify the relationship (i.e. impact when exporters transition in and out of importing intermediate inputs).

Columns (2, 4 and 6) show our preferred regression results (with firm fixed effects) of export outcomes (i.e. export value, number of products and countries per firm) against the importer-exporter dummy. The results show that, holding everything constant, importer-exporters are on average 29.5% larger in export values; have 16.8% more products and 9.7% more destination countries relative to periods when they were exporters only[2].

Looking within importer-exporters, here we are interested in the heterogeneity of the relationship between importing and exporting within firms and over-time. We also include in the regression the number of imported input varieties .(Feng, Li & Swenson, 2016; Pierola, Fernandes & Farole, 2015). The number of varieties imported are constructed following Feng et al. (2016) where an imported input variety is defined as HS6 product-country pairs. This variable is necessarily larger than the number of HS6 products exported by a firm[3]. Table 7 presents the results.

The results show that an increase in the value of imported inputs by 10% is, on average, associated with an increase in total export values per firm by 0.84%, an increase in the number of products by 0.2% and an increase in the number of countries served by 0.23% for the importer-exporters in the sample. Regarding the variety channel, the results show that a 10% increase in the number of imported varieties is, on average, associated with a 1.4% increase in the exported value and number of products exported and a 0.7% increase in the number of destination countries served, holding all other factors constant.

These results corroborate those in international literature (Edwards, Sanfilippo & Sundaram, 2016; Feng, Li & Swenson, 2016; Pierola, Fernandes & Farole, 2015; Bas & Strauss-Kahn, 2015) where access to imported inputs is shown to raise firm export outcomes. However, in the absence of a variable capturing firm size, the coefficient on imported inputs cannot be interpreted as capturing the effect of increased imports intensity on export value. This is because, failure to control for firm size may be driving the results. So essentially, we make use of imported inputs as a control for the firm size. The variety indicator, on the other hand, tells us something about the complementary input hypothesis, that is, import varieties complement each other raising firm productivity and thus firm export outcomes. More importantly, Table 7 regressions form the baseline regression from which we test whether access to TREO matters.

[2] This % is calculated as $\exp(\beta) - 1) * 100$, where β is the estimated coefficient. Comparison is relative to the firm itself over-time.

[3] As an example, let us assume that a firm produces "blue jeans for export" and imports inputs to produce the jeans. Let one of these inputs be a unique item, "buttons". The firm can import "buttons" from the US, Canada, China, or South Africa. The "blue jeans" will be a final export product, while the imported inputs varieties count will be four (product-country pairs)

4.2.2 Export Performance Premia for the Exporters that Access TREO

The second question is central to this paper, in which we analyse the marginal effect of TREO access on export performance. We start with a regression (with FE) of export value on importer-exporter dummy and TREO dummy. Table 8 presents the regression results.

To interpret column (1), the coefficient on TREO reflects the marginal impact of TREO over and above being an importer. An importer that begins to import under TREO experiences a 51% change in export value relative to pre-TREO periods. In column (2) we check whether controlling for within firm changes in import size affects TREO estimates in column (1). We see that the coefficient stays almost unchanged, indicating a premium of 47.4% if an importer uses TREO. This suggests that TREO has a level effect on firm export value and does not work through enhancing responsiveness of exports to import values. In column (3) we do the same for the number of imported varieties and in column (4) we include both value of imported inputs and the number of varieties imported. Column (4) is essentially the same as results in Table 7 column (1) with inclusion of TREO dummy. We find that the level effect of TREO (i.e. approximately 47%) on export value is maintained in this specification as well.

Finally, in column (5) we provide a direct check whether the effect of TREO works directly and through its impact on value of imported inputs and number of imported varieties. We find that an importer that begins to import under TREO experiences a 56.8% change in export value relative to pre-TREO periods. However, we do not find evidence of indirect effects of TREO as the coefficients on the interaction terms are insignificant. We conclude that TREO has a uniform effect across all firms and is not influenced by firm import characteristics. This is more consistent with a level shift that one expects in a constant return to scale firm where tariff reductions shift down the marginal cost curve by a common percentage.

Next, we examine the performance differences in the number of products exported per firm (firm-product extensive margin). All estimations are obtained from a fixed effects regression with year and firm effects. Table 9 shows the regression results.

In column (1) we see that the coefficient on importer-exporter dummy is positive and significant, suggesting that being able to import and export confers a performance advantage in terms of product scope relative to periods when a firm did not import. The coefficient on TREO reflects the marginal impact of TREO over and above being an importer but is not significant. This suggests that, on average, there is no performance premia in terms of exported products for the importer that begin to use TREO relative to their pre-TREO performance levels. In column (2) we check whether controlling for within firm changes in import size affects the TREO premia in column (1). We see that the coefficient stays positive and not significant. In column (3) we do the same for the number of imported varieties and column (4-5) includes both the value of imported inputs and the number of varieties imported as well as interac-

tion terms with the TREO dummy. The coefficient on TREO dummy remains insignificant.

Overall, the coefficients on TREO dummy indicate that a switch in the firm's status from non-TREO to TREO is not associated with a change in the firm's number of products exported. This makes intuitive sense because importing is associated with access to a large variety of new intermediate goods that can be combined to produce new products to be exported. Thus, being able to import intermediate inputs confer a wider product scope to importer-exporters relative to periods when they did not import. However, since TREO does not discriminate on certain types of imported inputs, it has no effect on the number of products exported by the importer-exporters that begins to use TREO compared to the number of products in the pre-TREO periods. This is also consistent with information conveyed in Table 4.

In column (4) we control for both the value of imported inputs (or firm size) and the number of varieties imported. The results show that a 10% increase in the number of imported varieties is, on average, associated with a 1.4% increase in the number of product exported, holding all other factors constant. Notice that by including the number of varieties imported, the coefficient on value of imported inputs drops from 0.048 to 0.016, suggesting that a 10% increase in the value of imported inputs is now, on average, associated with 0.16% increase in a firm's product scope. This suggests that the number of varieties imported is a significant channel through which product scope can be expanded.

Finally, we examine the performance differences in the number of destination countries in firms' export portfolio (firm-destination extensive margin). Table 10 shows fixed effects regression results.

Column (1) results show that importer-exporters have 9.5% more destination countries relative to periods when they did not import. The coefficient on TREO reflects the marginal impact of TREO over and above being an importer. An importer that begins to use TREO experiences a 14.7% change in the number of destination countries relative to their pre-TREO levels. In column (2) we check whether controlling for within firm changes in import size affects TREO estimates in column (1). We see that within importer-exporters, a 10% increase in the value of imported inputs is, on average, associated with 0.36% increase in the number of destination countries served. The coefficient on TREO dummy indicates that importer-exporters that import inputs through TREO have, on average, 10.5% more destination countries in their export portfolio relative to their pre-TREO level of destination countries.

In column (3) we control for the number of varieties imported. The coefficient on the value of imported inputs remains positive and significant, suggesting that a 10% increase in this variable is, on average, associated with an increase in the number of destination countries served by 0.22%. The coefficient on TREO dummy indicate that access to TREO raises the number of destination countries served per TREO firm by 10.1% relative to the level prior to accessing TREO.

The coefficient on the number of imported varieties is positive and significant at 1% level, suggesting that an increase in the number of imported varieties by 10% is, on average, associated with a 0.65% increase in the number of destination

countries served. This result is qualitatively similar to that found by Pierola et al. (2015) for Peru using a fixed effects regression and controlling for the year and firm effects. In their case, a 10% increase in the number of imported varieties was on average associated with a 0.06% increase in the number of destination countries served for the Peruvian exporters. This suggests that access to a large variety of imported inputs makes it possible to break into new markets, possibly by easing both fixed costs of entry and per period costs to serving foreign markets.

Finally, in column (5) we provide a direct check whether the effect of TREO works directly or indirectly through its impact on value of imported inputs and number of imported varieties. We find that an importer that begins to import under TREO experiences a 11.1% change in number of countries in her export portfolio relative to pre-TREO periods. However, the estimation is imprecise. We do not find evidence of indirect effects of TREO as the coefficients on the interaction terms are insignificant.

4.2.3 Dealing with Endogeneity Concerns

There is a major concern that the results in this study may be suffering from severe selection effect. Firstly, given costs of applying and complying with TREO conditions: (a) more efficient, and (b) larger firms are more likely to make use of the facility. The consequence is that the estimated coefficient on TREO will be biased upwards due to this selection effect. We do not have variables for productivity or size. We also do not have an instrument for TREO directly. We attempt to address this concerns as follows. First, we included firm fixed effects to control for time invariant firm characteristics associated with selection of firms into TREO. This would cover managerial efficiency, stable productivity levels among others. While this deals with a cross-firm selection, it does not deal with within-firm selection. The inclusion of firm fixed effects implies that the results are driven by the transition of firms into and out of TREO. If this transition is driven by time varying firm characteristics (changes in productivity, size, etc.) then the estimates will still be biased.

Second, we included lagged import variables. Our concern is that firms simultaneously start importing and adopt TREO in response to an increase in demand. This really deals with endogeneity of importing and adoption of TREO (rather than selection effects), but it would help reduce some of the selection bias. Third and final, we split the sample into large, medium and small firms. As theory and literature shows (Fernandes, Freund & Pierola, 2016; Matthee et al., 2016; Bernard & Jensen, 1999) exporting is correlated with productivity and firm size. By categorising firms by size, we hope to reduce the potential selection bias associated with larger more efficient firms selecting into TREO. The following section provides results for the sub-sample.

4.2.3.1 Robustness of TREO access on Export Outcomes per Sub-Sample

The lack of information on firm covariates on pre-entry to TREO, means we cannot use a strategy such as propensity score matching to deal with selection bias to TREO .(Lechner, 2002; Dehejia & Wahba, 2002; Smith & Todd, 2001). We are also at the moment not aware of a suitable instrument to employ that determines selection to the scheme but not the firm's export outcome. Taking these issues into account, we prod further to assess the robustness of TREO premia using firm fixed effects estimates based on three sub-samples of firms.

A common stylized fact in studies using transaction level datasets, both in the developed and developing countries is that a majority of exporters are very small .(Fernandes, Freund & Pierola, 2016; Matthee et al., 2016; Bernard & Jensen, 1999). It is the top 10% of firms that accounts for the largest share of annual total exports. Using this fact, we classified firms into three sub groups based on their total export value over the whole sample period, 2004-2013. Firms are defined as small if their exports over the entire sample period falls below the 75^{th} percentile, medium sized if their exports fall between the 75^{th} and 90^{th} percentiles and large if their exports fall among the top 10%. We regressed firm export outcomes on TREO dummy and other controls within each of the three sub-samples. Table 11 shows the regression results for exports.

In column (1) we see that the coefficient on TREO dummy is negative and not significant, while the coefficient on the interaction term of TREO with value of imported inputs is positive and significant at 5% level. The result suggests that for a small firm, the benefit for accessing TREO is dependent on the amount of imported inputs. For a firm with an average log value of imported inputs equal to 11.14 (see summary Table 3), this is associated with a 58.5% increase in the firm's export value[4].

Column (2) results are for the medium sized firms. We note that the coefficient on TREO dummy is negative and not significant. The interaction term is also insignificant. The results suggest that TREO has no effect on export value for the medium sized firms. However, we see that the coefficient on the number of imported varieties is positive and significant; suggesting that an increase in this variable is, on average, associated with an increase in export value for the medium sized firms. Column (3) presents results for the large firms. We find that the coefficient on TREO dummy is positive and significant, suggesting that a large firm that access TREO experience a level increase in its exports. A negative term on the interaction term between the value of imported inputs and TREO dummy suggests that the effect of TREO diminishes as both the number of varieties imported and value of imports rises, although the coefficients are not significant. Finally, in column (4) we compare results from the sub-samples to the overall regression. This helps us to assess the extent to which large sized firms derives our results.

Overall, we find a strong and positive effect of TREO on export value for the small and large firms but not for the medium sized ones. These results, suggests that the effect of TREO along the intensive margin is large. The results on product and destination scope (or the firm extensive margin) did not change

[4] Calculated as $\exp\left(0 + 0.461 * Log\left(value\,of\,\bar{imported\,inputs}\right)\right) - 1 * 100$.

from what is presented previously in Table 9 and Table 10. Considering that we have already presented a lot of tables, these results output are not presented here but are available on request.

4.2.3.2 Robustness to Controlling for the Potential Endogenous Imported Inputs

The second major concern is that imports are themselves potentially endogenous. Further, the coefficient on value of imports in Table 8 column (4) could be biased by omitted productivity and size variables. Theory and empirical literature points to the role that imports play in driving firm productivity. Given that we do not deal with time varying firm productivity, the coefficient on imports could be biased upwards by the omission of firm productivity (note we deal with cross firm time-invariant firm effects through inclusion of firm FE). This is dealt with in three ways in the paper: (a) inclusion of firm FE, (b) inclusion of lagged import variable to avoid simultaneity bias and (c) instrumentation. This section details the instrumentation approach.

We follow Bas and Strauss-Kahn (2014) in the use of average input tariffs per firm as an instrument. Input tariffs are calculated at the firm level as an average of all tariffs on 6-digit HS products that a firm import for use in its final production process in period (t). A good instrument should be able to sufficiently explain the variation in the potentially endogenous variable (firm's imported inputs) but not the variation in firm's export outcomes. We show in the appendix (see Table A-2) using a bivariate regression, that there is no correlation between the instrumental variable and firm's export outcomes. Using a two stage least squares regression where, in the first step, we regress the value of imported inputs on the average tariffs per firm and lagged value of imported inputs (see appendix Table A-3), the predicted value of imported inputs (t-1) from the first step regression is included as the main regressor in equation (2). This strategy also allows us to calculate the interaction term of the predicted imported value of inputs with the TREO dummy .(Wooldridge, 2002). The results in Table 12 are obtained after controlling for firm and year fixed effects. Since the value of imported inputs is estimated from the first step regression, the standard errors are bootstrapped to account for this fact.

Column (1) results shows that a 10% increase in imported inputs is, on average, associated with an increase in the firm's export value by 0.71%. TREO dummy is positive and significant, suggesting that firms that change their status from non-TREO to TREO (TREO dummy=1) experience a raise (a level change) in their export value by 28.9% compared to their pre-TREO export level. Comparing these results with the FE results presented in column (4) of Table 8, the coefficients on value of imported inputs and TREO dummy are smaller for the IV. The coefficient on number of imported varieties is not significant.

Column (2) results show that the coefficient on TREO dummy is not significant. The number of imported varieties is the only factor that counts in the variation of exported products. Comparing this results with the FE results in

Table 9 column (4), we also find that the IV coefficient on value of imported inputs and the number of imported varieties is small relative to fixed effects regression. Finally, column (3) shows that imported inputs and number of varieties imported has no significant relationship with the number of destination countries served per firm. This is contrary to the findings using fixed effects results in column (4) of Table 10. The TREO dummy is positive and significant at 1 percent level, suggesting that a firm that access TREO experiences an increase in the number of destination countries served by 11.2% relative to its pre-TREO performance.

Overall, the IV results are consistent with findings in the previous section indicating that firms that import and export under TREO are on average large in export value and have more destination countries in their export portfolio relative to exporters only. The marginal effects uncovered in the IV regression, are smaller relative to fixed effects regression, seemingly addressing the upward bias of the coefficient on TREO arising from self-selection of large and efficient firms into the scheme.

4.2.3.3 Robustness to Different Measures of Firm Level Average Tariffs

Third and finally, there is a concern that the IV results in section 4.2.3.2 may be driven by the approach used to calculate the average firm level tariffs. To address this concern, we re-run the IV results (for export values) using three different approaches to calculate average tariffs at the firm level.

The first, firm average tariffs (column 1) is calculated as a ratio of duty liable to the CIF value of all HS6 products imported by a firm in a year. The second approach uses the MFN Ad valorem tariffs (column 2) taken from TRAINS website and averaged across all HS6 products imported by a firm in a year. Finally, the third approach uses weighted average tariff per firm (column 3), which is calculated using the ratio of a firm's total import of a given HS6 product to Kenya's total import of the same product across the entire sample period as constant weights. The constant weights are used together with the MFN Ad valorem tariff rate to calculate the weighted average tariffs per firm (Feng et al, 2016). The results are shown in Table 13.

We find that the three methods used to compute average tariffs at the firm yields results that are consistent. An increase in imported inputs is, on average, associated with an increase in the firm's export value. TREO dummy is positive and significant, suggesting that firms that change their status from non-TREO to TREO experience a raise in their export value compared to their pre-TREO export level. We relate this results to those found by Bas and Strauss-Kahn (2014) showing that the results from the two measures (weighted and unweighted firm level tariffs) are not significantly different.

5 Conclusion

We examine the effect of imported intermediate inputs on a firm's export performance and evaluate the effectiveness of Kenya's duty exemption scheme in providing access to imported inputs and altering the firm's export outcomes. We find three main results. Firstly, there is a positive and significant performance premium for the exporters who import intermediate inputs relative to those who never import. Furthermore, within firms that import and export, an increase in the value of imported inputs is associated with an increase in total export values, an increase in the number of products exported and an expansion in the number of destination countries served. These results provide evidence of stronger export performance for firms that import inputs and export.

Secondly, an increase in the number of imported varieties per importer-exporter is associated with an increase in the number of products and destination countries served. Third and finally, importer-exporters that access TREO, have a significant performance premium on export value and geographic diversification of exports but not on product scope relative to their pre-TREO performance levels. TREO has a uniform level effect across all firms and is not influenced by firm import characteristics.

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Table 1: number of beneficiaries and duty exemptions (million US$) per year

year	#firms	US$(mn)
2004	278	99.2
2005	292	143.6
2006	304	275.8
2007	307	316.8
2008	319	199.0
2009	307	177.0
2010	310	270.8
2011	312	433.8
2012	312	350.2
2013	287	290.1

Note: Computed from TREO database.

Table 2: Kenya's Most Favoured Nation (Ad valorem Equivalent) Tariffs, selected years

HS-Section	Description	2004		2005		2010		2012	
		Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)	Mean(AVE)	Sd(AVE)
1	Live animals	24.1	15.20	25.6	9.7	25.5	9.5	25.4	8.9
2	Vegetables	22.4	13.21	17.5	9.9	18.2	9.9	18.4	9.5
3	Fats & oils	17.2	11.49	13.9	10.5	13.5	10.6	13.6	10.3
4	Food,bev. & tobacc.	24.8	14.41	23.7	14.4	23.9	14.5	24.0	14.6
5	Mineral products	10.8	8.142	6.2	8.5	5.2	8.1	4.8	7.5
6	Chemicals	9.8	9.58	3.0	7.2	3.0	7.4	3.0	7.3
7	Plastics	14.6	11.02	10.6	9.9	10.6	10.0	10.7	10.0
8	Leather	16.5	5.83	14.1	8.1	14.3	8.1	14.3	8.1
9	Wood	20.8	12.09	18.4	10.2	17.7	10.2	17.6	10.3
10	Pulp & paper	22.3	15.52	15.8	10.8	15.4	10.9	15.3	11.0
11	Textile & clothing	25.4	7.82	20.9	9.1	20.8	9.3	20.7	9.2
12	Footwear	30.6	6.70	22.9	5.3	22.7	5.5	23.2	5.0
13	Stone, glass, cement	18.3	7.30	17.7	9.0	17.5	9.2	17.1	9.3
14	Jewelry	20.4	5.69	23.6	5.7	23.6	5.8	23.6	5.8
15	Base metals	16.7	11.06	10.3	9.1	10.1	9.1	9.8	9.2
16	Machinery	10.3	9.66	6.7	9.1	6.2	8.8	6.1	8.8
17	Transport & Equip.	14.8	13.48	7.1	9.7	7.3	10.0	7.1	10.0
18	Optics	9.9	7.82	4.0	6.9	3.4	6.7	3.3	6.7
19	Arms	14.5	2.18	25.0	0.0	25.0	0.0	25.0	0.0
20	Miscellaneous	20.4	6.94	23.4	4.9	23.2	5.3	22.7	6.0
21	Works of art	15.0	0	25.0	0.0	25.0	0.0	25.0	0.0
	Mean	16.8		12.87		12.72		12.94	
	Sd	12.2		11.91		12.00		12.12	
	Min	0.0		0		0		0	
	Max	100		100		100		100	
	#HS8 lines	5886		5423		5260		5442	

Notes: Ad valorem tariffs are obtained from World Integrated Trade Solution (WITS) TRAINS database and own computation. Sectors created by reducing HS 2-digit classification into 21 sectors. Mean (AVE) stands for average ad valorem tariffs, while Sd (AVE) is the respective standard deviation. The bottom panel contains the country's annual average AVE tariffs. Computed using the simple average for MFN tariffs.

Table 3:Summary statistics of the key variables

Variable	N	mean	sd	min	max
Log(Export value)	45 753	5.33	2.84	-8.66	14.42
Number of products	45 753	6.95	16.81	1.00	523
Number of countries	45 753	2.69	3.70	1.00	65.00
Log(value of imported inputs)	20 167	11.14	2.85	-2.00	19.10
Importer-exporter dummy	45 753	0.44	0.50	0.00	1.00
TREO dummy	45 753	0.05	0.22	0.00	1.00
Log(TREO value)	2 362	11.25	2.59	-4.91	18.53
Average tariff per firm (avg. tariff)	20 167	10.94	7.63	0.00	100
Average tariff per firm (MFN tariff)	20 154	12.26	7.67	0.00	100
Average weighted tariff per firm (MFN tariff)	20 154	0.54	1.63	0.00	48.46
Number of imported inputs varieties	20 167	24.73	53.31	0.00	1 410

Notes: constructed from customs database and TREO database

Table 4: Differences in the average number of products, across exporter types

	2005	2007	2009	2011	2013
Exporter type			Products		
Importer-exporters	8.61	9.83	9.35	9.73	9.06
N	*(1,751)*	*(1,893)*	*(2,051)*	*(2,342)*	*(2,259)*
Exporters only	3.70	5.52	5.45	5.62	5.71
N	*(2,139)*	*(2,798)*	*(2,598)*	*(2,948)*	*(2,687)*
Differences	*4.91*	*4.31*	*3.90*	*4.12*	*3.35*
Std.Err	0.46	0.52	0.49	0.48	0.52
t-statistics	10.67	8.32	7.97	8.49	6.44
Importer-Exporter type			Products		
TREO	11.57	10.75	10.08	10.25	9.80
N	*(210)*	*(204)*	*(202)*	*(192)*	*(176)*
Non-TREO	8.21	9.72	9.27	9.69	9.00
N	*(1,541)*	*(1,689)*	*(1,849)*	*(2,150)*	*(2,083)*
Differences	*3.36*	*1.03*	*0.81*	*0.56*	*0.80*
Std.Err	1.35	1.60	1.43	1.44	1.70
t-statistics	2.48	0.64	0.57	0.39	0.47

Notes: The exporter type is either importer-exporter or exporter only. Among importer-exporter we have TREO users and non-TREO users. The t-statistics indicates that differences in means of exports are statistically significant across the years. Importer-exporter firms outperforms exporters only, while importer-exporters that benefit from TREO do not do better relative to non-TREO users in terms of product scope. N represents the number of firms in each category for the selected period.

Table 5: Differences in the average number of destinations per firm

	2005	2007	2009	2011	2013
Exporter type	Destination-countries				
Importer-exporters	3.85	3.61	3.42	3.53	3.60
N	*(1,751)*	*(1,893)*	*(2,051)*	*(2,342)*	*(2,259)*
Exporters only	1.90	1.90	1.93	1.99	2.16
N	*(2,139)*	*(2,798)*	*(2,598)*	*(2,948)*	*(2,687)*
Differences	*1.95*	*1.71*	*1.49*	*1.54*	*1.44*
Std.Err	0.12	0.10	0.10	0.10	0.11
t-statistics	15.75	16.56	15.36	15.90	12.77
Importer-Exporter type	Destination-countries				
TREO	7.73	7.79	7.31	7.74	8.16
N	*(210)*	*(204)*	*(202)*	*(192)*	*(176)*
Non-TREO	3.32	3.10	3.00	3.16	3.22
N	*(1,541)*	*(1,689)*	*(1,849)*	*(2,150)*	*(2,083)*
Differences	*4.41*	*4.69*	*4.31*	*4.58*	*4.94*
Std.Err	0.34	0.32	0.29	0.30	0.35
t-statistics	12.89	14.49	15.02	15.18	14.26

Notes: The exporter type is either importer-exporter or exporter only. Among importer-exporter we have TREO users and non-TREO users. The t-statistics indicates that differences in means for the number of destination-countries are statistically significant across the years. N represents the number of firms in each category for the selected time period.

Table 6: Export performance differences between importer-exporters and exporters only

VARIABLES	Log(Export value)		Log(Products)		Log(Countries)	
	(1)	(2)	(3)	(4)	(5)	(6)
L.Importer_exporter dummy	1.056***	0.259***	0.516***	0.155***	0.399***	0.093***
	(0.067)	(0.055)	(0.028)	(0.029)	(0.021)	(0.019)
Constant	6.057***	5.890***	1.029***	1.253***	0.704***	0.795***
	(0.063)	(0.047)	(0.027)	(0.024)	(0.020)	(0.016)
Observations	25,331	25,331	25,331	25,331	25,331	25,331
R-squared	0.042	0.833	0.047	0.756	0.056	0.794
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	NO	YES	NO	YES	NO	YES
F	47.28	20.70	45.72	9.079	50.86	7.371
Number of clusters	7011	7011	7011	7011	7011	7011

Notes: The dependent variables include export value, number of products, and number of countries per firm. The explanatory variable is a dummy equal 1 if an exporter imports intermediate goods and zero otherwise. All continuous variables are in logs and the explanatory variables enter with a lag of one period. All estimations include year and firm fixed effects. Standard errors are clustered at the firm level and in the parentheses. All coefficients are significant at 1% level.

Table 7: Imported inputs and export performance within importer-exporters

VARIABLES	Log(Export value) (1)	Log(Products) (2)	Log(Countries) (3)
L.Log(value of imported inputs)	0.084***	0.016*	0.023***
	(0.019)	(0.009)	(0.006)
L.Log(number of imported varieties)	0.141***	0.139***	0.066***
	(0.040)	(0.021)	(0.013)
Constant	5.629***	1.105***	0.705***
	(0.136)	(0.065)	(0.046)
Observations	14,010	14,010	14,010
R-squared	0.834	0.751	0.807
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
F	11.24	11.87	10.51
Number of clusters	3611	3611	3611

Notes: The dependent variables include export value, number of products, and number of destination countries per firm. The explanatory variable is the value of imported inputs. All continuous variables are in logs and the explanatory variable enters with a lag of one period. All estimations include year and firm fixed effects. Standard errors are clustered at the firm level and in the parentheses. Asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 8: Differences in exports value among exporter types

Dependent Variable	Log(Export value)				
	(1)	(2)	(3)	(4)	(5)
L.Importer_exporter dummy	0.254***				
	(0.055)				
L.Log(value of imported inputs)		0.112***		0.080***	0.078***
		(0.017)		(0.019)	(0.020)
L.Log(number of imported varieties)			0.226***	0.138***	0.147***
			(0.037)	(0.040)	(0.043)
L.TREO dummy	0.412***	0.388***	0.405***	0.379***	0.453*
	(0.090)	(0.101)	(0.102)	(0.100)	(0.235)
(L.Log(value of imported inputs))(L.TREO dummy)					0.017
					(0.033)
(L.Log(number of imported varieties))(L.TREO dummy)					-0.074
					(0.075)
Constant	5.864***	5.777***	5.919***	5.619***	5.611***
	(0.047)	(0.126)	(0.108)	(0.136)	(0.140)
Observations	25,331	14,010	14,010	14,010	14,010
R-squared	0.833	0.834	0.834	0.834	0.834
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
F-Statistics	20.63	11.72	11.90	11.69	10.18
Number of Clusters	7011	3611	3611	3611	3611

Notes: The dependent variable is the export value per firm in period (t). The explanatory variables are the importer-exporter dummy; TREO dummy, value of imported inputs, number of imported input varieties and the interaction terms with TREO dummy. All explanatory variables are lagged by one period. Estimation includes year and firm fixed effects. Standard errors are clustered at the firm level and in the parentheses. Asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 9: Differences in performance in number of products exported

Dependent Variable	Log(Products)				
	(1)	(2)	(3)	(4)	(5)
L.Importer_exporter dummy	0.154***				
	(0.029)				
L.Log(value of imported inputs)		0.048***		0.016*	0.013
		(0.008)		(0.009)	(0.010)
L.Log(number of imported varieties)			0.157***	0.139***	0.147***
			(0.018)	(0.021)	(0.022)
L.TREO dummy	0.060	0.017	0.013	0.008	-0.013
	(0.043)	(0.051)	(0.050)	(0.050)	(0.123)
(L.Log(value of imported inputs))(L.TREO dummy)					0.026
					(0.019)
(L.Log(number of imported varieties))(L.TREO dummy)					-0.065
					(0.046)
Constant	1.250***	1.264***	1.165***	1.105***	1.105***
	(0.025)	(0.060)	(0.054)	(0.065)	(0.066)
Observations	25,331	14,010	14,010	14,010	14,010
R-squared	0.756	0.749	0.751	0.751	0.751
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
F-Statistics	8.412	7.639	11.66	10.80	9.318
Number of Clusters	7011	3611	3611	3611	3611

Notes: The dependent variable is the number of products exported per firm in period (t). The explanatory variables are the importer-exporter dummy; TREO dummy, value of imported inputs, number of imported input varieties and the interaction terms with TREO dummy. All explanatory variables are lagged by one period. Estimation includes year and firm fixed effects. Standard errors are clustered at the firm level and in the parentheses. Asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 10: Differences in performance in the number of destination countries

Dependent Variable	Log(Countries)				
	(1)	(2)	(3)	(4)	(5)
L.Importer_exporter dummy	0.091***				
	(0.019)				
L.Log(value of imported inputs)		0.036***		0.022***	0.021***
		(0.006)		(0.006)	(0.007)
L.Log(number of imported varieties)			0.089***	0.065***	0.068***
			(0.012)	(0.013)	(0.014)
L.TREO dummy	0.137***	0.100**	0.102**	0.096**	0.105
	(0.037)	(0.040)	(0.040)	(0.040)	(0.123)
(L.Log(value of imported inputs))(L.TREO dummy)					0.006
					(0.015)
(L.Log(number of imported varieties))(L.TREO dummy)					-0.019
					(0.031)
Constant	0.786***	0.778***	0.784***	0.703***	0.701***
	(0.016)	(0.043)	(0.036)	(0.046)	(0.046)
Observations	25,331	14,010	14,010	14,010	14,010
R-squared	0.794	0.806	0.806	0.807	0.807
Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
F-Statistics	8.017	8.696	10.37	9.992	8.473
Number of Clusters	7011	3611	3611	3611	3611

Notes: The dependent variable is the number of destination countries per firm in period (t). The explanatory variables are the importer-exporter dummy; TREO dummy, value of imported inputs, number of imported input varieties and the interaction terms with TREO dummy. All explanatory variables are lagged by one period. Estimation includes year and firm fixed effects. Standard errors are clustered at the firm level and in the parentheses. Asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 11: Differential effect of TREO on export value by sub-samples

Dependent variable	Log(Export value)			
	(1)	(2)	(3)	(4)
	Small	Medium	Large	Overall
L.Log(value of imported inputs)	-0.002	0.031	0.125***	0.078***
	(0.075)	(0.030)	(0.026)	(0.020)
L.Log(number of imported varieties)	-0.057	0.117*	0.204***	0.147***
	(0.155)	(0.071)	(0.056)	(0.043)
L.TREO dummy	-8.908	-0.036	0.718***	0.453*
	(8.700)	(1.150)	(0.232)	(0.235)
(L.Log(value of imported inputs))(L.TREO dummy)	0.461**	-0.012	-0.005	0.017
	(0.189)	(0.137)	(0.034)	(0.033)
(L.Log(number of imported varieties))(L.TREO dummy)	4.567	0.166	-0.104	-0.074
	(7.632)	(0.380)	(0.075)	(0.075)
Constant	3.443***	4.657***	6.776***	5.611***
	(0.385)	(0.213)	(0.205)	(0.140)
Observations	2,224	4,437	7,349	14,010
R-squared	0.637	0.414	0.736	0.834
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
F-Statistics	3.34	3.53	11.70	10.18
Number of clusters	1171	1231	1209	3611

Notes: The dependent variable is the log of export value per firm in period (t). The explanatory variables are log of value of imported inputs, TREO dummy and the interaction term and enter the regression with a one period lag. All estimations are from a fixed effects regression on a separate sub-sample. Standard errors are clustered at the firm level and in the parentheses. Asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 12: Access to TREO, imported inputs and firm export margins

Dependent variables	Log(Export value)	Log(Products)	Log(Countries)
	(1)	(2)	(3)
L.Log(value of imported inputs)	0.071***	0.006	0.000
	(0.024)	(0.010)	(0.010)
L.Log(number of imported varieties)	-0.024	0.069***	0.027
	(0.053)	(0.026)	(0.017)
L.TREO dummy	0.254***	0.038	0.106***
	(0.081)	(0.045)	(0.034)
Constant	6.610***	1.510***	1.093***
	(0.178)	(0.083)	(0.071)
Observations	7,422	7,422	7,422
R-squared	0.874	0.783	0.838
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
N_reps	100	100	100
chi2	123.2	72.11	63.77

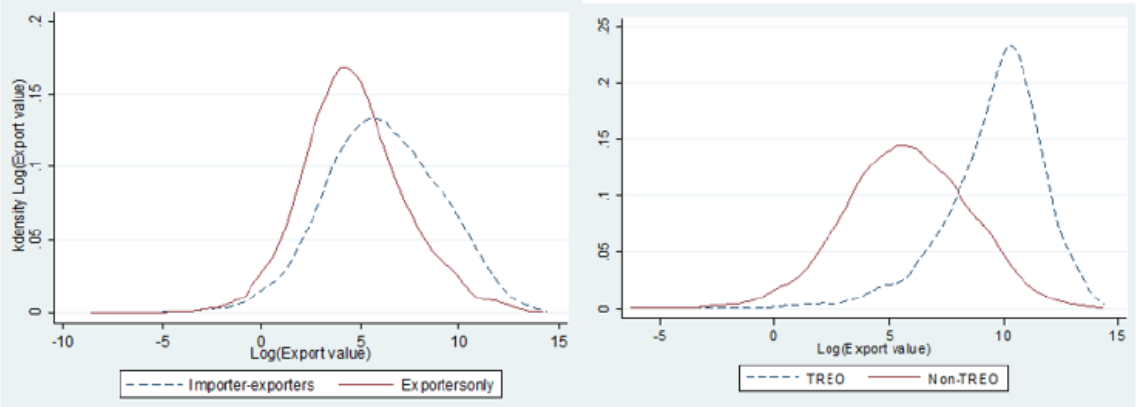
Notes: The dependent variables are the export value, number of products and number of countries. The explanatory variables are the value of imported inputs, the number of imported varieties and TREO dummy lagged by one period. The sample size falls due incorporation of value of imported inputs (lagged three periods) as an internal instrument in the first step regression. Estimation includes year and firm effects. The instrumental variables are input tariffs and imported inputs lagged three periods. Bootstrapped standard errors in the parentheses and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Table 13: Different measures if firm level average tariffs

Dependent variable	Log(Export value)		
	(1)	(2)	(3)
	avg_tariff	avg_tariffMFN	avg_tariffMFNwgt
L.Log(value of imported inputs$\hat{1}$)	0.071***		
	(0.022)		
L.Log(value of imported inputs$\hat{2}$)		0.071***	
		(0.021)	
L.Log(value of imported inputs$\hat{3}$)			0.071***
			(0.025)
L.Log(number of imported varieties)	-0.024	-0.024	-0.025
	(0.043)	(0.050)	(0.049)
L.TREO dummy	0.254***	0.254***	0.254***
	(0.083)	(0.091)	(0.089)
Constant	6.610***	6.605***	6.610***
	(0.189)	(0.178)	(0.189)
Observations	7,422	7,422	7,422
R-squared	0.874	0.874	0.874
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
N_reps	100	100	100
chi2	106.3	108.6	78.91

Notes: The dependent variable is the export value. The explanatory variables are the value of imported inputs, and TREO dummy are lagged by one period. The sample size falls due incorporation of value of imported inputs (lagged three periods) as an internal instrument in the first step regression. Estimation includes year and firm effects. The instrumental variables are firm's average tariffs (unweighted measure; unweighted MFN tariffs; and weighted measure) and imported inputs lagged three periods. Bootstrapped standard errors in the parentheses and asterisks indicate the level of significance (*** p<0.01, ** p<0.05, * p<0.1).

Figure 2: The distribution in export value by exporter type (2004-2013)



Notes: kernel density plot for the log of firm exports over the sample period. The average exports in logs for the importer-exporter is larger relative to exporters only. The average exports in logs for the importer-exporter that uses TREO is also larger relative to importer-exporter that never use TREO.

Appendix

Merger of TREO data to exports database

Table A-1 represent the quality of merger of TREO database to export transaction level database. Most of the beneficiaries under TREO are exporters, unmatched TREO represents indirect exporters who are also eligible but not direct exporters. They represent a very small proportion (0.2%).

Firm exports (Export value): This is the real export value per firm in a given period (t). It is constructed as a summation of the annual fob export sales value of all 6 digits HS products classification sold by an exporter in a given year in US$. It is deflated using Kenya's aggregate export price index to remove the effects of export price changes. *Number of products and countries per exporter:* The number of exported products is the count of all six-digit HS products exported by the firm in period t. It represents firm's extensive margins of trade expansion in period t.The number of countries is the count of all destination countries served by the firm in period t. It represents firm's geographic diversification of exports in period t. $TREO\ dummy$: This is a binary variable equal to one if the importer-exporter type of firm is a beneficiary to TREO and zero otherwise. *Value of imported inputs:* This is calculated as the sum of annual CIF value for each of the 6-digit HS intermediate goods imported by the firm in a given year in US$. The variable captures the exact expenditure by firms on imported inputs. Related, we also created a variable that captures the number of varieties *(number of varieties imported)* imported, which count all the 6-digit HS product-country pair per importer. This is in line with the definition adopted by Feng et al. (2016) and Broda and Weinstein (2006) in which a variety is defined as a product-county pair.

Appendix Tables

Table A-1: Merger of TREO database to Exporter's transaction database

	2004		2006		2012	
	#obs	mean(log TREO)	#obs	mean(log TREO)	#obs	mean(log TREO)
Unmatched TREO	47	15.28725	50	15.64252	85	16.06664
Matched TREO	4,665	16.15008	4,697	16.40777	5,090	16.91685
Diff		-0.86283		-0.76525		-0.85021

Notes: The differences in the mean of log (TREO) between matched and unmatched are statistically significant, in favour of the matched category.

Table A-2: Correlation between exporter outcomes and firm tariff rates

	Dep.var on column		
	(1)	(2)	(3)
VARIABLES	value	products	countries
L3.lnavg_tariff_wits	0.017	0.029	0.014
	(0.039)	(0.018)	(0.012)
Constant	6.608***	1.547***	1.030***
	(0.102)	(0.049)	(0.032)
Observations	9,410	9,410	9,410
R-squared	0.864	0.782	0.833
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
N_clust	2636	2636	2636

Notes: The results are not statistically significant, implying that firm's average tariffs are not correlated with export outcomes for the firm.

Table A-3: First stage regression of the IV estimations

	Dep.var: L1.lnimported inputs			
	(1)	(2)	(3)	(4)
VARIABLES	avg_tariff	avg_tariffMFN	avg_tariffwgt	sectortariff
L3.lnavg_tariff	-0.004			
	(0.021)			
L3.lnavg_tariff_wits		-0.039*		
		(0.023)		
L3.lnavg_weightfirm_tariff			-0.049	
			(0.041)	
L3.lnavg_sectortariff				0.062*
				(0.034)
L3.lnimp_inputs	0.836***	0.835***	0.839***	0.837***
	(0.009)	(0.009)	(0.009)	(0.009)
Constant	0.076	0.204	0.095	-0.132
	(0.738)	(0.737)	(0.743)	(0.736)
Observations	7,423	7,423	7,423	7,423
R-squared	0.733	0.734	0.733	0.734
Year FE	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES
N_clust	1845	1845	1845	1845

Notes: Dependent variables are lagged once. The IV are firm input tariffs and imported inputs (value and varieties) and are lagged 3 periods. Input tariffs are calculated at firm level as an average of all tariffs on HS6 intermediate products imported by a firm in a period t. All variables are in logs. Robust standard errors in the parentheses *** p<0.01, ** p<0.05, * p<0.1

Table A-4: Sectoral average MFN tariffs over time (intermediate goods)

HS-section	Stats	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Live animals	Mean	24,8	26,5	31,9	28,5	31,5	31,9	28,9	30,4	34,7	25,8
	Sd	23,4	19,7	23,1	22,5	23,5	23,3	21,1	20,9	21,9	20,5
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	60,0	60,0	60,0	60,0	60,0	60,0	60,0	60,0	60,0	60,0
Vegetables	Mean	7,3	2,6	2,6	2,4	2,5	2,7	2,7	2,7	2,4	2,1
	Sd	6,3	5,1	5,0	5,0	5,3	5,3	5,4	5,1	5,2	4,8
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Fats & oils	Mean	18,8	16,0	15,5	16,3	14,8	16,7	15,5	16,0	17,2	17,5
	Sd	13,6	10,3	10,7	9,5	10,0	9,8	10,6	10,5	9,7	9,8
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Food bev & tobacc	Mean	20,6	22,5	19,6	21,5	23,3	24,4	24,8	22,8	22,0	16,9
	Sd	18,7	18,1	15,3	15,3	18,3	19,6	19,9	17,4	15,2	12,1
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	50,0
Mineral products	Mean	8,1	9,1	6,2	6,3	6,8	6,3	5,5	4,5	4,8	5,0
	Sd	11,4	10,8	9,8	10,5	11,5	11,8	10,6	8,0	8,4	8,3
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	55,0	55,0	55,0	55,0	55,0	55,0	25,0	35,0	25,0
Chemicals	Mean	7,9	4,1	4,1	4,2	4,4	4,5	5,0	5,0	5,2	5,3
	Sd	10,2	8,1	8,2	8,2	8,4	8,4	8,9	9,0	9,2	9,3
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Plastics	Mean	17,4	12,6	12,8	12,9	12,9	13,3	14,0	14,4	14,4	14,7
	Sd	10,0	8,8	8,8	8,9	8,9	8,9	9,1	9,0	9,0	8,9
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Leather	Mean	11,7	11,4	10,3	11,4	10,0	10,0	10,0	9,8	10,3	10,0
	Sd	4,8	5,0	2,2	4,4	0,0	0,0	0,0	1,5	2,2	0,0
	Min	5,0	0,0	10,0	10,0	10,0	10,0	10,0	0,0	10,0	10,0
	Max	15,0	25,0	25,0	25,0	10,0	10,0	10,0	10,0	25,0	10,0
Wood	Mean	23,6	23,2	23,0	23,4	23,5	23,9	24,2	24,3	24,3	24,3
	Sd	9,2	5,2	5,5	5,1	4,9	4,3	3,7	3,6	3,6	3,6
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Pulp & paper	Mean	30,9	22,0	21,6	21,7	21,9	22,3	22,2	22,3	22,5	20,7
	Sd	10,2	6,9	7,2	7,3	7,1	6,8	6,9	6,7	6,5	7,5
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Textile & clothing	Mean	21,8	19,9	20,3	21,1	21,1	21,0	21,0	20,8	20,5	20,3
	Sd	7,4	8,7	8,3	8,2	8,5	8,2	8,2	7,8	7,8	7,8
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	30,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0	50,0
Stone glass & ceme	Mean	20,7	16,8	17,0	17,0	17,2	17,3	18,2	18,5	18,6	18,7
	Sd	6,8	9,1	9,1	9,2	9,0	9,1	8,9	8,8	8,8	8,7
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Jewelry	Mean	17,9	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Sd	4,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Min	15,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Max	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Base metals	Mean	23,2	14,4	14,4	14,7	14,8	14,7	15,0	14,5	14,7	15,0
	Sd	11,3	8,1	8,0	8,1	8,2	8,2	8,2	8,3	8,3	8,3
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0
Machinery	Mean	13,9	10,6	10,9	10,9	10,9	10,8	11,0	11,0	10,9	10,9
	Sd	7,9	7,3	7,5	7,4	7,1	7,1	7,1	7,1	7,0	7,0
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Transport & Equip.	Mean	17,4	9,6	9,6	9,6	9,5	9,5	9,6	9,5	9,4	9,4
	Sd	6,5	3,0	3,6	3,5	3,5	3,7	3,5	3,5	3,4	3,3
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	35,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Optics	Mean	8,4	4,1	3,3	2,8	2,8	2,7	3,2	2,8	2,8	2,6
	Sd	7,5	6,5	5,7	5,6	5,6	5,4	6,0	5,8	5,7	5,5
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Arms	Mean	12,9	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Sd	4,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Min	5,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
	Max	15,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0
Miscellaneous	Mean	19,9	20,6	20,3	20,5	20,4	21,0	21,2	21,0	21,0	20,9
	Sd	6,9	7,2	7,2	7,0	7,1	6,8	6,7	6,8	7,0	6,9
	Min	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Max	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0