TARIFF PREFERENCES AS A DETERMINANT FOR EXPORTS FROM SUB-SAHARAN AFRICA

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FOR EXPORTS FROM SUB-SAHARAN AFRICA

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Abstract

This paper examines the impact of market access conditions as a determinant of exports from sub-Saharan Africa. The analysis focuses on tariffs and considers both direct market access (the tariffs faced by exports from sub-Saharan Africa) and relative market access conditions (the preferential margin of African exports relative to that of other competitors). The results find that both direct market access conditions and relative market access conditions matter, although relative market access conditions matter in a larger number of cases. This suggests that the exports from the countries of sub-Saharan Africa often face more competition from foreign competitors than from domestic industries in their destination markets. We also find that, given the relatively large tariffs currently applied to intraregional trade, complete tariff liberalization within the countries of sub-Saharan Africa represents a significant incentive for intraregional trade.

Acknowledgements

Contents

Figure

Tables

1. INTRODUCTION

Exports originating from sub-Saharan Africa are highly concentrated in a very limited number of products, largely raw materials and agricultural commodities, which are exported to a limited number of destinations, mainly developed countries. The lack of product and geographic diversification of exports from sub-Saharan Africa represent a concern for the sustainability of an export-led economic growth strategy. In practice, the export growth of the last decade has been mostly due to the increase in value and/or volumes of pre-existing trade flows (the intensive margin). Trade growth due to new trade flows (the extensive margin), has been more modest.[1] The limited export diversification of countries in sub-Saharan Africa is due both to the low number of new export products and geographic destination introduced each year and to the generally low survival rate of the majority of export flows. In practice, although some diversification takes place, it is not sustained in the long term. Thus, the exports of countries in sub-Saharan Africa remain not diversified.

Although higher survival rates are essential for achieving aggregate export growth (Besedes and Prusa, 2006 CJE; Brenton, Pierola, and von Uexkull, 2009), trade at the extensive margin is very important for the sustained economic growth of poor countries. In fact, export diversification is essential to reduce volatility associated with external economic shocks (Cadot, Carrere and Strauss-Khan; 2011).

Export diversification is problematic for many developing countries as it requires competitiveness in different sectors and foreign markets. The literature has pointed to several constraints that developing countries face in achieving export diversification, many of which are often more severe for sub-Saharan Africa countries (Rodrik, 1998; Edward and Alves, 2006; Johnson, Ostry and Subramanian, 2007). These constraints include a natural resource curse (Deaton, 1999), high costs of starting and conducting cross-border transactions (Djankov, Freund and Pham, 2010; Freund and Rocha, 2009), weak rule of law (Meon and Sekkat, 2004), inadequate infrastructures, as well as lack of regional growth poles (Collier and Venables, 2008), poor implementation of trade facilitation mechanisms (Wilson and Portugal-Perez ,2008; Dennis and Shepherd, 2011), unfavourable trade policies (Hoekman, Ng and Olarreaga, 2002; Shepherd, 2010) and the lack of supply capacity (Fugazza, 2004; Redding and Venables, 2004; Mayer and Fajarnes, 2008).

Our study contributes to the better understanding of the determinants of exports from sub-Saharan Africa by focusing on the role of market access, in particular tariffs. While exports from sub-Saharan Africa often face relatively low tariffs in high-income markets, these exports generally face high tariffs in developing countries and even regionally. In this regard, the system of trade preferences is an important determinant of exports because it creates both favourable and unfavourable conditions for sub-Saharan Africa exporters. On the one hand, preferential access in high-income markets generally provides the countries of sub-Saharan Africa with favourable preferential margins. On the other hand, this is not the case in many developing markets where those countries often face relatively higher tariffs vis-à-vis foreign competitors. Diverse market access conditions are found not only across destinations but also across typologies of products. While exports of primary products from sub-Saharan Africa face very low tariffs in most markets, the market access conditions faced by intermediate and especially consumer products are generally more restrictive as well as more varied across destinations.

The empirical approach of this paper, examining whether market access conditions affects export flows, is based on a probabilistic model. In particular, one contribution of this paper is that it assesses not only the impact of the tariff on the probability of exports, but also the impact of the preferential margin relative to foreign competitors. The importance of the system of preferences in explaining trade flows relates our paper to the literature on relative preferential margins (Carrere, 2011; Hoekman and Nicita, 2011; Fugazza and Nicita, 2013). Because diversification requires not only entry

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[1] Pre-existing trade flows are defined product-destination flows which were already occurring both in 2001 and 2011. New flow ore those that were occurring in 2011 but not in 2001.

into new export products and markets but also the survival of pre-existing export flows, in the analysis we also explore whether market access conditions affect both the probability of initiating new trade flows and that of survival for pre-existing trade flows. We also distinguish whether these effects are different across primary, intermediate and consumer products. Finally, the analysis of this paper is used to quantify the extent to which a free trade area in sub-Saharan Africa would enhance regional trade opportunities.

The results indicate that market access conditions have significant, although small, implications for exports from sub-Saharan Africa. We find that direct market access conditions (the tariffs faced by exporters) contribute only to the probability of initiating new trade flows and not to the probability of the survival of pre-existing trade flows. On the other hand, we find that relative market access conditions (the gap between the tariff faced by exporters and the tariff applied to foreign competitors) matter in all cases. We also find a positive effect on the probability of trading related to a hypothetical regional free trade area among the countries of sub-Saharan Africa.

The reminder of this paper is as follows. Section 2 presents the data and provides some descriptive statistics for exports and market access in sub-Saharan Africa. Section 3 presents the estimating framework, assessing the extent to which market access affects the probability of exports from sub-Saharan Africa. Section 4 discusses the results and Section 5 concludes.

2. DATA AND DESCRIPTIVE STATISTICS

To assess the impact of market access conditions on exports from sub-Saharan Africa, this paper utilizes detailed bilateral data at the 6-digit level of the Harmonized System (HS88) classification comprising 28 sub-Saharan African exporting countries[2] and 94 importing countries (33 of which are in sub-Saharan Africa). The trade data is from the UNSD COMTRADE database, and the tariff data is from UNCTAD TRAINS database. Trade agreement data originates from the NSF-Kellogg Institute Database on Economic Integration Agreements (EIA)[3]. The data utilized for the construction of the exchange rate variable originates from UNCTAD Globstat.

For the purpose of this paper, we organize the data in several ways. First, as the analysis relies on changes in trade and trade policy, we use data at only two points in time. In doing so we use two-year average data based on 2000-2001 and 2010-2011.[4] The use of the average will minimize omissions and gaps in the data, which are not uncommon for the statistics on the countries of sub-Saharan Africa.[5] We also omit any trade flow of little magnitude (less than $10,000). We split the data into three distinguished data sets, each covering a broad product group: primary products, comprised of about 330 HS 6-digit products; intermediate goods, comprised of almost 2,500 products; and consumer goods, almost 1,200 products.[6] This split permits the investigation of possible differences in the effects of the covariates of interest across these broad product groups. The splitting of the data set is also necessary for computational purposes as a data set with a full product range would make the estimation of a fixed-effect estimation computationally challenging. Finally, we further reduce the data

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[2] The countries included as exporters are: Benin, Burkina Faso, Botswana, Cameroon, Chad, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritania, Mozambique, Mauritius, Namibia, Niger, Nigeria, Rwanda, Sierra Leone, Senegal, South Africa, Swaziland, Togo, Uganda, United Republic of Tanzania and Zambia.

[3] The EIA Data Base is available at http://nd.edu/~kellogg/faculty/fellows/bergstrand.shtml. As our sample goes to 2011 we update the data for the cases where the countries in our sample signed an agreement after 2005 (i.e. Rwanda and Burundi entering the Eastern African Community).

[4] For simplicity, in the reminder of the paper we refer to these averages as 2001 and 2011 unless otherwise specified.

[5] In constructing bilateral trade we mainly use more reliable import data. We use export data only when the importing country does not report any statistics.

[6] The classification across primary, intermediate and consumer goods is based on the Broad Economic Categories (BEC) classification.

set by not including HS 6-digit products which do not have enough within-product variance (products that are not exported at all or are exported only by one country in our sample).[7]

Before describing the data, we briefly discuss the two variables of interest used in the analysis. Market access conditions are captured by two variables: the first variable captures *direct* market access conditions (the tariff faced by exports), and the second variable captures *relative* market access conditions (the tariff faced by an exporter relative to the tariff faced by foreign competitors). Both measures are calculated for each HS 6-digit product at the bilateral level. The first measure, direct market access, is simply the bilateral applied tariff at the HS 6-digit level. The *relative* market access condition is measured by the relative preferential margin (RPM) (Hoekman and Nicita, 2011; and Fugazza and Nicita, 2013). The RPM takes into account that preferential rates granted to a given country, although lower than most-favoured nation (MFN), could still penalize the given country relative to other countries that benefit from even lower preferential tariffs. The RPM is calculated as the difference, in tariff percentage points, that a given good faces when exported from a given country relative to being exported from any other.[8] In formal terms the RPM is calculated as follows:

$$RPM_{g,jk} = \frac{\sum_{v} tv_{g,vk}\,\tau_{g,vk}}{\sum_{v} tv_{g,vk}} - \tau_{g,jk}\,, \; v \neq j \qquad (1)$$

where the subscript *j* denotes the exporter, *k* denotes the importer, *v* denotes countries competing with country *j* in exporting to country *k*, and *g* denotes the HS 6-digit product; and where *tv* is export value and where τ is the bilateral tariff. In other words, the RPM for a product *g* exported from country *j* to country *k* is the difference between the average HS 6-digit (trade weighted) tariff applied by country *k* to imports originating from each country *v* and the direct tariff applied by country *k* to country *j*.

2.1   EXPORT PERFORMANCE AND MARKET ACCESS OF THE COUNTRIES OF SUB-SAHARAN AFRICA

Exports from sub-Saharan Africa are concentrated in a limited number of products, largely minerals and agricultural commodities. For the 28 countries in our sample primary products accounted for about two thirds of total exports from sub-Saharan Africa in 2011, or about $105 billion. Exports of semi-processed intermediate goods accounted for about $55 billion. Consumer goods were only about $16 billion. Table 1 reports some statistics on exports from sub-Saharan Africa for the three broad categories of goods.

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[7] Omitting these HS 6-digit products does not affect the econometric results as they would be captured by the fixed effect model.

[8] Note that any measure of preferential margin could be positive or negative, depending on the advantage or disadvantage of the country with respect to other competing exporters. The RPM varies between the negative of the tariff trade restrictiveness index (maximum negative bias, i.e. only one trading partner faces tariffs while all other exporters enjoy duty free access) and the MFN tariff rate (maximum positive bias, i.e. only the trading partner enjoys duty free access while all other exporters face MFN tariffs). RPM is exactly zero when there is no discrimination (i.e. the importing country applies identical tariffs across all existing trading partners). In summary, the RPM provides a measure of the tariff advantage (or disadvantage) provided to the actual exports from country *j* to country k, given the structure of the tariff preferences of country *k*.

Table 1
Exports from sub-Saharan Africa in 2011

	Primary	Intermediate	Consumer
Exports (billion USD)	105	55	16
Percentage to:			
Developed countries	73%	64%	65%
Non-regional developing countries	21%	19%	4%
Sub-Saharan Africa	5%	17%	31%

In terms of geographic diversification, exports from sub-Saharan Africa are largely bound to developed countries markets (mainly the European Union). However, non-regional developing countries, especially in Asia, represent an increasingly important export market. Intraregional trade in sub-Saharan Africa is very limited and accounts for only 5 per cent of primary goods exports and about 17 per cent of intermediate exports. Consumer products are exported relatively more within the sub-Saharan Africa region (31 per cent), but these represent in value only about $5 billion.

Although these figures may not appear impressive, exports from sub-Saharan Africa greatly increased in the last decade. For the 28 countries in sub-Saharan Africa in our sample, total exports went from about $60 billion in 2001 to more than $180 billion in 2011. Most of the growth in exports has been in primary products; exports of intermediate and consumer products have also grown but at a slower pace. Table 2 reports some statistics on the increase in exports from sub-Saharan Africa.

Table 2
Growth of exports from sub-Saharan Africa, 2001-2011

	Primary	Intermediate	Consumer
Growth in trade value	185%	136%	93%
at the intensive margin	152%	98%	66%
at the extensive margin	34%	38%	27%
Growth in the number of trade flows	22%	27%	24%
Percentage of exports at the extensive margin			
Developed countries	6%	15%	11%
Non-regional developing countries	33%	16%	39%
Sub-Saharan Africa	15%	20%	17%
All countries average	12%	16%	14%

One important feature of export growth in sub-Saharan Africa is that export diversification has been largely absent. The increase in exports has been mostly due to the intensive margins (the increased value and/or volume of pre-existing product-destination flows). Trade growth at the extensive margin (the increase in value due to new product-destination flows) has been much more modest. In 2011, more than three-quarters of export growth in sub-Saharan Africa was in products and destinations that were already exported to in 2001. In aggregate levels, the growth of export flows in 2011 at the extensive margin was around 13 per cent, with most new trade flows occurring vis-à-vis non-regional developing countries.

The lack of diversification is generally observed also at the level of exporters. Table 3 reports the number of product-destination flows for each country in 2011. Most countries export only a very limited number of products to a very limited number of destinations. The median number of export

flows is 157 product-destination flows for primary, 320 for intermediate and 312 for consumer products. Diversification is largely related to the degree of economic development, with low-income countries generally less diversified than middle-income and larger countries.

Table 3
Number of product-destination export flows in 2011

	Primary Products			*Intermediate Products*			*Consumer Products*		
	New Flows	Surviving Flows	Disapp. Flows	New Flows	Surviving Flows	Disapp. Flows	New Flows	Surviving Flows	Disapp. Flows
Benin	55	32	17	44	69	18	43	34	15
Botswana	28	6	8	221	33	8	88	84	18
Burkina Faso	40	37	27	94	51	20	69	51	24
Cameroon	98	86	122	235	131	155	186	97	61
Chad	14	21	21	28	4	2	5	2	0
Cote d'Ivoire	124	116	141	419	374	357	257	241	257
Ethiopia	87	28	77	122	83	34	226	45	45
Gabon	46	33	55	161	75	68	37	17	5
Ghana	117	88	107	599	245	275	397	128	194
Kenya	232	119	166	1379	441	649	1003	335	592
Madagascar	96	84	106	129	124	78	476	292	522
Malawi	86	36	98	74	26	16	82	104	73
Mali	47	53	23	95	113	25	64	68	22
Mauritania	26	15	10	34	32	11	58	92	83
Mauritius	54	26	27	664	215	118	699	463	618
Mozambique	174	58	52	192	66	55	107	57	42
Namibia	57	33	35	168	70	21	152	102	99
Niger	26	13	1	70	69	5	49	30	5
Nigeria	131	103	116	497	283	199	257	92	122
Rwanda	31	20	21	17	12	2	25	9	5
Senegal	76	51	38	261	98	34	309	132	201
Sierra Leone	55	21	10	156	96	15	65	62	8
South Africa	670	692	969	7541	5191	8142	3187	2332	4159
Swaziland	19	4	4	284	183	59	212	116	86
Togo	54	53	45	177	57	25	163	74	41
Uganda	151	44	89	330	40	57	275	48	70
United Republic of Tanzania	238	97	140	498	145	76	347	134	147
Zambia	128	57	71	258	175	84	89	40	28
Average (simple)	106	72	93	527	304	379	319	189	269
Median	67	41	49	185	90	45	158	88	66

An important characteristic of the export structure that is common across many countries in sub-Saharan Africa is the relatively large share of new and disappearing flows. This indicates that although some diversification takes place (as shown by the relatively large number of new trade flows), it is not sustained in the long term (as shown by the large number of disappearing flows). Thus the overall number of product-destination export flows remains relatively small. This suggests that to better understand the poor diversification of exports from sub-Saharan Africa, it is important not only to examine what determines the occurrence of new flows, but also what determines the survival of pre-existing export flows.

Although there are numerous reasons relating to the pattern of diversification of exports from sub-Saharan Africa, we investigate the role of market access. Exports from sub-Saharan Africa face very different market access conditions depending on their destination. On the one hand, they

generally benefit from duty-free treatment in the markets of many developed countries.[9] On the other hand, a large number exports from sub-Saharan Africa still face relatively high tariffs, especially on the exports of manufacturing to developing countries. In addition, while preferential access in high-income markets generally provides sub-Saharan Africa with substantial preferential margins, this is not the case in many developing markets where the countries of sub-Saharan Africa often face relatively higher tariffs vis-à-vis foreign competitors. In practice, the structure of preferences provides exporters in sub-Saharan Africa with favourable market access vis-à-vis foreign competitors in developed countries, while penalizing exporters in sub-Saharan Africa in many non-regional developing country markets, especially in those countries that are part of extraregional trade agreements, such as ASEAN or MERCOSUR. Table 4 reports the tariffs and RPM faced by exports from sub-Saharan Africa in 2011 and their change since 2001 (in parenthesis).

Table 4
Tariff and RPM faced by exports from sub-Saharan Africa, by destination

	Primary	*Intermediate*	*Consumers*
Tariff			
Developed Countries	0.7% (0.3)	0.3% (-0.5)	1.0% (-5.2)
Non-Regional Developing Countries	0.6% (-2.4)	1.5% (-5.4)	7.2% (-7.2)
Sub-Saharan Africa	1.5% (0.1)	2.4% (-3.6)	3.2% (-6.6)
All Countries	0.7% (0.0)	0.9% (-1.1)	1.9% (-5.2)
RPM			
Developed Countries	0.0% (0.0)	0.1% (0.2)	1.4% (3.0)
Non-Regional Developing Countries	0.0% (0.9)	0.0% (1.7)	-0.5% (2.4)
Sub-Saharan Africa	0.3% (0.0)	4.3% (1.8)	10.8% (4.3)
All Countries	0.0% (0.1)	0.8% (0.6)	4.2% (4.2)

Note: changes from 2001 to 2011 are in parenthesis. Figures are trade weighted averages.

Market access conditions for the countries of sub-Saharan Africa have greatly improved in the last decade, particularly with respect to access to the markets of non-regional developing countries. However, largely because of preferential schemes, as of 2011 the most favourable conditions for exports from sub-Saharan Africa are still found in the markets of developed countries. In those markets exports from sub-Saharan Africa face virtually zero tariffs on intermediate products, an average 0.3 per cent tariff for primary and a tariff of 1 per cent for consumer products. In spite of recent improvements, the countries of sub-Saharan Africa still face higher tariffs in the markets of developing countries. Most unfavourable conditions are for extraregional exports of consumer products, which face an average tariff of almost 7.2 per cent. However, tariffs are also relatively high in the case of intraregional trade, especially for intermediate and consumer products. In regard to relative market access, the system of preferences generally provides the countries of sub-Saharan Africa with positive tariff margins vis-à-vis foreign competitors, both in developed countries and in regional markets, but not in non-regional developing countries, where the RPM is virtually zero or even negative for consumer products.

The data shows an improvement in market access conditions for sub-Saharan Africa across pre-existing, new and disappearing export flows. Table 5 reports simple average statistics on tariffs and RPM for each of these flows.

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[9] Because of their least developed country status, many countries in sub-Saharan Africa are beneficiaries of preferential access in high-income markets such as the United States of America or the European Union.

Table 5
Tariff and RPM faced by exports from sub-Saharan Africa, by type of flow

	Primary	*Intermediate*	*Consumer*
Tariff			
New flows	3.5% (-1.6)	4.4% (-3.3)	8.1% (-5.3)
Continuing flows	1.3% (-1.2)	3.9% (-3.0)	5.9% (-5.2)
Disappearing flows	1.0% (-0.8)	2.2% (-1.6)	2.7% (-3.6)
RPM			
New flows	-0.7% (0.4)	-0.3% (1.3)	-0.7% (2.1)
Continuing flows	0.5% (0.3)	1.8% (1.2)	2.5% (3.1)
Disappearing flows	0.4% (0.0)	1.9% (0.4)	5.0% (1.9)

Note: changes from 2001 to 2011 are in parenthesis. Figures are trade weighted averages.

In regard to both direct and relative market access conditions, the data shows no clear difference between new and continuing flows. However, disappearing flows appear to have experienced a smaller reduction (increase) in tariffs (RPM), possibly suggesting a correlation between these indicators and the probability of export. Although market access conditions faced by the countries of sub-Saharan Africa have on average improved, there are a substantial number of products for which market access conditions have not changed or have even deteriorated, both in direct and relative terms. In numbers, direct market access conditions have improved for around 40 per cent of flows for consumer and intermediate products and about 26 per cent in the case of primary products. On the other hand, tariffs have been increasing in a very small number of cases (less than 8 per cent of cases for consumer and intermediate goods and about 5 per cent for primary products). In the majority of cases tariffs have not changed. The observed no change in the applied tariff is often related to the already large number of products (especially in primary products) where tariffs were already zero in 2001. As the change in RPM depends not only on the applied tariff but also on competitors' tariffs, the RPM is subject to more variance than the applied tariff. In this regard, we observe about an equal number of instances where the RPM has increased and decreased, although there are still a large number of cases where there is no change in RPM, especially in primary products. The observations with no changes in RPM are largely related to the products already facing a zero MFN tariff in 2001.

In terms of correlation between the two market access measures, any reduction (increase) in tariffs is generally reflected in an improvement (deterioration) in the RPM. However, as the RPM is related to the tariff applied to other competitors, the relationship between the two measures does not always hold. In practice, we observe a substantial number of cases (about 10 per cent) where an improvement in direct market access conditions is not accompanied by an improvement in relative market access conditions. This implies that the competitive benefit of the lower tariff has been eroded by the even lower reduction in the tariff applied to other foreign competitors (say, because a reduction in the MFN tariff was accompanied by a trade agreement among third countries). Similarly, there are some cases (although quite limited in number) where the higher tariff is not accompanied by deterioration of relative market access conditions, implying that the negative effect of the higher tariff has been compensated by an even higher increase in the tariffs applied to foreign competitors.

3. EMPIRICAL APPROACH

The empirical strategy to measure the impact of market access on the probability of exporting relies on a comparative static approach. The econometric model is similar to the one used by Debaere and Mostashari (2010), who analyse the contribution of tariffs in the extensive margin of imports of the United States. However, our set-up has two main differences. One difference is in the panel structure. In our data sets the analysis is based on the export structure of 28 countries in sub-Saharan Africa, rather than on the import structure of a single country. The second is in the variables explaining market access conditions, where we consider both tariffs and preferential margins. In summary, the econometric model investigates whether the probability of countries in sub-Saharan Africa exporting a product is related to changes in bilateral market access conditions, controlling for various determinants. We use a probit estimation, where we include a number of variables and fixed effects to control for other possible changes in the determinants of the probability of exporting.[10] In practice, the analysis relies on differences in trade patterns and trade policy variables between the beginning and the end of our time span. In formal terms the dependent variable $P_{g,jk}^{t_1}$ is defined as:

$$P_{g,jk}^{t_1} = 1\big[tv_{g,jk} > 0\big] \tag{1}$$

where the subscript g denotes the HS 6-digit level product, j denotes the exporter and k the importer, while tv stands for the level of bilateral trade. $P_{g,jk}^{t_1} = 1$ when $tv_{g,jk} > 0$ in 2011. The same reasoning applies to $P_{g,jk}^{t_0}$ in 2001. The econometric estimation consists of comparing product-level bilateral trade patterns between these two time periods t_0 and t_1, accounting for differences in trade policy and other determinants. More formally, the estimating equation is given by a model in difference:[11]

$$P_{g,jk}^{t_1} = \beta_1 + \beta_2 P_{g,jk}^{t_0} + \beta_3 \Delta\ln(1 + \tau_{g,jk}) + \beta_4 \Delta RPM_{g,jk} + \beta_5 \sum_j \Delta\ln(tv_{g,jk}) + \beta_6 \sum_k \Delta\ln(tv_{g,jk})$$
$$+ \beta_7 \Delta AG_{jk} + \beta_8 \ln(ER_{jk}) + \theta_g + \phi_j + \varphi_k + \varepsilon_{g,jk} \tag{2}$$

In equation (2), the probability of a non-zero product-level bilateral trade flow in ($P_{g,jk}^{t_1}$) depends on the existence of trade in t_0 ($P_{g,jk}^{t_0}$) and on changes (between the two periods) in the trade policy variables and in other factors that may have influenced the likelihood of bilateral trade.

In this specification the trade policy variables of interest are the change in the log of the bilateral applied tariff $\Delta\ln(1 + \tau_{g,jk})$ and the change in the relative preferential margin ($\Delta RPM_{g,jk}$). The specification includes a number of control variables. Changes in product-country specific effects on supply are controlled for by adding the change in exporter j total exports of product g ($\sum_k \Delta\ln tv_{g,jk}$). Similarly, changes in demand conditions in the importing countries are controlled for by adding a change in the total imports of importer k of product g ($\sum_j \Delta\ln tv_{g,jk}$). A dummy variable

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[10] As explained in Greene (2004), the fixed effects estimator shows a large finite sample bias in discrete choice models when T is very small. Nevertheless Greene shows that the bias is persistent but it drops off rapidly as T increases to 3 and more. Since our panel is not of small size, this is not an issue in our case.

[11] In the difference model the dependent variable is $P_{g,jk}^{t_1} - P_{g,jk}^{t_0}$. As we are interested in the probability of exporting in t_1 we take $P_{g,jk}^{t_0}$ to the right hand side, thus controlling for the status of exports in t_0.

(ΔAG_{jk}) controls for the effect of trade agreements that have been established or modified between the two periods. The log of the cross exchange rate $\ln(ER_{jk})$ controls for changes in the real exchange rate. A series of fixed effects controls for importer, exporter and product time unvarying determinants that could affect the results. Also note that the estimation in first difference controls for unobserved characteristics at the level of the importer-exporter-product.

4. RESULTS

In this section we first discuss the results of the estimations from the probability model described above. Then we use the estimating coefficients and the changes in the variables of interest to calculate to what extent further regional tariff liberalization could promote trade flow within sub-Saharan Africa.

4.1. ECONOMETRIC RESULTS

First, we report the estimates of the probit model with fixed effects on the overall probability of exporting. Then we make a distinction between pre-existing and newly traded goods. Table 6 reports the results of the probit model for the three broad categories of goods: columns (1), (3) and (5) report a specification where we only include the tariffs, while columns (2), (4) and (6) also include the RPM, so as to capture the impact of relative market access conditions.

Table 6
Probit estimates for the effect of direct and relative market access conditions on export status

	Primary products		*Intermediate products*		*Consumer products*	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Δlog(1+tariff)	-0.113***	-0.037	-0.249***	-0.056***	-0.268***	-0.065***
	(0.000)	(0.146)	(0.000)	(0.000)	(0.000)	(0.000)
Δ(RPM)		0.253***		0.379***		0.272***
		(0.000)		(0.000)		(0.000)
Status 2001	0.231***	0.229***	0.137***	0.134***	0.196***	0.192***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Imports)	0.012***	0.012***	0.012***	0.012***	0.014***	0.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Exports)	0.015***	0.015***	0.015***	0.015***	0.016***	0.015***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ(AG)	0.054***	0.050***	0.038***	0.033***	0.032***	0.027***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(crossrate)	-0.037**	-0.035**	-0.054***	-0.053***	0.008	0.008
	(0.011)	(0.017)	(0.000)	(0.000)	(0.537)	(0.543)
Observations	43,796	43,779	228,009	227,968	131,349	131,325

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: The coefficients represent the average marginal effects of a probit model with dummies for exporters, importers, and products. All covariates represent the difference between 2011 and 2001.

In regard to the control variables, they are all significant and have the expected sign. The probability of exporting from sub-Saharan Africa largely depends on whether the good was already exported in the initial period (*Status 2001*). The probability of exporting also depends both on the change in demand in the importing country, as well as on the change in supply in the exporting country. Finally, trade agreements and the exchange rate also have a significant effect on the probability of exporting: both the creation/deepening of a trade agreement and a depreciation of the exchange rate have a positive effect on the probability of exporting. As per the market access variables, the overall results indicate that both tariff and RPM have a significant effect on the probability of exporting. Moreover, the inclusion of the RPM reduces the magnitude of the tariff coefficient, indicating that part of the effect of the change in the tariff does not operate directly on the probability of exporting, but works through the relative market access conditions. Although the coefficients on the market access variables are all significant, we find small effects. More specifically, the average marginal effect on the probability of exporting of a change in tariff is about 0.1 for primary and 0.25 for consumer products and for intermediates. These coefficients are further reduced once we control for the RPM. According to these results a one percentage point drop in the tariff of intermediate and consumer products would increase the probability of exporting of about 0.06 percentage points. Direct market access conditions are not significant for primary products. A reason for this lack of significance is that primary products cannot be easily replaced with domestic producers in importing countries and thus direct market access conditions are less relevant, since domestic competition is absent in this category of goods. On the other hand RPM is significant in all cases, indicating that exports from sub-Saharan Africa face competition from other foreign suppliers. In numbers, one unit increase in the RPM would increase the average probability of exporting of about 0.25 percentage points for primary products, 0.38 percentage points for intermediate products and 0.27 for consumer goods.

We now turn to investigate whether market access variables have similar effects depending on whether trade flows are pre-existing or not. That is, whether market access differently affects the probability of exports for the already traded products versus products that were not previously exported. Table 7 presents the results of the benchmark specification for the three categories of goods where the sample is split between pre-existing and new trade flows. We define pre-existing trade flows as flows at the exporter-importer-product level that were exported in t_0 and new trade flows as trade flows that were not exported in t_0.

Because new trade flows represent the large majority of export flows from sub-Saharan Africa, the results for new trade flows closely mimic the results for the overall sample (as per table 6), and therefore a similar interpretation applies. Most important is to investigate whether the market access variables similarly affect the probability of export survival for the smaller sample of pre-existing trade flows. In fact, although fewer in number, these flows are critically important as they represent the bulk of exports from sub-Saharan Africa in terms of value/volume. One important finding is that direct market access conditions do not significantly affect the probability of survival of pre-existing trade flows, but in the case of intermediate products whose coefficient is weakly significant, only at the 10 per cent significance level. One reason that may explain this result is that tariffs may not matter much in the case of existing flows because of the large sunk costs of exporting (Baldwin and Krugman, 1989; Alessandria and Choi, 2007, Albornoz et al. 2012). This hypothesis is also confirmed by firm-level studies such as Bernard and Jensen (2004) and Das, Roberts and Tybout (2007), which find large fixed costs for beginning to export. This implies that incumbent exporters could, at least to some extent, internalize an increase in the tariff. In regard to the impact of relative market access conditions on the probability of survival for pre-existing trade flows, the coefficient on the RPM remains significant, thus suggesting that deterioration in relative market access conditions does play a role in determining whether trade flows continue or are taken by foreign competitors. The above results have important implications for exports from sub-Saharan Africa. The first is that tariffs are important, but generally only for initiating new trade flows. Export survival of pre-existing trade flows does not appear to depend on the change in tariffs but in the case of intermediates. However, the level of significance of such a coefficient is marginal. Most importantly, the results suggests that many of the existing export flows from sub-Saharan Africa may be fungible (importing countries may be able to easily switch these from most competitive suppliers). Therefore, any change in preferential access for sub-Saharan Africa

can result in trade diversion effects.[12] This also implies that any erosion of preferential margins (say, due to the proliferation of RTAs) would imply a reduction in the probability of exports from sub-Saharan Africa, both for existing flows and for potential flows. We will discuss some of the implications for regional trade of these results in section 5.

Table 7
Probit estimates for export survival and of initiating new trade flows

	Entry into exporting			*Survival*		
	(1)	(2)	(3)	(4)	(5)	(6)
	Primary	Intermediate	Consumer	Primary	Intermediate	Consumer
$\Delta\log(1+\text{tariff})$	-0.034	-0.055***	-0.086***	-0.189	-0.136*	-0.055
	(0.151)	(0.000)	(0.000)	(0.217)	(0.070)	(0.514)
$\Delta(\text{RPM})$	0.221***	0.306***	0.206***	0.371**	0.441***	0.560***
	(0.000)	(0.000)	(0.000)	(0.028)	(0.000)	(0.000)
$\Delta\log(1+\text{Imports})$	0.009***	0.010***	0.012***	0.072***	0.057***	0.060***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta\log(1+\text{Exports})$	0.012***	0.012***	0.012***	0.065***	0.057***	0.070***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta(\text{AG})$	0.046***	0.032***	0.025***	0.058*	0.016	-0.009
	(0.000)	(0.000)	(0.000)	(0.100)	(0.363)	(0.709)
$\Delta\log(\text{crossrate})$	-0.033**	-0.044***	0.004	0.007	-0.127*	0.039
	(0.012)	(0.000)	(0.723)	(0.941)	(0.068)	(0.694)
Observations	38,329	205,572	115,878	4,569	19,866	12,619

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: The coefficients represent the average marginal effects of a probit model with dummies for exporters, importers, and products. All covariates represent the difference between 2011 and 2001.

Robustness check

Before discussing the implication of these results for intraregional trade we present some robustness checks related to the specification of the model. Table 8 reports the results of the same specification used in table 6 where we perform a linear probability model, a logit model and a probit model estimated on a more restricted sample.[13] The results are qualitatively similar, confirming what we found in the original probit model.

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[12] For example, a free trade agreement between a country in sub-Saharan Africa and the European Union does not directly affect the probability of export survival for exports from sub-Saharan Africa (although it does affect the probability of new entry and may very well affect the magnitude of trade flows). However, the trade agreement will still indirectly increase this probability of survival (as well as new entry) because the reduction in tariff provides the signatory country with a competitive edge versus other foreign competitors. On the other hand, a trade agreement between foreign countries (say a regional trade agreement) would negatively affect the probability of exports from sub-Saharan Africa, both for existing and new trade flows because such trade agreement would make countries in sub-Saharan Africa relatively less competitive vis-à-vis foreign competitors.

[13] We restrict the sample by defining the probability of exporting in a stricter way: instead of defining the probability of exporting as one when a triplet (exporter-importer-product) exports in any of the two years 2010 and 2011, we consider only the year 2011 and 2001 (instead of 2000 and 2001).

Table 8
Robustness checks with alternative estimation models and data sample

	Logit			*LPM*			*Probit Single Year*		
	Primary	Intermediate	Consumer	Primary	Intermediate	Consumer	Primary	Intermediate	Consumer
Δlog(1+tariff)	-0.028	-0.042***	-0.066***	-0.021	-0.027**	-0.039***	-0.036*	-0.064***	-0.070***
	(0.307)	(0.000)	(0.000)	(0.368)	(0.025)	(0.001)	(0.080)	(0.000)	(0.000)
Δ(RPM)	0.256***	0.377***	0.265***	0.312***	0.595***	0.368***	0.248***	0.368***	0.255***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
status (2001)	0.217***	0.127***	0.184***	0.442***	0.288***	0.397***	0.238***	0.139***	0.204***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Imports)	0.012***	0.012***	0.015***	0.011***	0.012***	0.013***	0.010***	0.011***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Exports)	0.014***	0.014***	0.016***	0.013***	0.011***	0.012***	0.012***	0.013***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ(AG)	0.049***	0.028***	0.025***	0.063***	0.054***	0.036***	0.008	0.025***	-0.018***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.480)	(0.000)	(0.005)
Δlog(crossrate)	-0.035**	-0.052***	0.010	-0.029**	-0.006	0.026***	-0.047***	-0.063***	0.010
	(0.019)	(0.000)	(0.509)	(0.028)	(0.273)	(0.000)	(0.003)	(0.000)	(0.481)
Observations	43,779	227,968	131,325	43,881	228,075	131,334	40,599	223,533	127,899

As a further check, in table 9 we estimate two specifications where market access variables are differently constructed and report the estimation on trade values larger than $1 million. In the first specification, instead of using Δlog(1+tariff), we use a specification where the tariff enters linearly (Δtariff), as is the case for the RPM. The results are similar to those in table 6, confirming that what we find is not led by the non-linearity in the tariff variable compared to the linearity of the RPM.

A second specification regards the structure of the RPM. This is constructed as the difference between the tariff faced by foreign competitors and the applied tariff. This may create some concern of multicollinearity, as the applied tariff is already included in the specification as an independent regressor. However, the correlation between the two variables is not large (about 0.3 for primary products and 0.4 for intermediate and consumer products) and the correlation between the coefficients does not indicate multicollinearity as a serious problem (about 0.4 for primary, 0.5 for intermediate and 0.6 for consumer products). Nevertheless, we perform a further check by using in the regression, instead of the RPM, simply the average change in the tariffs faced by all competitors. Although the results are generally in line with those of table 6, the coefficients on the applied direct tariff are substantially larger and always significant. The larger coefficients are due to the fact that by not explicitly controlling for relative market access, its effect is confounded in the direct market access variable. In principle, there is no reason why competitors' tariffs should affect the probability of exports of the given country other than through the preferential margin, which we isolate in the RPM.

Finally, to ensure that our findings are not driven by small trade flows we also perform a probit regression on a sample where we keep only observations with trade flows of a magnitude superior to $1 million. Results are, once again, qualitatively similar to those reported in table 6.

Table 9
Robustness checks with alternative specifications of the market access variables and omitting small trade flows

	Δlog(1+tariff)=Δ(tariff)			RPM=Δlog(1+competitor tariff)			Only Trade flows > 1 Million USD		
	Primary	Intermediate	Consumer	Primary	Intermediate	Consumer	Primary	Intermediate	Consumer
Δlog(1+tariff)	-0.006	-0.036***	-0.039***	-0.376***	-0.490***	-0.385***	-0.033	-0.069***	-0.073***
	(0.602)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.196)	(0.000)	(0.000)
RPM	0.269***	0.389***	0.284***	0.346***	0.436***	0.324***	0.239***	0.362***	0.271***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Status (2001)	0.229***	0.134***	0.192***	0.228***	0.133***	0.192***	0.226***	0.131***	0.187***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Imports)	0.012***	0.012***	0.015***	0.012***	0.012***	0.015***	0.017***	0.012***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(1+Exports)	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***	0.014***	0.014***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ(AG)	0.050***	0.033***	0.027***	0.049***	0.032***	0.026***	0.044***	0.033***	0.025***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δlog(crossrate)	-0.035**	-0.053***	0.008	-0.034**	-0.053***	0.008	-0.048***	-0.050***	0.010
	(0.016)	(0.000)	(0.545)	(0.018)	(0.000)	(0.547)	(0.001)	(0.000)	(0.459)
Observations	43,779	227,968	131,325	43,779	227,968	131,325	41,586	214,005	122,654

4.2 REGIONAL INTEGRATION AND PROBABILITY OF EXPORTS

The overall results of Section 4.1 have important implications for intraregional trade. The trade of countries in sub-Saharan Africa is far from liberalized as many of those countries still maintain relatively high tariffs on both regional and non-regional imports. In this regard, any step towards regional liberalization would imply a substantial decrease in the applied regional tariffs and a consequent increase in the RPM faced by each country in sub-Saharan Africa. Consequently, ceteris paribus, these improved intraregional market access conditions would have a positive effect not only on the magnitude of trade flows but also on the probability of exports. In order to simulate what the effect could be, in light of our main results from table 6, we calculate the change in the probability for each given country in sub-Saharan Africa *j* in export product *g* to country *k* as:

$$\Delta P^{t_1}_{g,jk} = \beta_3 \Delta \ln(1 + \tau_{g,jk}) + \beta_4 \Delta RPM_{g,jk} \tag{3}$$

where $\Delta \ln(1 + \tau_{g,jk}) = -\ln(1 + \tau^{t_0}_{g,jk})$, since intraregional tariffs are assumed to be fully liberalized in t_1, and $\Delta RPM_{g,jk} = RPM^{RTA}_{g,jk} - RPM_{g,jk}$, where the superscript *RTA* indicates the RPM calculated assuming zero intraregional tariffs in t_1. The beta coefficients are those estimated according to equation (2) and reported in table 6.

Before assessing how a free trade area among all the countries of sub-Saharan Africa would increase the probability of intraregional exports, we need to calculate how much tariffs and RPM would change. Table 10 reports the average change in tariff and RPM consequent to full tariff liberalization among the countries of sub-Saharan Africa in t_1.[14]

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[14] Table 10 reports simple averages so as to take into account products that are not traded, but could be potentially be so. Moreover, to take into account the production possibilities of each country, only products that are exported at least to one destination are included (e.g. liberalization in the tariffs on coffee does not enter in the aggregate statistics if the country does not export coffee at all).

Table 10
Change in tariffs and RPM (simple average between 2001 and 2011)

Country	Code	Primary		Intermediate		Consumer	
		Change in Tariffs	Change in RPM	Change in Tariffs	Change in RPM	Change in Tariffs	Change in RPM
Benin	BEN	-7.9%	6.6%	-11.0%	10.1%	-14.8%	13.9%
Botswana	BWA	-8.2%	6.5%	-8.2%	7.2%	-11.8%	9.7%
Burkina Faso	BFA	-10.5%	8.7%	-10.5%	9.9%	-16.7%	15.7%
Cameroon	CMR	-10.3%	9.1%	-10.4%	9.8%	-19.4%	18.9%
Chad	TCD	-9.6%	8.0%	-6.9%	5.9%	-19.0%	17.6%
Côte d'Ivoire	CIV	-8.7%	7.0%	-8.4%	7.7%	-16.4%	15.6%
Ethiopia	ETH	-8.0%	7.1%	-7.6%	7.2%	-17.3%	17.0%
Gabon	GAB	-7.7%	6.6%	-8.6%	7.9%	-16.0%	15.0%
Ghana	GHA	-10.2%	8.8%	-10.7%	10.0%	-19.2%	18.4%
Kenya	KEN	-5.1%	3.8%	-5.2%	4.6%	-13.1%	12.5%
Madagascar	MDG	-6.8%	5.5%	-9.1%	8.5%	-20.7%	21.7%
Malawi	MWI	-4.4%	3.5%	-5.6%	4.7%	-6.6%	6.8%
Mali	MLI	-10.2%	8.5%	-9.2%	8.6%	-16.4%	15.6%
Mauritania	MRT	-7.6%	6.9%	-8.8%	8.2%	-19.1%	19.2%
Mauritius	MUS	-4.1%	3.1%	-4.6%	4.1%	-5.9%	5.9%
Mozambique	MOZ	-7.0%	5.6%	-7.5%	6.9%	-11.4%	10.6%
Namibia	NAM	-6.2%	4.5%	-6.4%	5.9%	-10.9%	9.8%
Niger	NER	-9.4%	8.1%	-8.7%	8.1%	-14.9%	14.1%
Nigeria	NGA	-9.5%	8.2%	-10.0%	9.5%	-17.8%	17.1%
Rwanda	RWA	-7.9%	6.3%	-5.0%	4.6%	-10.0%	9.8%
Senegal	SEN	-8.4%	6.8%	-8.9%	8.2%	-16.3%	15.4%
Sierra Leone	SLE	-8.8%	8.4%	-10.3%	10.9%	-20.2%	24.3%
South Africa	ZAF	-5.8%	5.3%	-5.8%	5.5%	-9.2%	8.1%
Swaziland	SWZ	-6.5%	4.8%	-5.2%	4.6%	-7.8%	7.5%
Togo	TGO	-9.2%	7.3%	-10.1%	9.3%	-17.6%	16.5%
Uganda	UGA	-6.0%	4.2%	-6.3%	5.7%	-11.6%	10.7%
United Republic of Tanzania	TZA	-3.8%	2.6%	-4.6%	4.2%	-7.3%	6.6%
Zambia	ZMB	-3.8%	2.2%	-4.2%	3.5%	-6.9%	5.9%

Full tariff liberalization in sub-Saharan Africa would have a substantial impact on the tariffs faced by all countries, although to a different extent depending on the country and product category. Because of the higher tariffs applied, consumer products are those that would be most affected by tariff reduction, ranging from about 6 per cent for products potentially exported by Mauritius, to about 20 per cent for those of Sierra Leone and Madagascar. Exports of intermediate and even primary products would be affected too, but to a lesser extent, with overall reductions in the range of 5 to 10 percentage points. Tariff liberalization would also have a large impact on the RPM with average gains in the order of about 6 percentage points for primary products, about 7 percentage points for intermediates and 14 percentage points for consumer products. In practice, intraregional tariff liberalization would have the double positive effect of reducing internal barriers while giving member countries a higher preferential margin versus non-member competitors.

Intraregional tariff liberalization translates into the probability of exporting according to equation (3). The change in the probability of exporting is illustrated in figure 1, where these results are averaged by country across pre-existing trade flows and potential trade flows.

Effects of regional integration on the probability of exporting
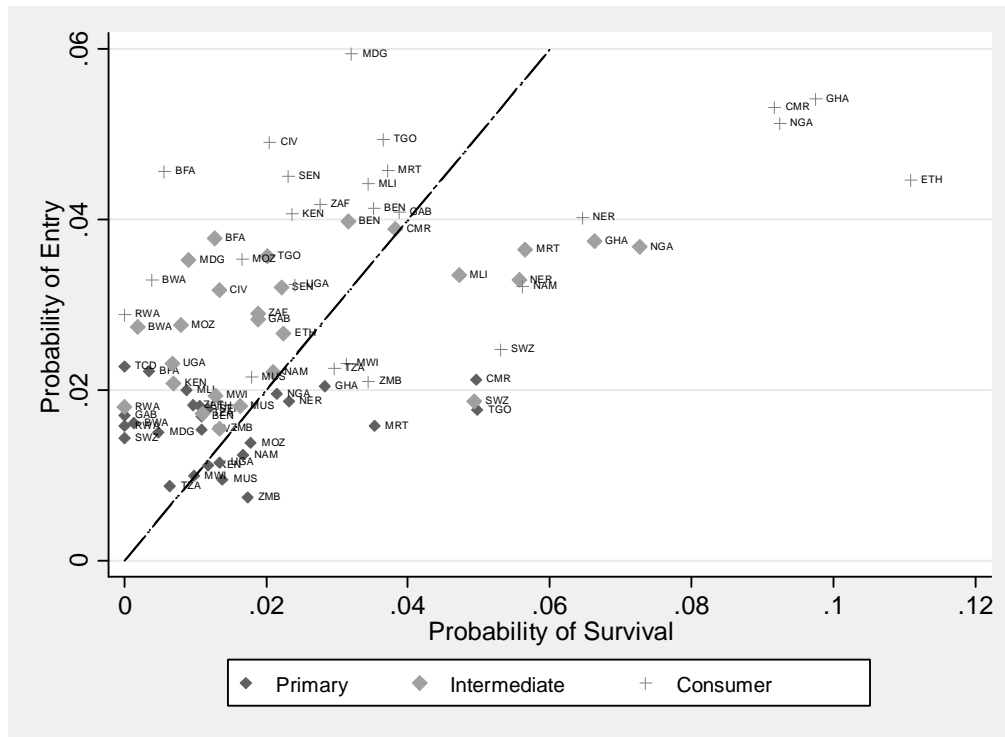
The changes in the probability of intraregional exports are not negligible. As most observations are above the 45 degree line, the change in probability of entry is higher than the change in the probability of survival for the majority of cases. The average effects are about 2.6 per cent in case of existing flows and about 2.8 per cent for the probability of entry. As the extent of the change depends on the pre-existing level of tariffs applied on products potentially exported by each country, there are important differences across countries. In particular, some countries such as Cameroon, Ghana, Ethiopia, Mauritania, Madagascar and Nigeria are expected to be among the top beneficiaries of regional tariff liberalization. On the other hand, Botswana, Malawi, Mauritius, Rwanda, the United Republic of Tanzania and Zimbabwe are expected to benefit much less. In general, for the majority of countries the results are more mixed with some countries expected to gain more than others in some categories of products. Results are also different across typologies of products. Higher probabilities are generally found for consumer products, and lower for primary goods.

5. CONCLUDING REMARKS

In this paper we investigate whether changes in market access conditions affect the probability of exports of the countries of sub-Saharan Africa. The analysis examines two components of market access: direct (the tariff faced by exports) and relative (the tariff faced by an exporter relative to that faced by foreign competitors). We also examine whether the effects are different between the probability of initiating new trade flows and that of making pre-existing flows survive.

The overall results support the overall findings of Debaere and Mostashari (2010), indicating that change in market access conditions have significant, although small, implications for exports; and also the results of Foster, Poeschl and Stehrer (2011) on the positive effects of regional trade agreements on the extensive margin of trade. In more detail, our analysis finds that the change in direct market access conditions affects only the probability of initiating new trade flows but not the probability of survival of pre-existing trade flows for sub-Saharan Africa. On the other hand, we find that relative market access conditions matter in all cases. This suggests that the exports of sub-Saharan Africa may face more competition from foreign competitors than domestic industries in destination markets. This result has the implication that any change in preferential access for sub-Saharan Africa can lead to trade diversion effects. This also implies that any erosion of preferential margins due to the proliferation of RTAs outside sub-Saharan Africa would imply a reduction in the probability of exports from sub-Saharan Africa, both for existing flows and for potential flows (ceteris paribus).

We lastly use these results to simulate the extent to which a potential complete tariff liberalization brought about by a free trade area in sub-Saharan Africa would contribute to enhancing regional trade opportunities. Given the relatively large tariffs applied to intraregional trade, we find that free trade would have the effect of substantially reducing tariff barriers while giving member countries a higher preferential margin versus non-member competitors. In magnitude, the average changes in the probability of intraregional trade resulting from complete tariff liberalization among the countries of sub-Saharan Africa are, on average, an increase of about 2.7 percentage points.

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