



**Macroeconomic Challenges Facing
Low-Income Countries**
New Perspectives

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**Imported Intermediate Inputs and Export
Diversification in Low-Income Countries**

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Imported Intermediate Inputs and Export Diversification in Low Income Countries.

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Abstract

Economists and policy-makers have advocated the need of developing countries, and in particular low-income countries, of moving away from exclusively producing commodities and into manufacturing, and of increasing the value-added of their products. For instance, Simon Johnson, Jonathan Ostry and Arvind Subramanian (2007) find this to be one of the key constraints on growth in African countries. This paper studies the role of imports of intermediate inputs as a determinant of export diversification and of transitions along supply chains towards producing more downstream products. The discussion is centered on the experience of low income countries and in particular, Sub-Saharan countries. The analysis studies detailed trade level data spanning the period 1962-2000, and exploits variation in trade policy across time, countries and industries.

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I. Introduction

Economists and policy-makers have advocated the need of developing countries, and in particular low-income countries, of moving away from exclusively producing commodities and into manufacturing, as well as of increasing the value-added of their products. For instance, Simon Johnson, Jonathan Ostry and Arvind Subramanian (2007) find this to be one of the key constraints to growth in African countries². A similar conclusion is reached by Dani Rodrik (2007) and the World Bank (2000)³.

This paper focuses on answering *how* these countries can achieve the diversification of their exports focusing in particular on the role of global supply chains and trade in intermediate inputs in this process. A natural way to diversify the exports of low income countries into manufacturing is to move sequentially to more downstream industries along production chains of which these countries already participate. For instance, whereas in the 1960s one of Benin's main exports was "Cotton, not carded or combed", one of Belgium's main exports was the more downstream and manufactured "Cotton fabrics, woven..." This is a simple example of a transition that requires some technology and learning, but seems feasible as other developing countries have followed this path. Crucially, imports of intermediate inputs can play an important role in producing new products, especially those located further downstream along supply chains. By providing access to imported intermediate inputs, trade liberalization can contribute to further export diversification. I use various measures of trade policy – including liberalization dates and industry-level tariffs on imported intermediate inputs to test this hypothesis.

² Johnson, Ostry and Subramanian's state in their abstract that "A key question is to what extent Africa can rely on manufactured exports as a mode of "escape from underdevelopment,"" and in their conclusions, "...we find that since the 1960s, escapes from poverty in the face of weak institutions have generally involved exports and—in almost all cases—manufacturing exports".

³ The World Bank's "Can Africa claim the 21st Century" (2000) report diagnoses that "Over the past 30 years it has lost market shares in global trade—even in traditional primary goods—and failed to diversify on any scale. Africa thus remains almost totally dependent on its traditional export commodities—despite their low income elasticity and declining and volatile terms of trade. Continuing concentration on these traditional exports would have adverse consequences for income and employment..."

Sections 3 through 5 provide an initial description of the diversification of low income countries' exports and imports, exploring the following questions. What road have the exports of low income countries followed in the last half-century in terms of their diversification? What is the evolution of trade in intermediate inputs in these countries? Have they moved up the value chain into less upstream industries? I answer these questions by studying the different experiences of low income countries over a long period of time spanning 1962-2000. I use various measures of diversification. I also use a new measure of upstreamness/downstreamness (the position along supply chains) developed by Antras et al (2012) and Fally (2012) to explore trends across low income countries and other regions.

Second, the paper studies the impact of access to intermediate inputs for export diversification. In sections 6 and 7, I use variation in trade policy across time, countries and industries to answer whether trade liberalization has promoted the use of a wider variety of imported intermediate inputs and whether this has led to export diversification and/or to downstream movements in supply chains. I first use the timing of trade liberalization reforms as defined by Wacziarg and Welch (2008) in the spirit of Sachs and Warner's (1995) original contribution. I next construct detailed industry level tariffs on inputs for a large number of developing and low income countries. I assemble this data using input-output tables for each of these individual countries. I study the effect of industry-level tariff cuts on intermediate inputs on several outcomes including the diversification of exports and the upstreamness/downstreamness of exported products in each industry. I find that trade liberalization leads countries to widen the variety of both exports and imports, and to move downstream along supply chains. I further find that the reduction in tariffs on imported intermediate inputs leads to a significant increase in the export varieties in a large set of developing countries.

This paper is connected to a very wide literature that studies growth in developing countries, and to a narrower subset that studies industrial policy and structural transformation. Imbs and Wacziarg (2003) study the relationship between countries' income per capita and the degree of diversification, finding an inverted U-shape pattern. Given Africa's stage of development, this suggests that the road ahead involves

diversification. Johnson, Ostry and Subramanian (2007) state that sustained growth in countries with weak institutions is almost always associated with exporting manufactured products. Rodrik (2012) finds convergence across countries in manufacturing industries, concluding that the shift of employment towards manufacturing is essential for developing countries. Hausman and Rodrik (2006) find that the combination of products exported by a country at a given point in time predicts future growth. Easterly and Reshef (2010) study the exports of African countries over the period 1994-2008 and find that they are concentrated in a narrow set of "successful" products that vary over time. This paper is also related to the literature on production fragmentation, global supply chains and trade in intermediate inputs, surveyed by Baldwin (2012). Regarding the link between access to imported intermediate inputs and export diversification, this paper is related to Goldberg et al (2010) who study the effect of reductions to tariffs on imported intermediate inputs on domestic product growth during the Indian trade liberalization.

To summarize, the contribution of the paper is to explore **how** the diversification of developing and low income countries' exports has happened (when it has), and the role of access to imported intermediate inputs in this process. The paper proposes and studies movements along the production chain as a natural path of diversification.

II. Data Sources and Measurement.

The empirical analysis in the following sections combines a series of datasets on trade flows, trade policy, and input-output tables. In this section I describe each of these data sources.

II.A Trade Flows

Data on trade flows are obtained from two sources. The first source is the NBER's Feenstra and Lipsey (Feenstra et al, 2005) dataset which covers the period 1962-2000. The data is based on the UN's COMTRADE database and reports product level trade flows by exporter, importer and year. Products are based on the 5-digit level SITC (revision 2) classification.

A key issue to take into account is the inconsistency and irregularity of the data reported by low income countries which are the focus of this paper. These countries do not report their trade data to the UN in every year, and the reported data sometimes differs significantly from the data reported by their trade partners. For this reason, the data on low income countries' exports is based on the reports of their trading partners' imports. On the other hand, the data on low income countries' imports is based on reports by the exporter. When both the exporting and importing country are low income countries, I prefer the data reported by the importer, since the importing country has more incentives for an accurate measurement.

II.B Trade Policy: Liberalization Dates.

To characterize trade policy reforms in low income countries I use data on the year in which each country has liberalized their trade regimes. An original classification of trade liberalization dates was provided by Sachs and Warner (1995) based on detailed country

studies that combined a series of criteria. Wacziarg and Welch (2008) updated and modified this classification. The Wacziarg and Welch (2008) dataset includes 98 countries that have liberalized their trade policy and spans the period 1952 to 2001.

II.C Trade Policy: Tariffs.

To characterize low income countries' trade policy I also use data on tariffs. Country level averages by year are obtained from the World Bank's World Development Indicators database. I also use product-level and industry-level tariffs. These are obtained from the UNCTAD's TRAINS database. The tariff data is available only starting in 1988. In fact for most low income countries the start date is several years later. The irregularity of tariff data reported in TRAINS is even more severe than that of trade flows described in II.A.

II.D Input-Output Tables.

I compute input tariffs by industry using input-output tables for a large number of developing and low income countries. These input-output tables are originally from the GTAP database, and are obtained directly from the Nicita and Olarreaga's (2006) Trade, Production and Protection (TPP) database. To construct IO tables that are consistent across many countries, these IO tables are constructed at a fairly aggregate level. Each IO table has 17 manufacturing industries reported using the ISIC classification. Concordance files from the World Bank and UN's WITS are used to match the IO tables to the trade data (reported in SITC codes) and the tariff data (reported in HS codes).

II.E Trade in Intermediate Inputs.

To measure trade in intermediate inputs I follow Baldwin and Taglioni (2011) and use the "Broad Economic Categories" (BEC) classification. Baldwin and Taglioni (2011)

assign BEC codes to three bins: final consumption goods, capital goods and intermediate inputs. Throughout the paper I eliminate oil exports and imports from the data.

II.F Classification of Low Income Countries.

I define low income countries as those which are members of the IMF's Poverty Reduction and Growth Trust (PRGT) list. These are shown in table II.A.

Table II.A: List of Low Income Countries According to the IMF's Poverty Reduction and Growth Trust (PRGT).

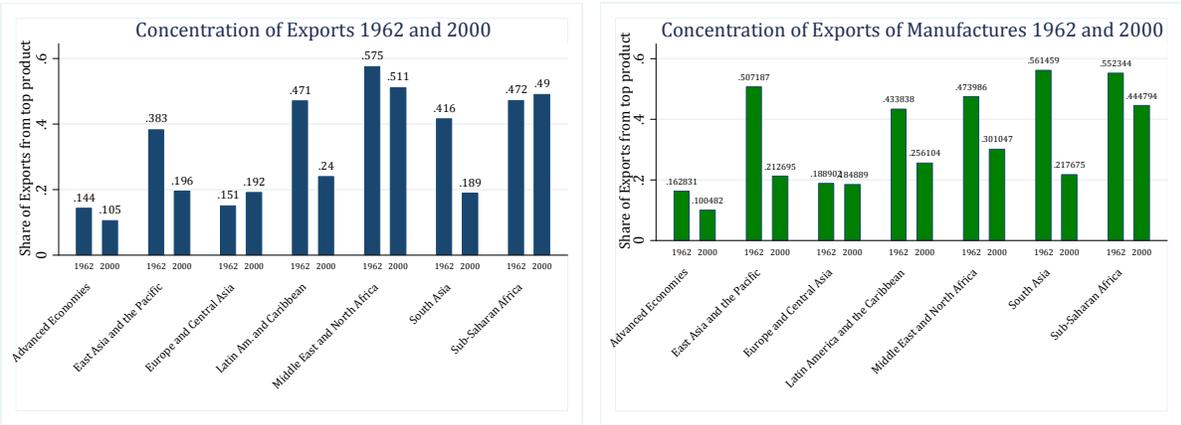
Afghanistan	Côte d'Ivoire	Kiribati	Nicaragua	Timor-Leste, Dem. Rep. of
Bangladesh	Djibouti	Kyrgyz Republic	Niger	Togo
Benin	Dominica	Lao P.D.R.	Nigeria	Tonga
Bhutan	Eritrea	Lesotho	Papua New Guinea	Uganda
Bolivia	Ethiopia	Liberia	Rwanda	Uzbekistan
Burkina Faso	Gambia, The	Madagascar	Samoa	Vanuatu
Burundi	Georgia	Malawi	São Tomé and Príncipe	Vietnam
Cambodia	Ghana	Maldives	Senegal	Yemen
Cameroon	Grenada	Mali	Sierra Leone	Zambia
Cape Verde	Guinea	Mauritania	Solomon Islands	Zimbabwe
Central African Republic	Guinea-Bissau	Moldova	St. Lucia	
Chad	Guyana	Mongolia	St. Vincent and the Grenadines	
Comoros	Haiti	Mozambique	Sudan	
Democratic Republic of the Congo	Honduras	Myanmar	Tajikistan	
Congo, Republic of	Kenya	Nepal	Tanzania	

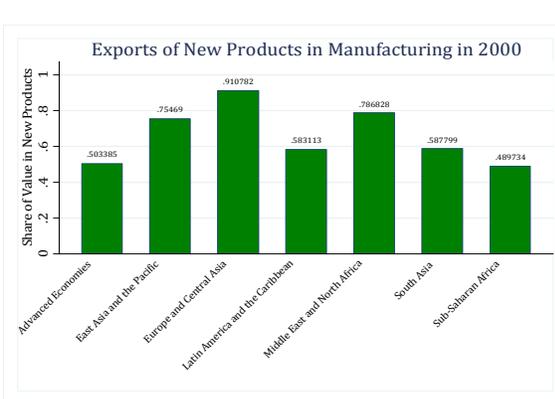
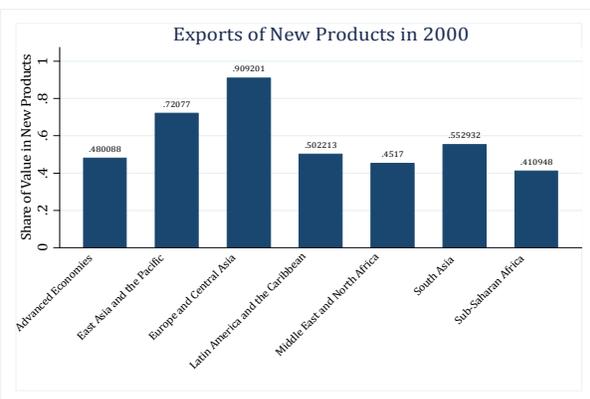
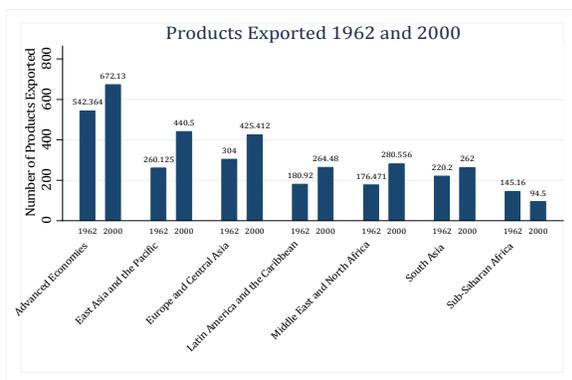
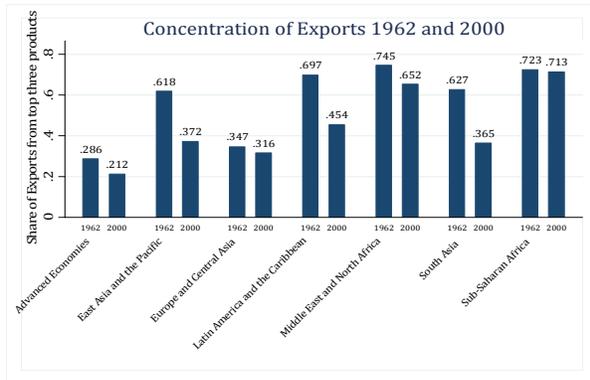
III. Diversification in Low Income Countries' Exports.

In this section I provide a description of the evolution and diversification of the exports of different regions of the world during the period 1962-2000, with a focus on low income countries and on Sub-Saharan Africa.

A first observation is that African exports are highly concentrated in a few products. The top single product - defined as a SITC 4 digit category - represents 49% of the value exported by the average Sub-Saharan African country in 2000. The situation was identical 50 years earlier. While Asia and Latin America also had very concentrated exports in 1962, they experienced sharp drops in this ratio. The top 3 products in the average Sub-Saharan African country represents 71% of the value exported, versus 21% in the average advanced economy. These patterns are described in figures III.A. When we focus on the manufacturing sector the conclusions are similar. When we look at the number of products exported by different countries, we see, first that the number for Sub-Saharan Africa is much lower than that of other regions. Further, Sub-Saharan Africa was the only region in which this number declined between 1962 and 2000.

Figure III.A Concentration of Exports across Regions, 1962-2000





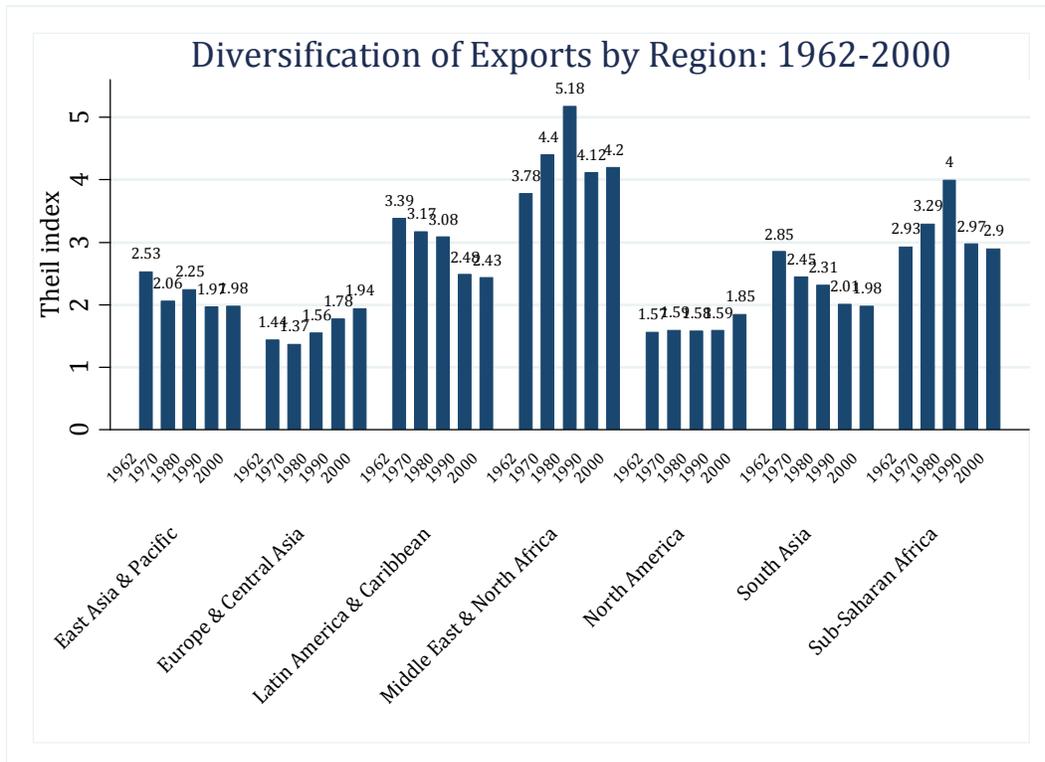
These initial patterns indicate that Africa's exports have not become more diversified in the last 50 years. The experience of high growth regions such as East Asia has been the opposite. It is worth noting however that new products (those that were not of a region's exports 50 years ago) represent 40% of the value exported in 2000 in Sub-Saharan Africa.

There are several measures of export diversification. A widely used measure is the Theil index, defined as follows. Lower values of the index reflect higher degrees of diversification.

$$T = \frac{1}{N} \sum_{i=1}^N \frac{x_i}{\mu} \ln \left(\frac{x_i}{\mu} \right) \quad \text{with } \mu = \frac{\sum_{i=1}^N x_i}{N}$$

Figure III.B shows the diversification of exports throughout the period 1962 – 2000 as measured by the Theil index for different regions of the world. These figure leads to a similar conclusion in the sense that the exports of Sub-saharan African countries are highly undiversified, and that large increases in diversification are observed for Asia and Latin America over this period.

Figure III.B Diversification of Exports by Regions, 1962-2000



IV. Diversification in Low Income Countries' Imports.

Next, I focus on the diversification of the imports of countries in different regions of the world. As in the previous section, I compute a weighted average of the Theil index for each country within regions. Figure III.C shows a large increase in diversification (a decline in the index) in Europe & Central Asia, and South Asia, as well as a more moderate increase in diversification in Latin America and in Sub-Saharan Africa. Overall, the imports of Sub-Saharan African countries are as diversified as those of other regions.

Figure III.C Diversification of Imports by Regions, 1962-2000

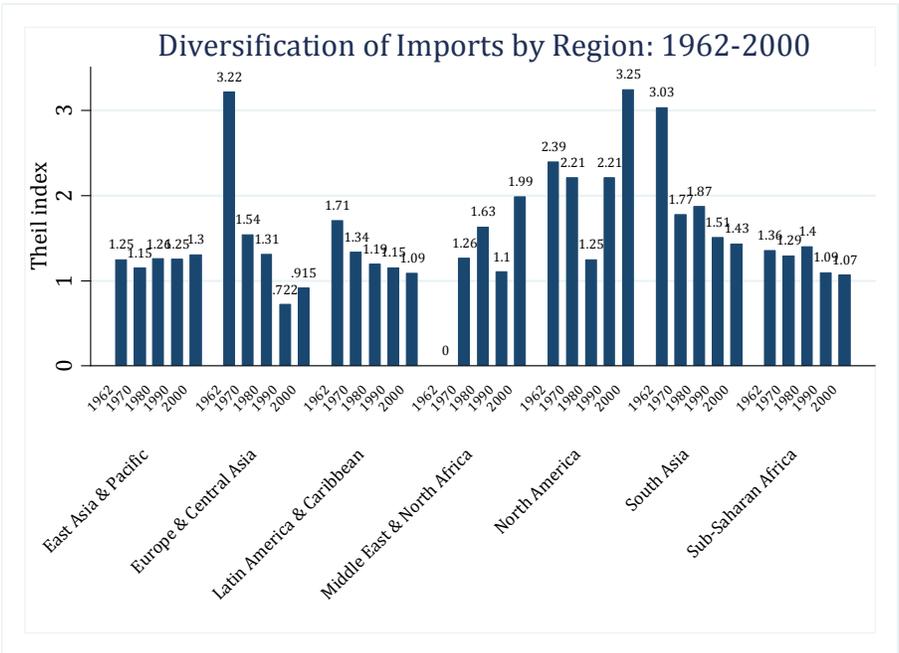
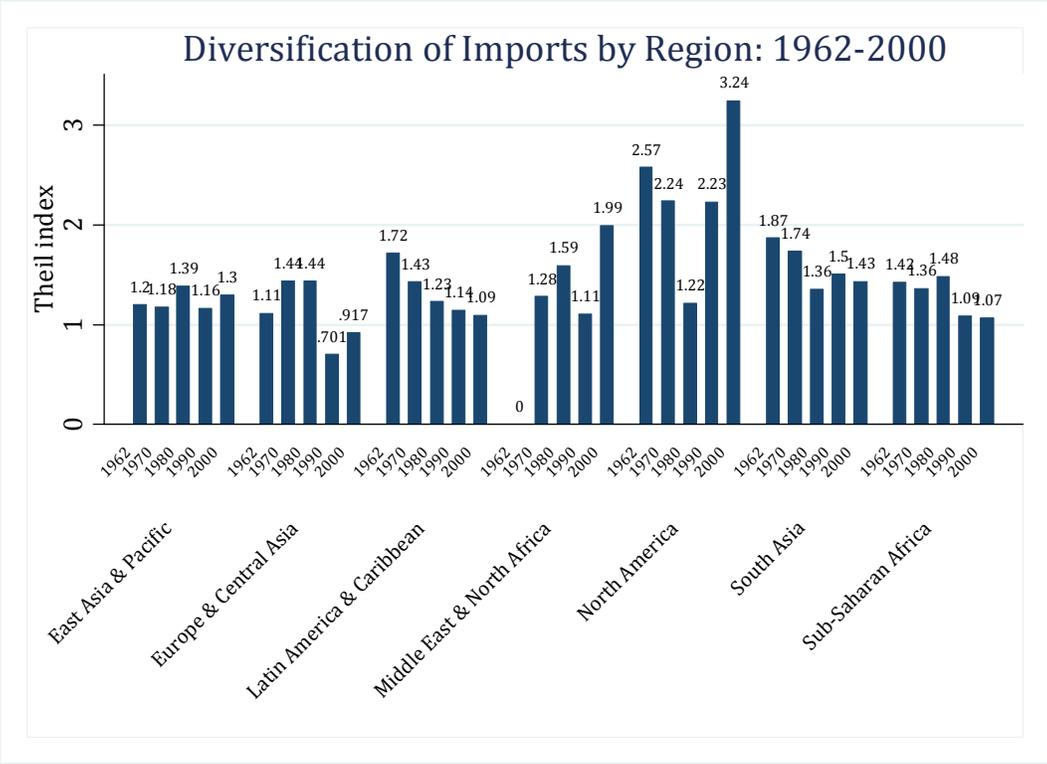


Figure III.D focuses on the diversification of imports of intermediate inputs. In this case, it is also the case that the level of diversification of Sub-Saharan African countries is similar to that of other regions in the world. The most evident increases in diversification during this period correspond to Latin America and South Asia.

Figure III.D Diversification of Imports by Regions, 1962-2000. Only Intermediate Inputs.



V. Upstreamness/Downstreamness: Measuring the Position of Countries Exports along Global Supply Chains.

This section characterizes countries' export baskets according to their position along supply chains. Subsection V.A describes the construction of the index of upstreamness/downstreamness developed by Antras et al (2012) and Fally (2012) and subsection V.B discusses the trends over time in different countries and regions' position along supply chains.

V.A: Measuring upstreamness/ downstreamness.

In this section I explain the construction of an index of upstreamness (or the position along production chains) at the country level to characterize low income countries' exports over the period 1962-2000. Antras et al (2012) and Fally (2012) construct the first index of upstreamness at the industry level. This index is based in input-output tables. The intuition behind this measure is that industries whose output is an input for relatively upstream industries are also relatively upstream. Based on this idea, Antras et al (2012) derive a recursive definition of upstreamness. This measure of upstreamness is constructed using the input-output table of the U.S. economy in 2002 because of its level of disaggregation. I am forced to operate under the assumption that input-output tables for other countries and time periods are not too different. The industry categories in the input-output tables available from the GTAP database and described in section II are too broad to construct meaningful measures of upstreamness.

To build a country-level index of export upstreamness, I compute the weighted average of the industry-level index in each individual year. The weights are the total value exported in each industry. The results of the upstreamness measure seem reasonable. Table 1 shows the ten most downstream products and the ten most upstream products.

Table V.1: Upstreamness/Downstreamness Index. List of Most Upstream and Most Downstream Products.

SITC 4	Product	Upstreamness Index	
7810	Passenger motor cars,for transport of pass.& goods	1.00	Most downstream
8452	Dresses,skirts,suits etc,knitted or crocheted	1.02	
8465	Corsets,brassieres,suspendres and the like	1.02	
8952	Pens,pencils and fountain pens	1.03	
7932	Ships,boats and other vessels	1.03	
7931	Warships of all kinds	1.03	
7523	Complete digital central processing units	1.04	
7522	Complete digital data processing machines	1.04	
7521	Analogue & hybrid data processing machines	1.04	
7414	Refrigerators & refr.equipment,ex.household,parts	1.05	
2816	Iron ore agglomerates (sinters,pellets,briquettes)	4.35	
6821	Copper and copper alloys,refined or not,unwrought	4.35	
6822	Copper and copper alloys,worked	4.35	
2922	Shellac,seed lac,stick lac,resins,gum-resins,etc.	4.60	
2924	Plants,seeds,fruit used in perfumery,pharmacy	4.60	
2320	Natural rubber latex; nat.rubber & sim.nat.gums	4.60	
2120	Furskins,raw (includ.astrakhan,caracul, etc.)	4.60	
6210	Materials of rubber(e.g.,pastes,plates,sheets,etc)	4.60	
2923	Veget.mater.of a kind used primar.for plaiting	4.60	
5112	Cyclic hydrocarbons	4.65	Most Upstream

V.B: Trends in Upstreamness/ Downstreamness.

Figure V.A shows the average level of the upstreamness index in 1962 and 2000 for regions of countries. Figure V.A considers all sectors, while V.B is restricted to manufacturing industries. A first observation is that there is not much correlation between income levels and the upstreamness index. A second observation, that is especially evident in figure V.B, is that regions that experienced high growth during this period, such as the East Asian countries, experienced a larger shift towards more downstream industries than other regions.

Figure V.A: Trends in Upstreamness/Downstreamness through time across different regions. All Sectors.

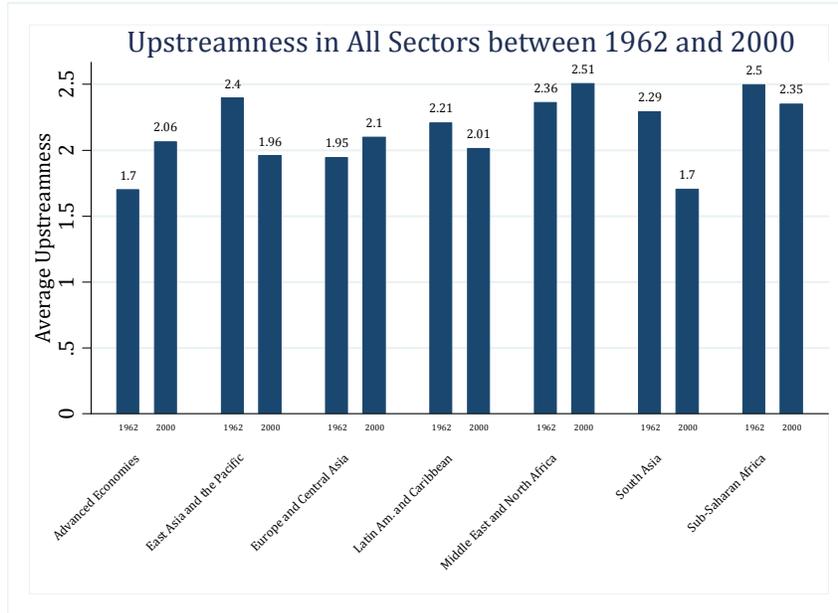
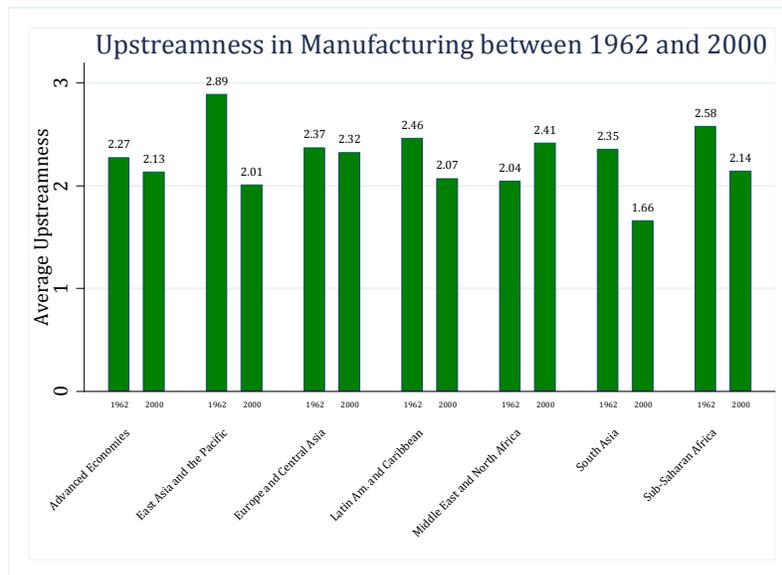


Figure V.B: Trends in Upstreamness/Downstreamness through time across different regions. Only Manufacturing Industries.



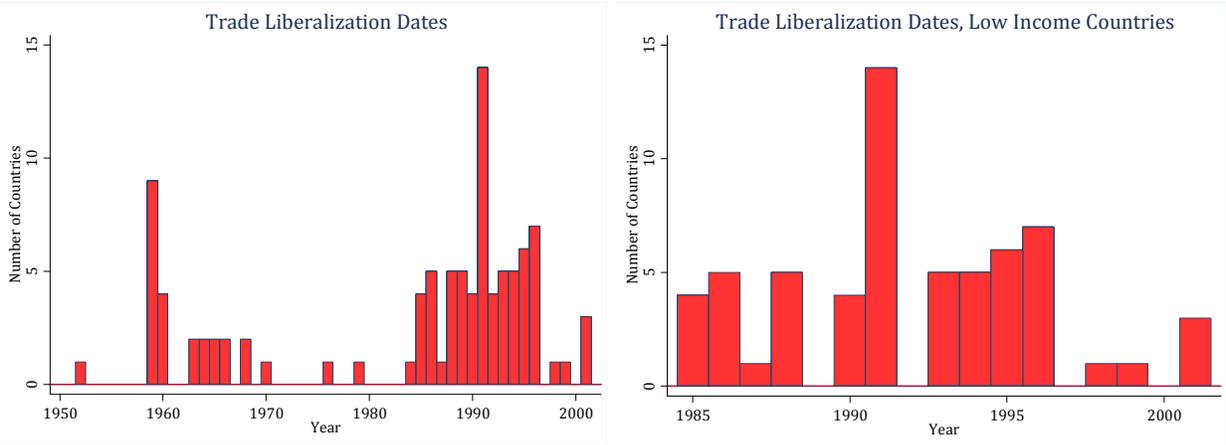
VI. Has Trade Liberalization led to a Diversification of Imports and Exports?

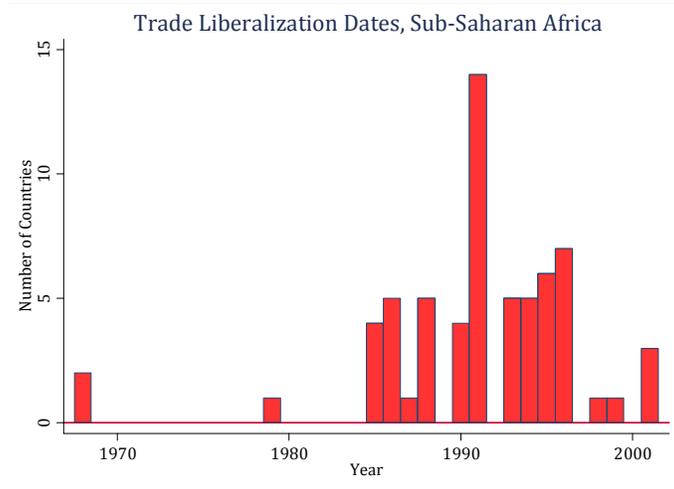
In this section I study whether trade liberalization reforms have induced a diversification of countries' exports and imports exploiting the variation in timing of these reforms across countries. In the next section I explore directly the link between access to intermediate inputs due to input tariff cuts and the diversification of exports. I begin by describing the timing of these reforms in subsection VI.A.

VI.A Trade Liberalization Reforms in Low Income Countries.

A large number of developing and low income countries have experienced trade liberalization reforms during recent decades. A majority of low income countries underwent these reforms in the early and mid 1990's. Figure VI.A shows the timing of these episodes, using Wacziarg and Welch's (2008) classification of liberalization dates, described in section II.

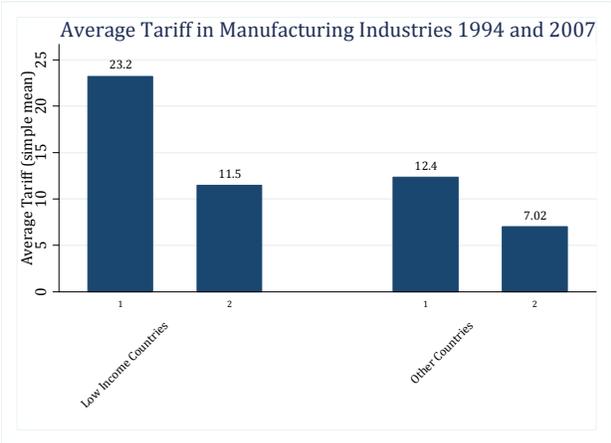
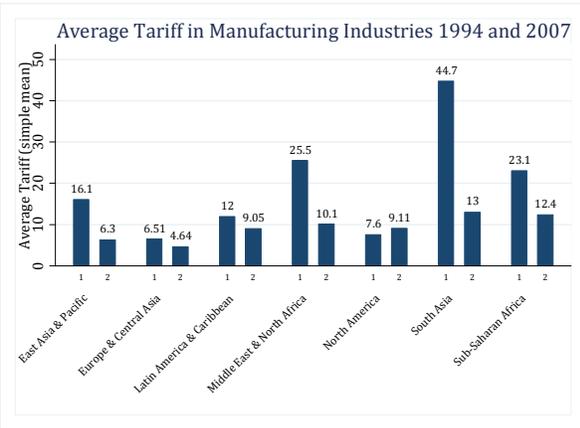
Figure VI.A: Timing of Trade Liberalization Reforms in All Countries, Low Income Countries and Sub-Saharan Countries.





This trend is also reflected in the average level of import tariffs of these countries. Figure VI.B compares the average tariff level across regional and income groups in 1994 and 2007. Unfortunately, there is no data on tariffs available for earlier years. The average tariff set by low income countries in 1994 was twice as high compared to the average tariff in the rest of the world. This gap has been reduced significantly during the subsequent decade. Countries in Sub-Saharan Africa have experienced roughly the same transformation. The most impressive liberalization during the 1994 - 2007 period however corresponds to South Asia.

Figure VI.B: Average Tariffs for Exports in Manufacturing Industries by Region and by Income Group, 1994 and 2007.



VI.B Effect of Trade Liberalization Reforms on Export and Import Diversification.

In this subsection I exploit the variation in the timing of trade liberalization reforms across countries to study their effect on the diversification of exports and imports. Specifically, I estimate the following regression.

$$Diversification_{ct} = Liberalized_{ct} + \mu_t + \delta_c + \varepsilon_{ct} \tag{6.1}$$

The dependent variable is a measure of export diversification or of import diversification. I use alternatively the number of exported or imported products and the Theil index of export or import diversification described in section III. I define a “Liberalized” dummy variable taking a value of 1 in the years following each country’s trade liberalization reforms as defined by Wacziarg and Welch (2008). I estimate separately this equation for all countries, the subset of low income countries and the subset of Sub-Saharan African countries. In each case, I include country and year fixed effects. I report separate results for exports of all products, imports of all products, and imports of intermediate inputs, in tables VI.A, VI.B and VI.C.

The results in table VI.A show that liberalization is associated with a larger variety of exported products in low income countries and in Sub-Saharan African countries, but not in the full sample. When using the Theil index of diversification, however, liberalization only leads to more diversification in the full sample. In the case of imported products, liberalization leads to an increase in the variety and diversification of imports. This is true both for imports in general as well as for imports of intermediate inputs, as shown in tables VI.B and VI.C. It holds for every sample, and the coefficients are economically significant. Liberalization is associated with a 0.11 standard deviation increase in the number of imported intermediate inputs as shown in table VI.C.

Table VI.A: Effect of Trade Liberalization on Export Diversification.

Dependent Variable: (Log) Number of Exported Products			
Sample:	All countries	Low Income Countries	SSA
Liberalized	0.005 0.029	0.123 *** 0.034	0.145 *** 0.038
Liberalized (Standardized Coefficients)	0.002	0.059	0.06
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4351	1439	1286
R-squared	0.815	0.842	0.868

Dependent Variable: Theil Index of Export Diversification			
Sample:	All countries	Low Income Countries	SSA
Liberalized	-0.208 *** 0.025	-0.022 0.04	0 0.045
Liberalized (Standardized Coefficients)	-0.121	-0.011	0
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4351	1439	1286
R-squared	0.738	0.781	0.761

Notes. This table reports the estimation of equation 6.1. The dependent variable is the (log) number of exported products in the upper panel and the Theil index of Export Diversification in the lower panel. Each estimation includes country and year fixed effects. The first column on the left includes all countries, the middle column is restricted to low income countries and the third column, to countries in Sub-Saharan Africa. Standard errors are clustered at the country and year level. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

Table VI.B: Effect of Trade Liberalization on Import Diversification.**PANEL A**

Dependent Variable:	(Log) Number of Imported Products		
Sample:	All countries	Low Income Countries	SSA
Liberalized	0.118 *** 0.016	0.186 *** 0.028	0.157 *** 0.03
Liberalized (Standardized Coefficients)	0.129	0.169	0.134
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4335	1438	1285
R-squared	0.632	0.622	0.64

PANEL B

Dependent Variable:	Theil Index of Import Diversification		
Sample:	All countries	Low Income Countries	SSA
Liberalized	-0.091 *** 0.178	-0.101 *** 0.033	-0.125 *** 0.034
Liberalized (Standardized Coefficients)	-0.094	-0.07	-0.084
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4335	1438	1285
R-squared	0.594	0.703	0.723

Notes. This table reports the estimation of equation 6.1. The dependent variable is the (log) number of imported products in the upper panel and the Theil index of Import Diversification in the lower panel. Each estimation includes country and year fixed effects. The first column on the left includes all countries, the middle column is restricted to low income countries and the third column, to countries in Sub-Saharan Africa. Standard errors are clustered at the country and year level. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

Table VI.C: Effect of Trade Liberalization on Import Diversification. Intermediate Inputs

Dependent Variable:	(Log) Number of Imported Products (Intermediate Inputs)		
Sample:	All countries	Low Income Countries	SSA
Liberalized	0.117 *** 0.017	0.177 *** 0.031	0.159 *** 0.033
Liberalized (Standardized Coefficients)	0.109	0.141	0.12
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4335	1438	1285
R-squared	0.691	0.647	0.679
Dependent Variable:	Theil Index of Import Diversification (Intermediate Inputs)		
Sample:	All countries	Low Income Countries	SSA
Liberalized	-0.097 *** 0.0179	-0.11 *** 0.034	-0.145 *** 0.036
Liberalized (Standardized Coefficients)	-0.097	-0.072	-0.091
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4335	1438	1285
R-squared	0.622	0.699	0.716

Notes. This table reports the estimation of equation 6.1. The dependent variable is the (log) number of imported products in the upper panel and the Theil index of Import Diversification in the lower panel. Each estimation includes country and year fixed effects. The first column on the left includes all countries, the middle column is restricted to low income countries and the third column, to countries in Sub-Saharan Africa. Standard errors are clustered at the country and year level. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

VI.C Effect of Trade Liberalization Reforms on Movements along Supply Chains

Next, I study whether trade liberalization has induced a movement along supply chains towards the production of more downstream products. The previous subsection has presented evidence that these liberalization episodes have increased the imports of intermediate inputs. In a context of increasingly fragmented production across countries, the increased availability of intermediate inputs could allow countries to export more downstream products. To test this hypothesis, I estimate the following regression along the same lines as the estimation in subsection VI.B. This time the dependent variable is the country level upstreamness/downstreamness index described in section V.

$$\text{Upstreamness/Downstreamness Index}_{ct} = \text{Liberalized}_{ct} + \mu_t + \delta_c + \varepsilon_{ct} \quad (6.2)$$

The results are described in table VI.D. The first column reports the results for the full sample of countries. Trade liberalization is associated with further downstreamness of a country's exports. The standardized coefficients indicate that on average liberalization leads to 0.08 standard deviations of further downstreamness. A similar result, with a smaller magnitude, is observed for low income countries. This result is absent in the sample of Sub-Saharan African countries in the third column.

Table VI.D: Effect of Trade Liberalization on the Upstreamness/Downstreamness of Exports.

Dependent Variable:	Upstreamness/Downstreamness Index		
Sample:	All countries	Low Income Countries	SSA
Liberalized	-0.109 *** 0.016	-0.084 ** 0.035	0.015 0.036
Liberalized (Standardized Coefficients)	-0.088	-0.044	0.008
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Number of Observations	4351	1439	1286
R-squared	0.786	0.801	0.816

Notes. This table reports the estimation of equation 6.2. The dependent variable is the upstreamness/downstreamness index. Each estimation includes country and year fixed effects. The first column on the left includes all countries, the middle column is restricted to low income countries and the third column, to countries in Sub-Saharan Africa. Standard errors are clustered at the country and year level. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

VII. Trade Liberalization and Diversification: Industry Level Evidence.

In this section I provide evidence on the link between access to imported intermediate inputs and export diversification. I use the level in input tariffs across industries, time and countries as an exogenous source of variation in the access to imported intermediate inputs. I ask whether lower tariff levels in certain industries are associated with an increase in the number of products exported corresponding to these industries by each country. I also focus on the diversification of export products as measured by the Theil index described in section III. Finally, I examine whether increased access to intermediate inputs due to tariff cuts leads to movements downstream in the products exported in these industries. For this purpose I construct an industry-level version of the measure of upstreamness/downstreamness discussed in section V.

Due to the lack of data available on tariffs for earlier periods, I focus on the period 1990-2000. As I discussed in section VI, the trade liberalization reforms in many developing countries occurred during this period. I use input-output tables specific to each country to construct these tariffs at the country-industry-year level. The list of countries in the sample – determined by the availability of tariff data and input-output tables – is reported in table VII.C.

I first focus on the effect of tariffs on intermediate inputs on the number and diversification of exports. These diversification measures are also defined at the industry level. I estimate the following equation, where “i” stands for industry, “c” for country and “t” for year. I include year, country and industry fixed effects, and exploit the variation of input tariffs along these three dimensions.

$$Diversification_{ict} = Input\ Tariff_{ict} + \mu_t + \delta_c + \theta_i + \varepsilon_{ict} \tag{7.1}$$

Next, I focus on the effect of input tariffs on the position along supply chains of the products exported by each industry. I compute a measure of the upstreamness/downstreamness index described in section V at the industry level. I estimate the following regression.

$$\text{Upstreamness/Downstreamness Index}_{ict} = \text{Input Tariff}_{ict} + \mu_t + \delta_c + \theta_i + \varepsilon_{ict} \quad (7.2)$$

The results are shown in table VII.A and indicate that lower input tariffs lead to a larger variety of exported products (right column) and to more downstreamness of the exported products in each industry. A one standard deviation reduction in input tariffs is associated to a 0.07 standard deviations increase in the number of exported products (right column) and a 0.26 standard deviations increase in downstreamness. Due to the relatively small number of countries for which there is data available on tariffs and input-output tables, I do not split the sample across country groups.

Table VII.A: Effect of Tariffs on Imported Intermediate Inputs on the Number of Exported Products and on the Upstreamness/Downstreamness of Exports.

Dependent Variable:		
	Upstreamness/Downstreamness Index	Number of Exported Products
Input Tariff	-0.007 *** 0.001	-0.14 ** 0.068
Input Tariff (Standardized Coefficients)	-0.26	-0.07
Year fixed effects	Yes	Yes
Country fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Number of Observations	731	732
R-squared	0.786	0.751

Notes. This table reports the estimation of equation 7.1 and 7.2. The dependent variable is the upstreamness/downstreamness index defined at the industry level (left column) and the number of exported products (right column). Each estimation includes country, industry and year fixed effects. Standard errors are clustered at the country and year level. ***, ** and * denote significance at the 1%, 5% and 10% confidence levels.

Table VII.B: List of Countries with Industry-Level Data on Tariffs on Imported Intermediate Inputs.

Argentina	Indonesia	Thailand
Bolivia	Mexico	Turkey
Chile	Morocco	Uruguay
China	Nepal	Venezuela
Colombia	Peru	South Africa
Ecuador	Philippines	
India	Sri Lanka	

VIII. Conclusions.

This paper has analyzed the role of trade liberalizations on widening the variety and diversification of imported intermediate inputs by developing and low income countries. It has then related the access to imported intermediate inputs to a greater diversification of these countries' export baskets. I have also shown that trade liberalization leads to movements towards more downstream stages of supply chains. These results highlight the importance of studying vertical linkages in order to understand the process of export diversification. Much is left for future research, including further examination at the firm level regarding the link between access to imported intermediate inputs and export diversification. Efforts in improving the availability of data on trade flows and trade policy – especially tariffs – would be of great value.

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