

Local Income Changes and Export Opportunities

How to avoid the Middle Income Trap

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Motivation

- ▶ Structural transformation is at the heart of economic development
- ▶ Successful DEEs substitute low valued-added goods with more *sophisticated* products
- ▶ From inside- to on-the frontier innovation is not automatic!
- ▶ Risk of Middle Income Trap (episodes of growth slow down)

What I will do

- ▶ Look into degree of sophistication of the export structures and study its dynamics (Fortunato and Razo, 2013)
 - ▶ Built up an index using Hausman, Hwang and Rodrik (**HHR**)
 - ▶ Assess the importance of Sophistication for Growth
 - ▶ Study how export sophistication evolves through time (and the risk of middle income trap) assuming a Markov process
- ▶ Policy discussion (Klinger, 2009)
- ▶ The case of Africa (Fortunato and Valensisi, 2011)

An Export Sophistication index

- ▶ **HHR** propose a measure of the *sophistication* of a country's export package to capture the implied productivity of exported goods.
- ▶ Idea: when exporting a good, countries reveal their productivity levels (cfr RCA) therefore the characteristics of the exporters reveal important information about the product;
- ▶ In particular **HHR** look at the income of the exporters as a way to capture the implicit productivity (i.e. the sophistication) of exported goods



- ▶ If a product accounts for a large percentage of poor-country exports but a small percentage of rich-country exports, then it will have a low level of sophistication. Conversely, if a product accounts for a large percentage of rich countries export packages but is not significant among poor-countries, it will have a higher level of sophistication.
- ▶ The more the export structure is similar to the one of the richest countries, the more it is sophisticated

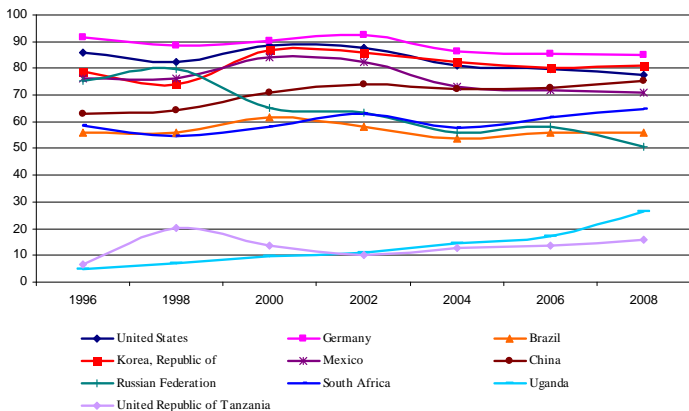
- ▶ There is significant variance in this relationship (Poland versus Argentina).
- ▶ Outcomes-based, whereas past metrics were based on a priori assumptions of sophistication (e.g. all agriculture is less sophisticated, all manufactures are more sophisticated)

Descriptive statistics

Top and bottom five countries by average SI: 1996-2008

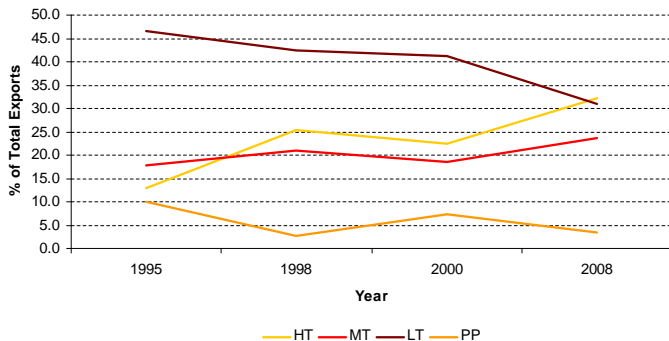
Country	Highest average SI	Country	Lowest average SI
Ireland	95.69	Burundi	7.42
Switzerland	95.66	Rwanda	4.70
Japan	94.82	Ethiopia	4.60
Finland	91.84	Mali	4.18
Singapore	90.53	Malawi	2.70

Evolution of the sophistication index for selected countries: 1996-2008



The two sides of the BRICS: Chinese boom

China Export's Structure: 1995-2008



Growth Regressions

- ▶ Cross country growth regressions: 1996-2008
- ▶ Rat race among **Sophistication, Technological content** and **Diversification**

The Results

Cross country growth regressions: 1996-2008

	(1)	(2)	(3)	(4)	(5)
	Growth	Growth	Growth	Growth	Growth
Variables					
Expy	0.0147*** (0.004)	0.0153*** (0.004)	0.01** (0.003)	0.01** (0.004)	0.01* (0.004)
HHI	0.00002 (0.00003)	-0.00001 (0.00003)	-0.00002 (0.00002)	-0.00002 (0.00002)	-0.00002 (0.00005)
Tech/Exports	0.004 (0.006)	-0.0065 (0.006)	-0.002 (0.005)	-0.0015 (0.006)	-0.0015 (0.006)
GDP per capita	-0.00003*** (0.000001)	-0.00003*** (0.000001)	-0.00003*** (0.000001)	-0.00003*** (0.000001)	-0.00003*** (0.000001)
FDI/GDP		0.022*** (0.005)	0.014*** (0.004)	0.014*** (0.005)	0.0135** (0.005)
Capital formation			0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)
Trade/GDP				0.0003 (0.001)	0.0003 (0.001)
Schooling					-0.0007 (0.001)
Constant	0.434** (0.154)	0.46*** (0.145)	-0.065 (0.15)	0.052 (0.16)	0.067 (0.16)
Observations	168	168	168	168	168
R-squared	0.08	0.19	0.35	0.35	0.35

These results illustrate that a country's relative level of export sophistication has significant consequences for subsequent growth. That is to say, if a country has a sophisticated export basket relative to its level of income, subsequent growth is much higher.

Sophistication as a Markov process

- ▶ We assume that **the sophistication of the export structure in each country evolves overtime as an exogenous first-order Markov process** (i.e. the conditional probability distribution of future states of the process depends only upon the present state)

Sophistication as a Markov process

- ▶ We are assuming that
 - ▶ The characteristics at a certain point in time (e.g. the **capital stock**, the **behavioral rules of each firm** and the **public policies**) describe entirely the current state of country's export and can be used to make an assessment on the future evolution
 - ▶ Capabilities literature (Sutton, 2001): whether or not a country is able to venture into new activities is determined by the existing set of capabilities

Related Literature

- ▶ Technological evolution: Nelson and Winter (1982)
- ▶ Productivity changes: Fernandes and Isgut (2008) and Funke and Hao Yu (2009)
- ▶ Switches of growth regimes: Jerzmanowki (2006)

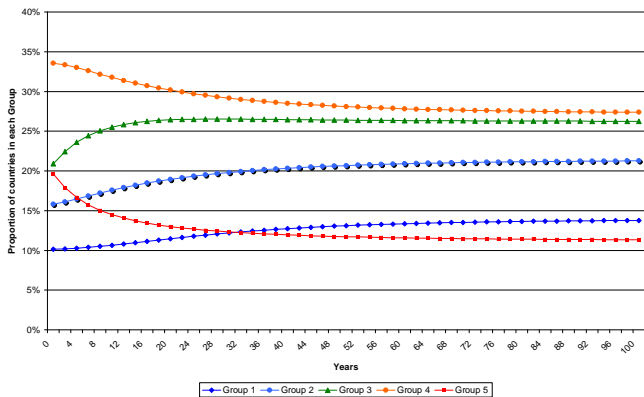
What we do

In a nutshell:

- ▶ We divide the countries in five sophistication groups (based on the SI index)
- ▶ We calculate the probabilities of switching sophistication group every two years and then average the transition probabilities (TPM)
- ▶ We use the TPM to estimate the proportion of countries in each group after n periods in the future



The results: Benchmark case



- ▶ Relative quick convergence towards the steady state (80 years)
- ▶ The proportion of countries in the highest sophistication groups increases from 26% to 32%
- ▶ The proportion of countries in the lowest sophistication groups, 4 and 5, decreases from 54% to 41%
- ▶ Getting stuck in intermediate (and even low) sophistication levels is a real problem

The results: allowing for structural differences

- ▶ We separate countries according to their initial income level and calculate two transition probability matrices (top 20% and remaining 80%)
- ▶ In the steady state, the richest countries will remain in the top 2 sophistication groups with a probability above 80%, whereas the lower income countries will remain with 80% probabilities in the middle and lower sophistication groups

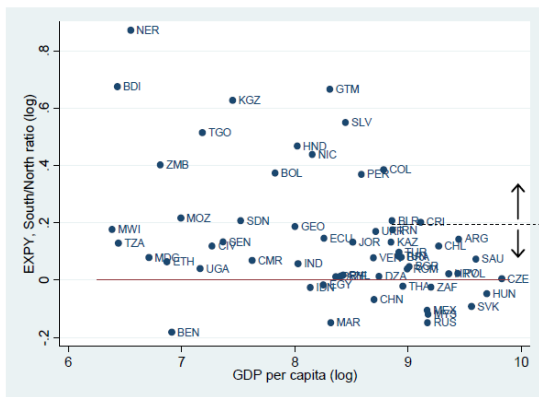
Policy Remarks

- ▶ Under the export dynamics observed during the period 1996-2008, most countries will get stuck in the intermediate levels of export sophistication and only very few developing economies will eventually manage to climb to the top of the sophistication ladder
- ▶ Need Policy! But what?



- ▶ Encourage entrepreneurship and investment in **new** activities
 - ▶ Increase the private returns to innovation (ex ante) but also push out unproductive firms to avoid moral hazard (ex post)
 - ▶ Public sector credit or guarantees that operate by transferring part of the risk of failure to the government better than trade protection
- ▶ Meaningful exchange rate policy
 - ▶ Avoid overvaluation in resource-abundant countries
 - ▶ Avoid undervaluation at middle levels of income since it may slow the movement of resources into more technologically sophisticated activities and weaken the incentive to move up the technological ladder
- ▶ Choosing the "right" trade partners
 - ▶ South-South exports are more sophisticated than North-South
 - ▶ South-South foster manufacture sector and generates more technological spillover

Sophistication of Northbound and Southbound Exports

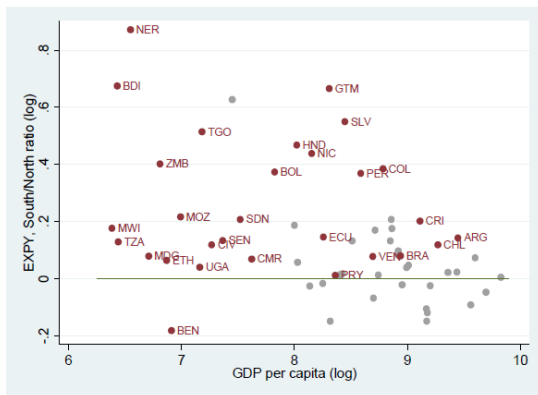


Exports to the South
are more
sophisticated than
exports to the North

Exports to the North
are more
sophisticated than
exports to the South

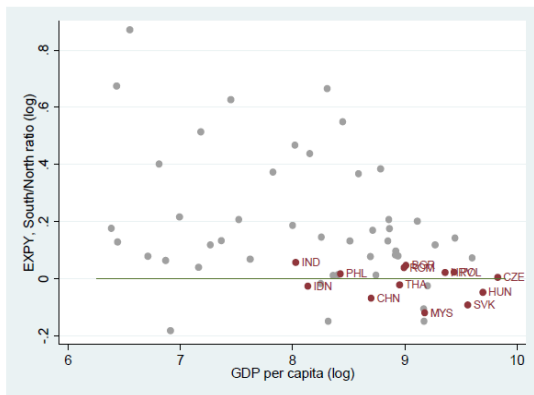


Results by region: Africa and Latin America



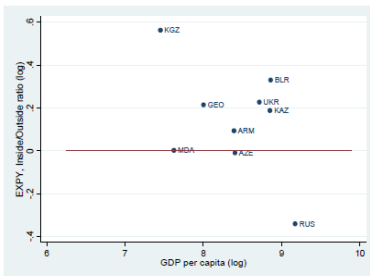


Results by region: Asia and eastern Europe

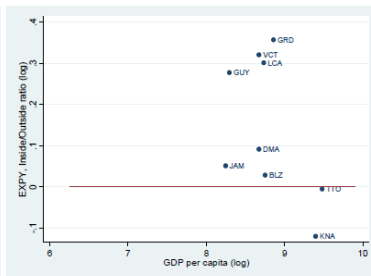


Results by Trade Blocs: CIS and CARICOM

CIS



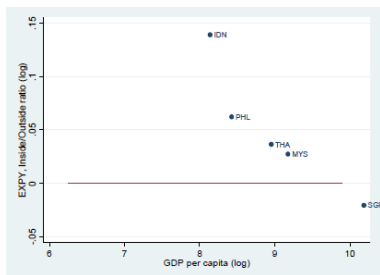
CARICOM



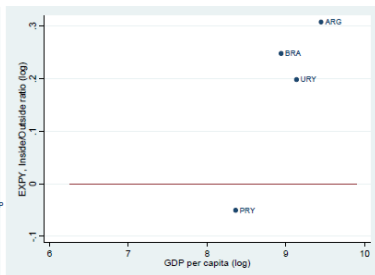


Results by Trade Blocs: ASEAN and MERCOSUR

ASEAN

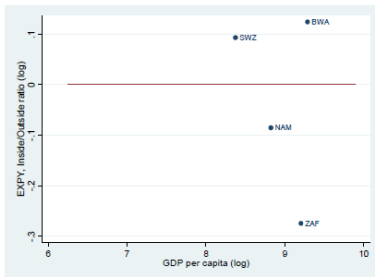


MERCOSUR

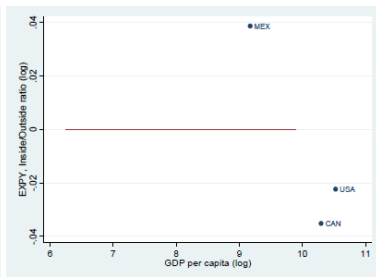


Results by Trade Blocs: SACU and NAFTA

SACU

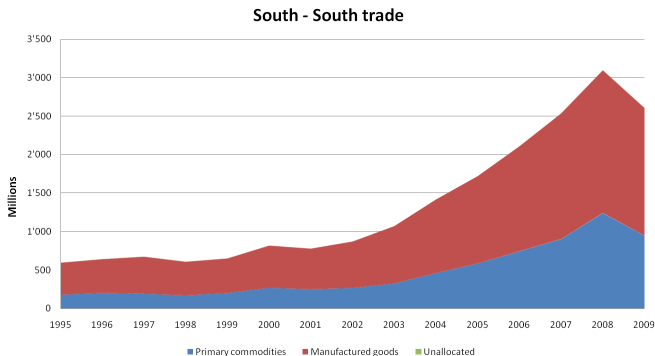


NAFTA

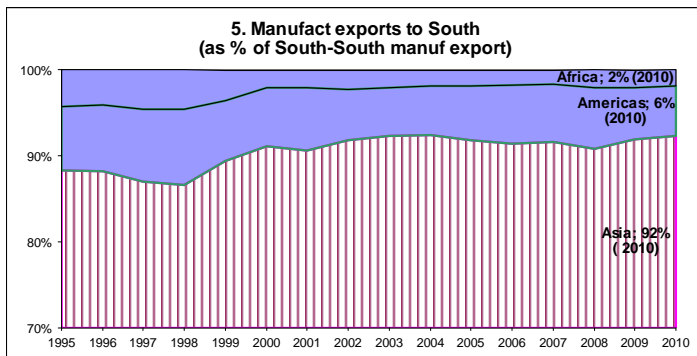




Over 60% of South-South export is in manufacture



From the South to the South



Summing Up

- ▶ Over 90% of South-South manufactures export comes from Asia
- ▶ Emerging regional specialization: Asia exports manufactured goods and Africa and Americas export commodities to Asia
- ▶ Fuels dominate Africa's export to Americas, while basic food items are the main export from Americas to Africa
- ▶ In **trade within a region**, however, **manufacture export claims the highest share both in Africa and Americas**

- ▶ Step I (**product level**): Weighted average of the GNI per capita of the countries exporting that product (i.e. the implicit productivity level)

$$PRODY_k = \sum_j \frac{X_{kj} / X_j}{\sum_j (X_{kj} / X_j)} Y_j$$

If a product accounts for a large percentage of poor-country exports but a small percentage of rich-country exports, then it will have a lower PRODY as it is a “poor-country” export. Conversely, if a product accounts for a large percentage of rich countries export packages but is not significant among poor-countries, it will have a higher PRODY.

- ▶ Step II (**country level**): The average of the PRODY of each good that a country exports, weighted by that product's share of total exports

$$EXPY_{jt} = \sum_k \frac{X_{kjt}}{X_{jt}} PRODY_k$$

Since PRODY is measured using the GNI per capita of the typical exporter, rich countries have a high EXPY and poor countries have a low EXPY. There is significant variance in this relationship (Poland versus Argentina).

- ▶ Step III: Normalizing the index

$$SI_{jt} = \frac{EXPY_{jt} - \text{Min} \{EXPY_t\}}{\text{Max} \{EXPY_t\} - \text{Min} \{EXPY_t\}} 100$$

Estimating the Transition Probability Matrix

- ▶ We consider five possible states, or sophistication groups, based on the value of the sophistication index (SI) for each country.
- ▶ We then classify the 158 countries which compose our sample into their corresponding export sophistication group for every year
- ▶ We calculate the probabilities of switching sophistication group every two years during the analyzed period (6 matrices)
- ▶ We average the transition probabilities of those six matrices and construct an average transition probability matrix



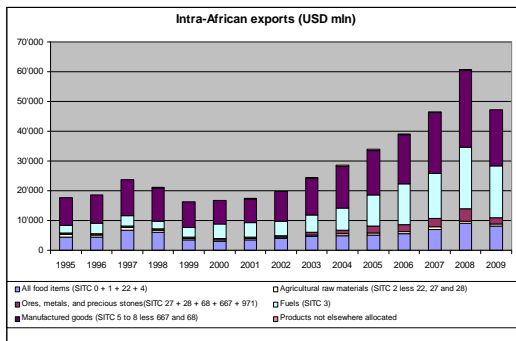
The Transition Probability Matrix

Initial state \ Future state	1	2	3	4	5	Total
1	0.83	0.16	0.01	0.00	0.00	1
2	0.10	0.78	0.11	0.01	0.00	1
3	0.00	0.09	0.77	0.13	0.01	1
4	0.00	0.01	0.11	0.77	0.10	1
5	0.00	0.01	0.03	0.23	0.72	1

We can calculate the probabilities that a country starting in Group i will be in Group j after a given number of periods, n
 Based on this result we can also calculate the proportion of countries in each group after n periods



Intra-African Exports Composition (Fortunato and Valensisi 2011)





All good things go together (sometimes)

Figure 2. 1995-2009 growth rates of African countries exports by destination

