Uneven growth in the extensive margin: explaining the lag of agricultural economies

Guzmán Ourens

Tilburg University

RIDGE Workshop on Macro and Development, Buenos Aires.

December, 2018

Table of Contents

Table of Contents

MOTIVATION

To understand cross-country income differences, it is important to see how much countries produce, but also the prices they obtain.

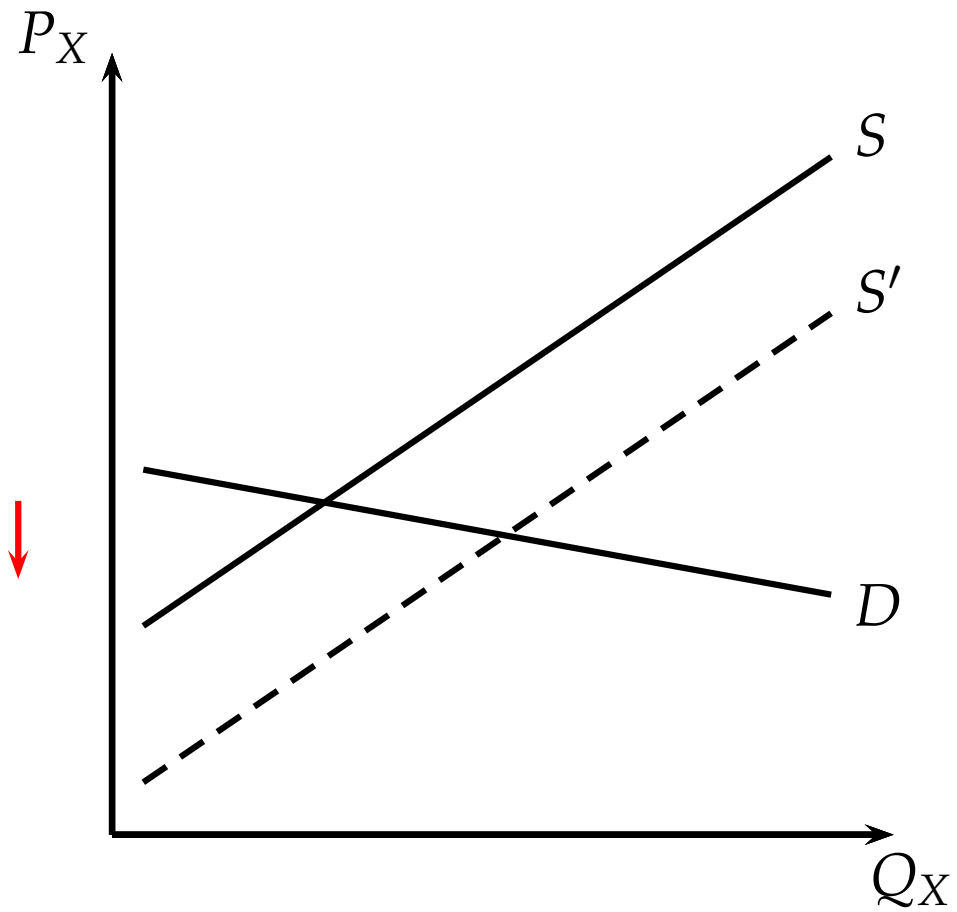
If focus is placed in *intensive margin*: **Terms of Trade Effect** (TTE):

- Fast growing economies tend to experience a deterioration in TT
- with TT=price of exports/price of imports

(Acemoglu and Ventura, 2002)

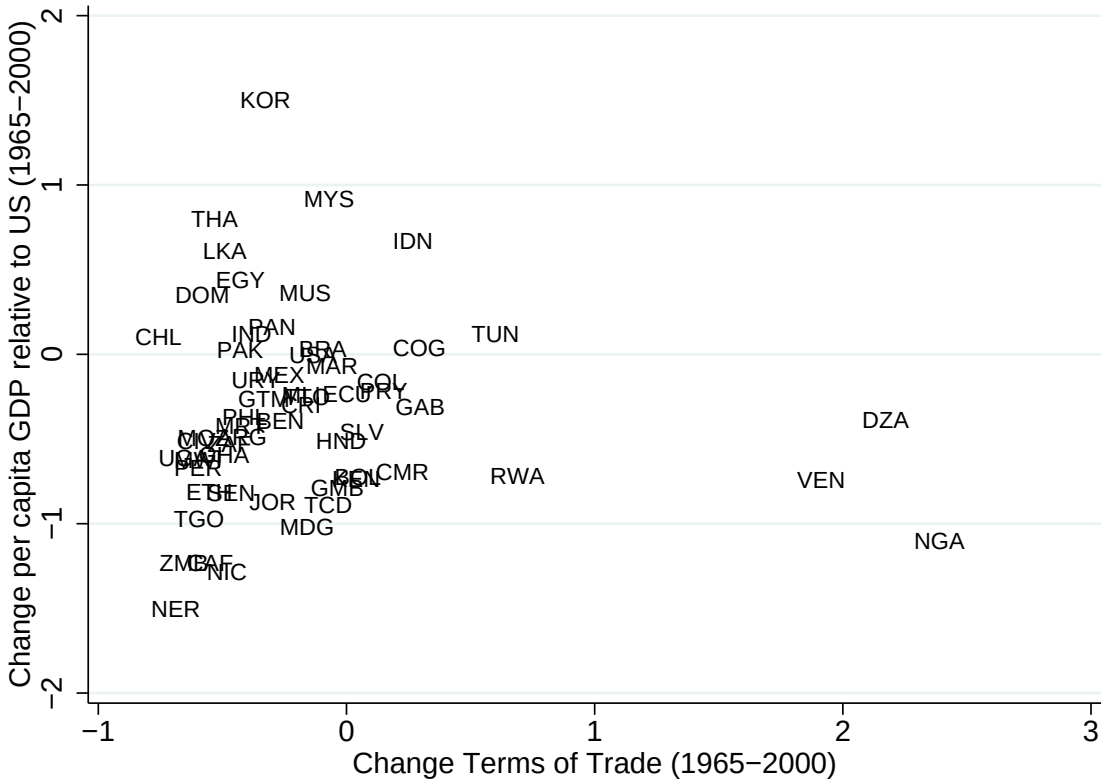
Motivation

Figure: Effect of relative growth on export prices



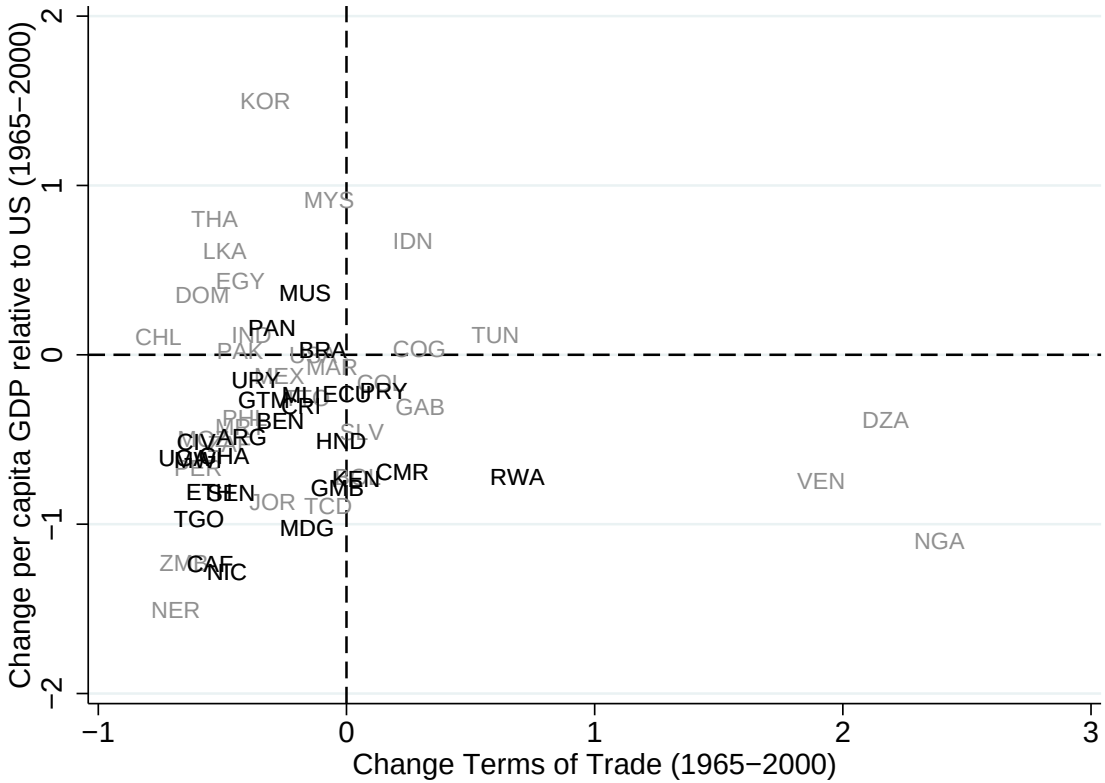
TERMS OF TRADE DETERIORATE FOR A-PRODUCERS

Figure: Change in real income relative to the US and terms of trade (1965-2000)



TERMS OF TRADE DETERIORATE FOR A-PRODUCERS

Figure: Change in real income relative to the US and terms of trade (1965-2000)



AV

MOTIVATION

Agricultural economies seem to experience a **reversed TTE**

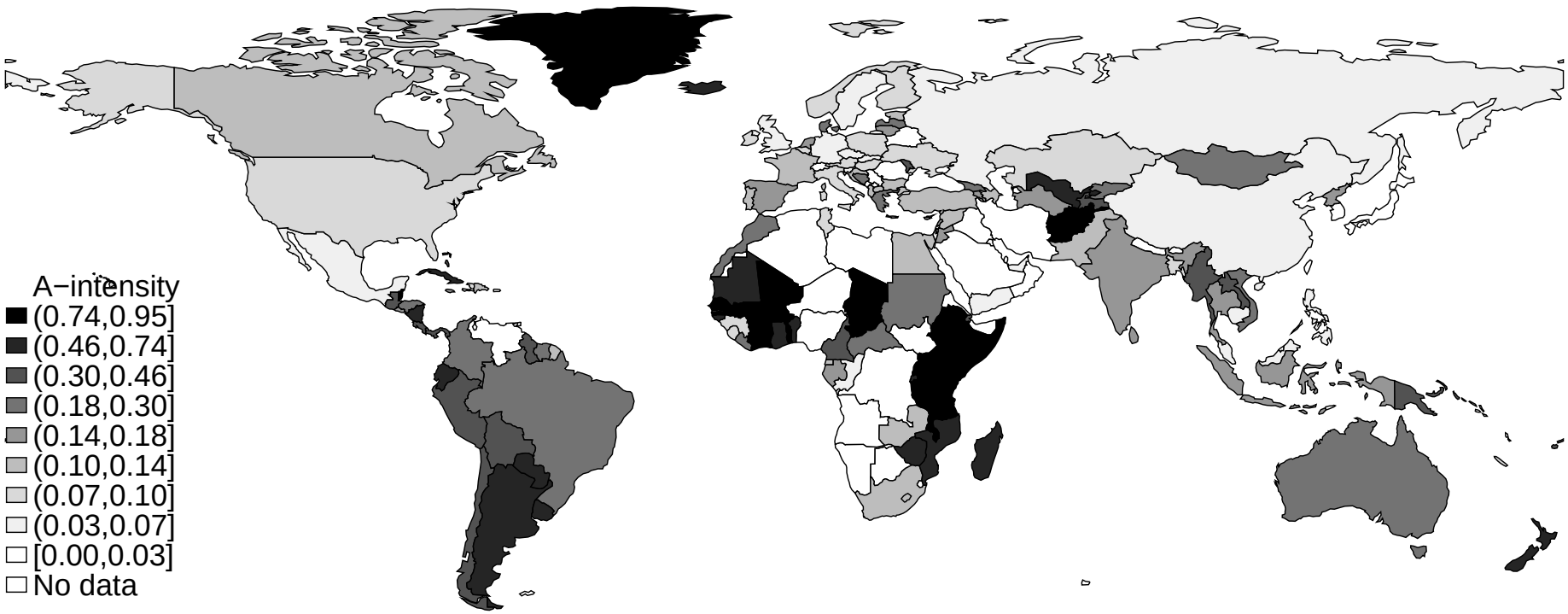
- outgrown by others (with otherwise similar characteristics)
- and terms of trade deterioration

What are the driving forces behind these patterns?

- Understanding this is crucial to explain development problems faced by economies with large CA in the A-sector.

Motivation

Intensity of A-exports by country (2000)



In a nutshell

In the present work we

- document a new growth fact: $g_A < g_M$
- show it can explain the patterns we see for A-economies

Our mechanism:

- focuses on the *extensive margin* of growth
  - abstracts from TFP growth, quality improvements and structural change

Our model sheds light on why diversification is uneven.

THE MECHANISM

$g_A < g_M$

$\Rightarrow$ diversity-loving consumers shift their expenditure away from A

$\Rightarrow$ the region specialized in A earns a falling share of world value

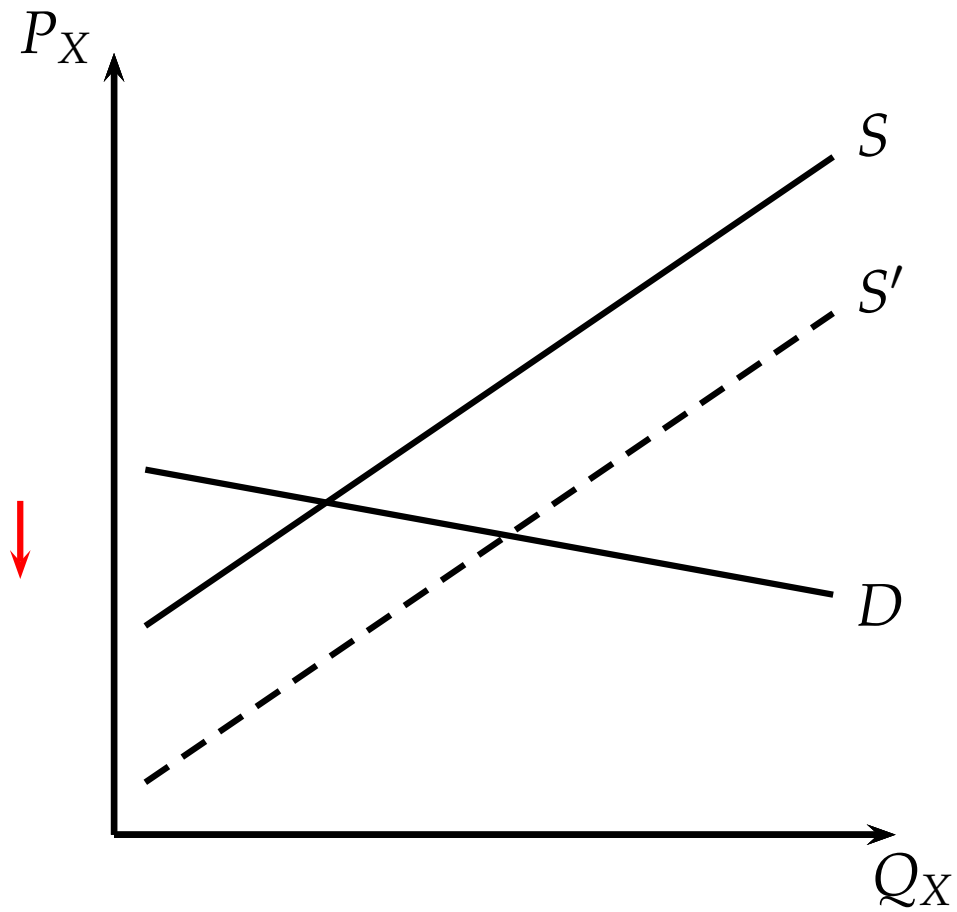
$\Rightarrow$ the aggregate value of firms producing A falls

$\Rightarrow$ this translates into falling relative wages

$\Rightarrow$ terms of trade deteriorate for that region.

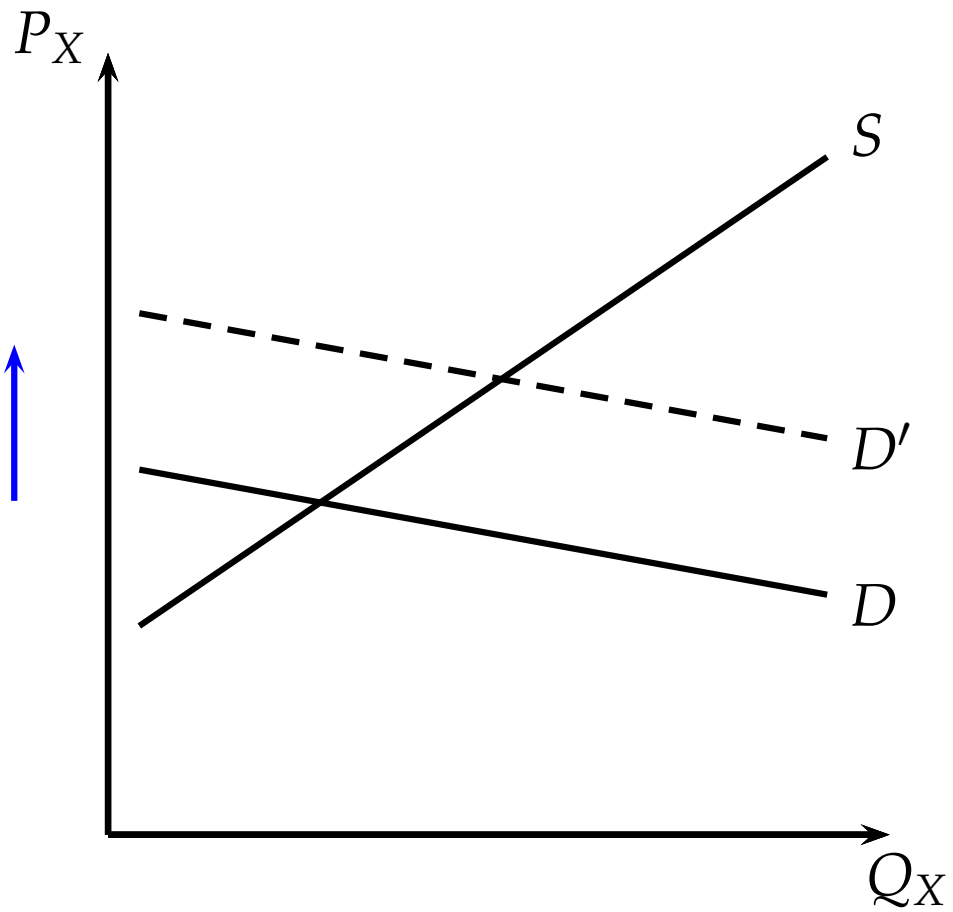
Motivation

Figure: Effect of relative growth on export prices



Motivation

Figure: Effect of relative growth on export prices



Competing Explanation

A reversed TTE can be accounted for in a model with

- uneven growth (intensive margin) +
- non-homothetic preferences

We contrasts empirically the predictions of both models and show that uneven growth in the extensive margin must be playing a role.

Moreover, our model:

- features endogenous income-elasticities of demand
- provides an intuitive link between a lagging tech and preferences

Related literature

My work is related to previous efforts on:

- **Sector-specific growth** in particular: Caselli (2005), Vollrath (2009), Hidalgo et al (2007), Hidalgo and Hausmann (2011), Rodrik (2016).
- **Terms of trade effect**: Prebisch (1950), Singer (1950), Krugman (1989), Feenstra (1996), Acemoglu and Ventura (2002).
- **Resource curse**: Sachs and Warner (2001), Auty (2007).
- **Structural change**: Lewis (1954), Baumol (1967), Matsuyama (1992), Murata (2002), Ngai and Pissarides (2007), Gollin et al (2012).
- **Engel's law**: Matsuyama (1992, 2000), Foellmi and Zweimuller (2008), Boppart (2014).
- **Diversification and welfare**: Broda and Weinstein (2006, 2010).

Table of Contents

DATA

- World trade flows from:
  - Raw UNCOMTRADE: 1962-2014, 5-digit, SITC Rev1.
  - Feenstra (2005): 1962-2000, 4-digit, SITC Rev2.
  - BACI92: 1992-2005, 6-digit, HS0.
- PWT, WDI, Sala-i-Martin et al (2004) and Barro and Lee (1993)

We construct three different lists of agricultural goods: Ai with $i = 1, 2, 3$. List Elast

Then we define n_{cit} =# of codes within industry i exported by c at t.

Then we compute

$$g_{c,i,t} = \frac{n_{cit+10} - n_{cit}}{n_{cit}}$$

What is a code in each classification?

In SITCRev1:

- 6 Manufactured goods classified chiefly by material
  - 665 Glassware
    - 66511 Commercial containers of glass,etc.
    - 66512 Inners for vacuum vessels

In HS0:

- 07 Edible vegetables and certain roots and tubers
  - 0713 Vegetables, leguminous dried, shelled
    - 071332 Beans, small red (Adzuki) dried, shelled
    - 071333 Kidney beans and white pea beans dried shelled

What is a bin in each classification?

Figure: Difference between Kidney beans (left) and Adzuki beans (right)

Domestic production data

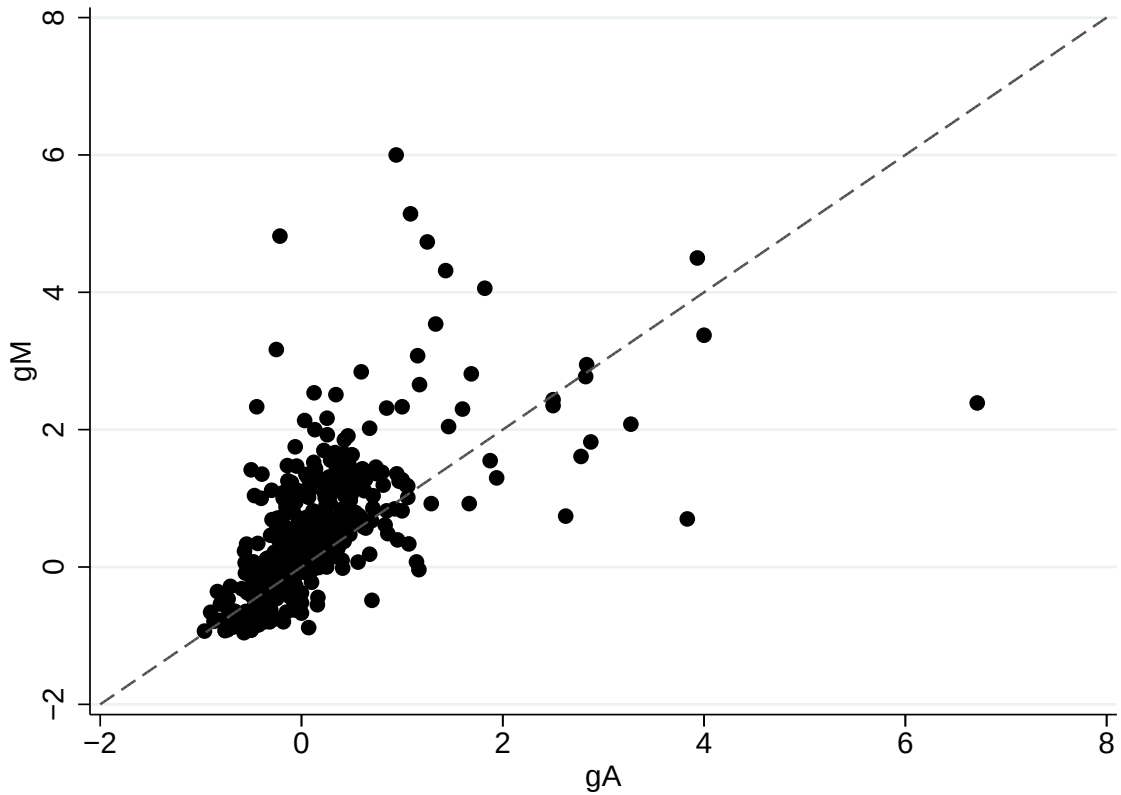
Number of producing firms from:

- EU: Eurostat.
  - Agricultural training of farm managers dataset, 2005, 2010 and 2013.
  - Manufacturing firm records in Structural business statistics (SBS), 2008-2015.
- US: Census Bureau's Statistics of US Businesses (SUSB), NAICS 6-d, 1998-2015.

Table of Contents

$g_A < g_M$

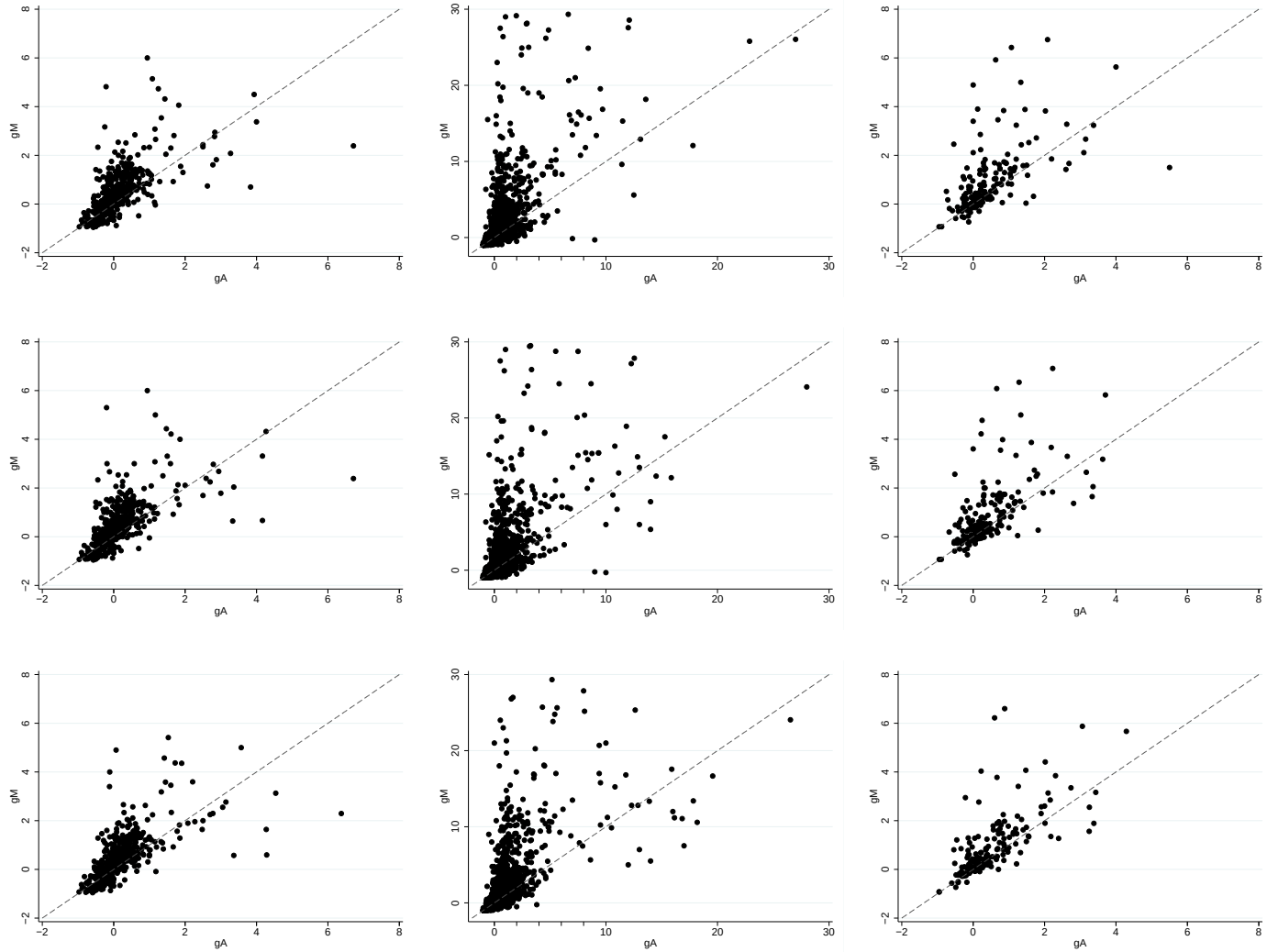
Figure: 10-year diversification rates in M and A goods for each country (g_{A1} and g_{M1}), 4-digit data (1962-2000)



model

$g_A < g_M$

Figure: g_{Ak} and g_{Mk} with $k = 1, 2, 3$



$g_A < g_M$

Table: Testing for differences in 10-year diversification rates, 4-digit data (1962-2000)

	$gM1 = gA1$	$gM2 = gA2$	$gM3 = gA3$
mean(gM)	0.681	0.673	0.653
sd(gM)	5.599	5.478	4.935
mean(gA)	0.210	0.233	0.270
sd(gA)	1.668	1.725	1.997
Obs.	559	559	559
$Ha : gM < gA$	0.996	0.995	0.998
$Ha : gM \neq gA$	0.008	0.009	0.004
$Ha : gM > gA$	0.004	0.005	0.002

$g_A < g_M$

Table: Testing for differences in 10-year diversification rates, 5-digit data (1962-2000)

	$gM1 = gA1$	$gM2 = gA2$	$gM3 = gA3$
mean(gM)	0.379	0.362	0.368
sd(gM)	1.013	0.981	0.998
mean(gA)	0.162	0.192	0.198
sd(gA)	0.516	0.551	0.559
Obs.	559	559	559
$Ha : gM < gA$	1.000	1.000	1.000
$Ha : gM \neq gA$	0.000	0.000	0.000
$Ha : gM > gA$	0.000	0.000	0.000

$g_A < g_M$

Table: Testing for differences in 13-year diversification rates, 6-digit data (1992-2005)

	$gM1 = gA1$	$gM2 = gA2$	$gM3 = gA3$
mean(gM)	0.766	0.770	0.754
sd(gM)	1.264	1.281	1.218
mean(gA)	0.375	0.393	0.428
sd(gA)	0.806	0.759	0.812
Obs.	219	219	217
$Ha : gM < gA$	1.000	1.000	1.000
$Ha : gM \neq gA$	0.000	0.000	0.000
$Ha : gM > gA$	0.000	0.000	0.000

$g_A < g_M$

Table: Testing for differences diversification rates, the rate of each sector being the average diversification of 2-digit lines within that sector, 4-digit data (1962-2000)

	$gM1 = gA1$	$gM2 = gA2$	$gM3 = gA3$
mean(gM)	0.512	0.520	0.515
sd(gM)	1.300	1.449	1.369
mean(gA)	0.264	0.282	0.338
sd(gA)	0.621	0.681	0.884
Obs.	566	566	564
$Ha : gM < gA$	1.000	1.000	1.000
$Ha : gM \neq gA$	0.000	0.000	0.000
$Ha : gM > gA$	0.000	0.000	0.000

$g_A < g_M$

Figure: g_{Ak} and g_{Mk} with $k = 1, 2, 3$, domestic production data for EU countries and the US

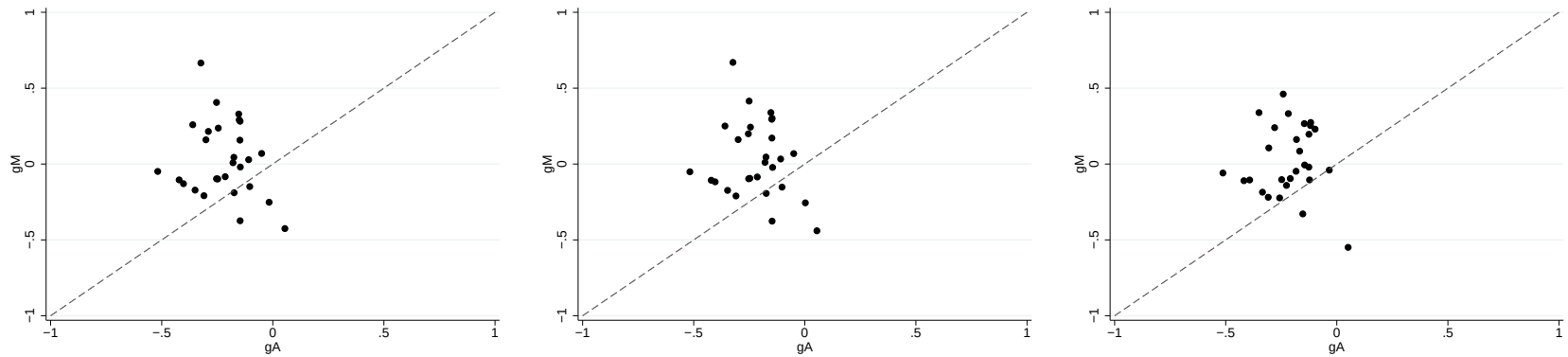


Table of Contents

SETUP

- 2 regions $c = N, S$
- 1 productive factor L_c (constant)
- 2 industries $i = M, A$ with multiple (homogeneous) firms that:
  - invest in R&D to develop a new varieties
  - engage in final good production
- R&D efforts generate spillovers within the industry
- Trade is perfectly free across regions
- Regions are perfectly specialized:
  - N produces M-goods
  - S produces A-goods

Growth Dynamics

$$g_i = \frac{L_i}{a_i \sigma_i} - \frac{\sigma_i - 1}{\sigma_i} \rho$$

$g_A < g_M$ if some combination of the following holds

- $\sigma_A > \sigma_M$ Elast
- $L_A < L_M$
- $a_A > a_M$ Prox

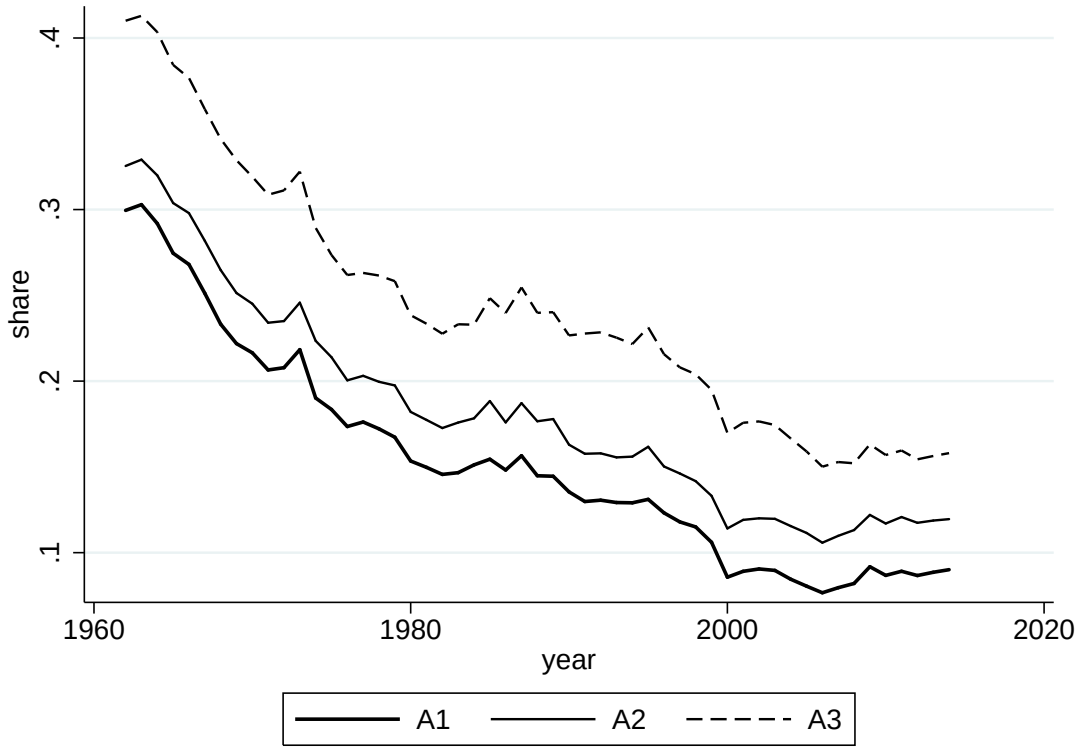
Assumption

We assume the vector of parameters is such that $g_A < g_M$.

Table of Contents

Declining share of natural resource-based products in international trade

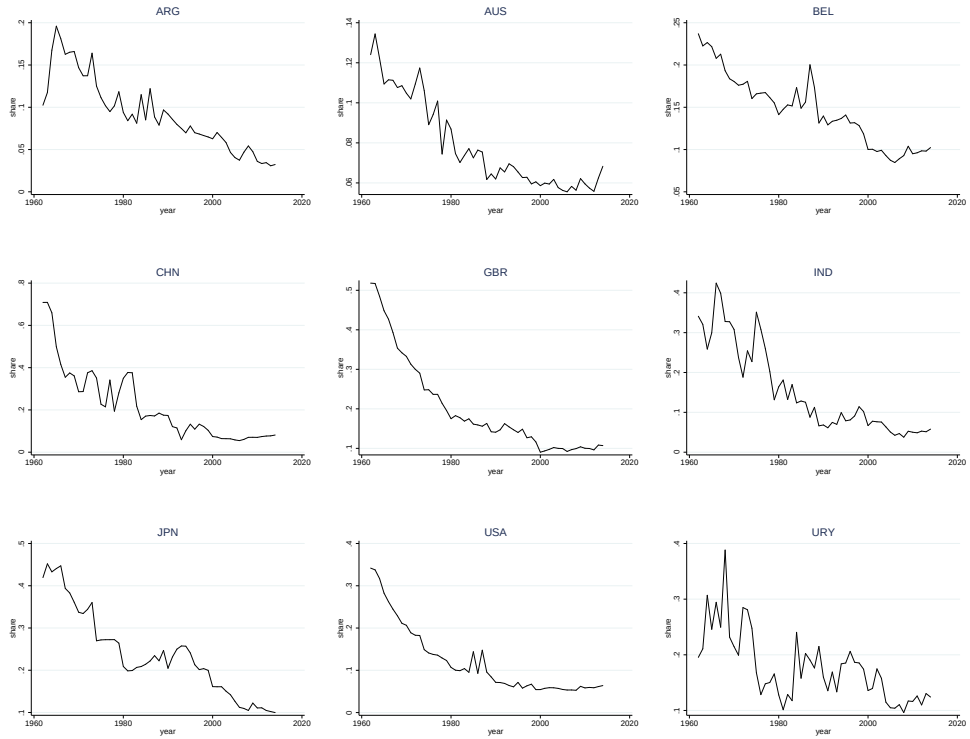
Figure: Share of A-goods in worldwide trade (1962-2015)



skip

Declining share of natural resource-based products in international trade

Figure: Share of A1-goods in imports for a sample of countries (1962-2015)



Uneven import diversification between industries

Table: Trends in import diversification

Dependant var:	r1	r2	r3	rE
year	-0.004***	-0.003***	-0.004***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
_cons	7.330***	7.047***	8.174***	5.289***
	(0.128)	(0.125)	(0.127)	(0.091)
Country-FE	Yes	Yes	Yes	Yes
Observations	5712	5712	5712	5712
R^2	0.357	0.347	0.404	0.363

Relative price index vs terms of trade

Comparing the predictions of our model with one of uneven output growth and non-homothetic prefs.

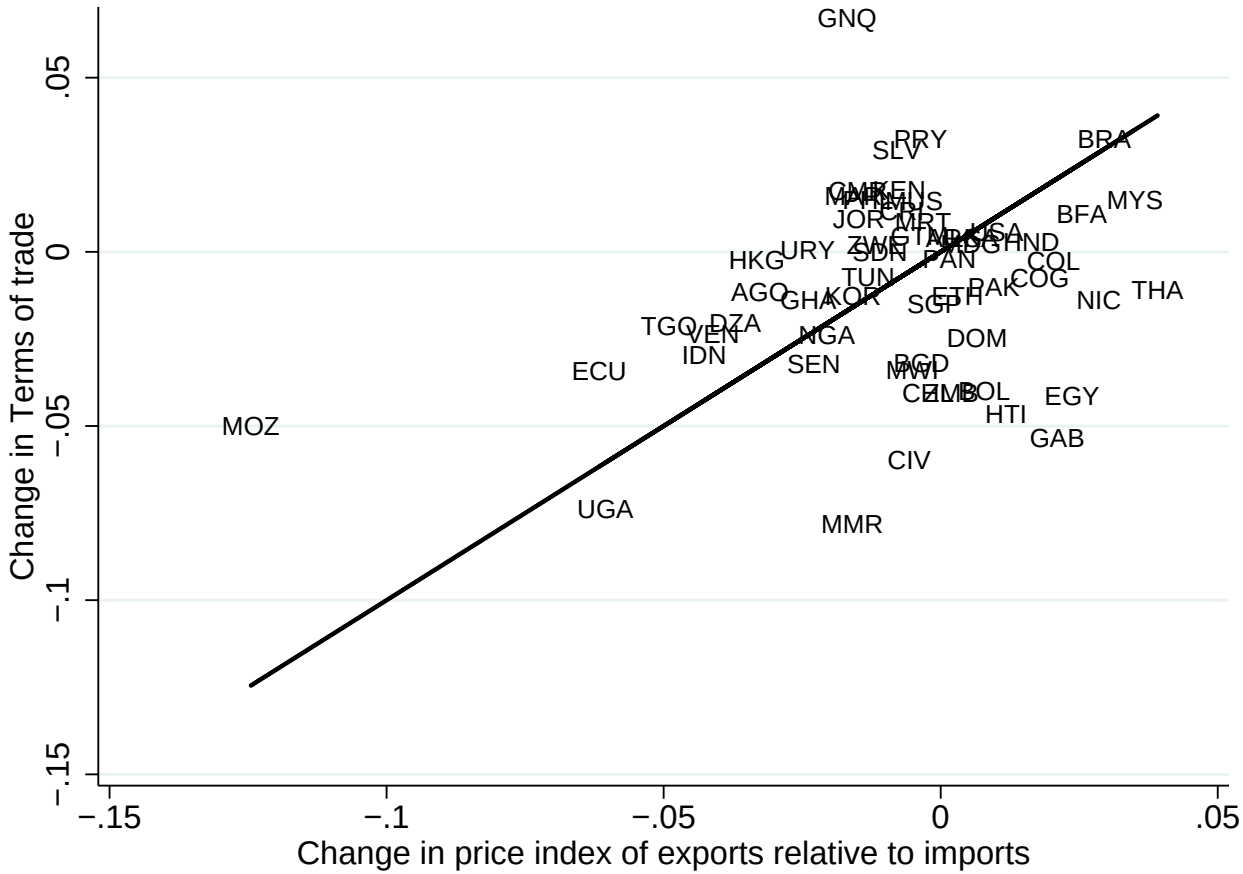
- We can write terms of trade for the South as:

$$\underbrace{\frac{p_A(t)}{p_M(t)}}_{TT} = \underbrace{\frac{n_A(t)^{1/(\sigma_A-1)}}{n_M(t)^{1/(\sigma_M-1)}}}_{\text{g ext. margin}} \underbrace{\frac{P_A(t)}{P_M(t)}}_{\text{P X/M}}$$

- Absent changes in the extensive margin, we should have a slope of one in the plane $[\Delta(p_A/p_M), \Delta(P_A/P_M)]$.
- Our model predicts a less steep relationship.

RELATIVE PRICE INDEX VS TERMS OF TRADE

Figure: Share of A-goods in worldwide trade (1962-2015)



RELATIVE PRICE INDEX VS TERMS OF TRADE

Figure: Share of A-goods in worldwide trade (1962-2015)

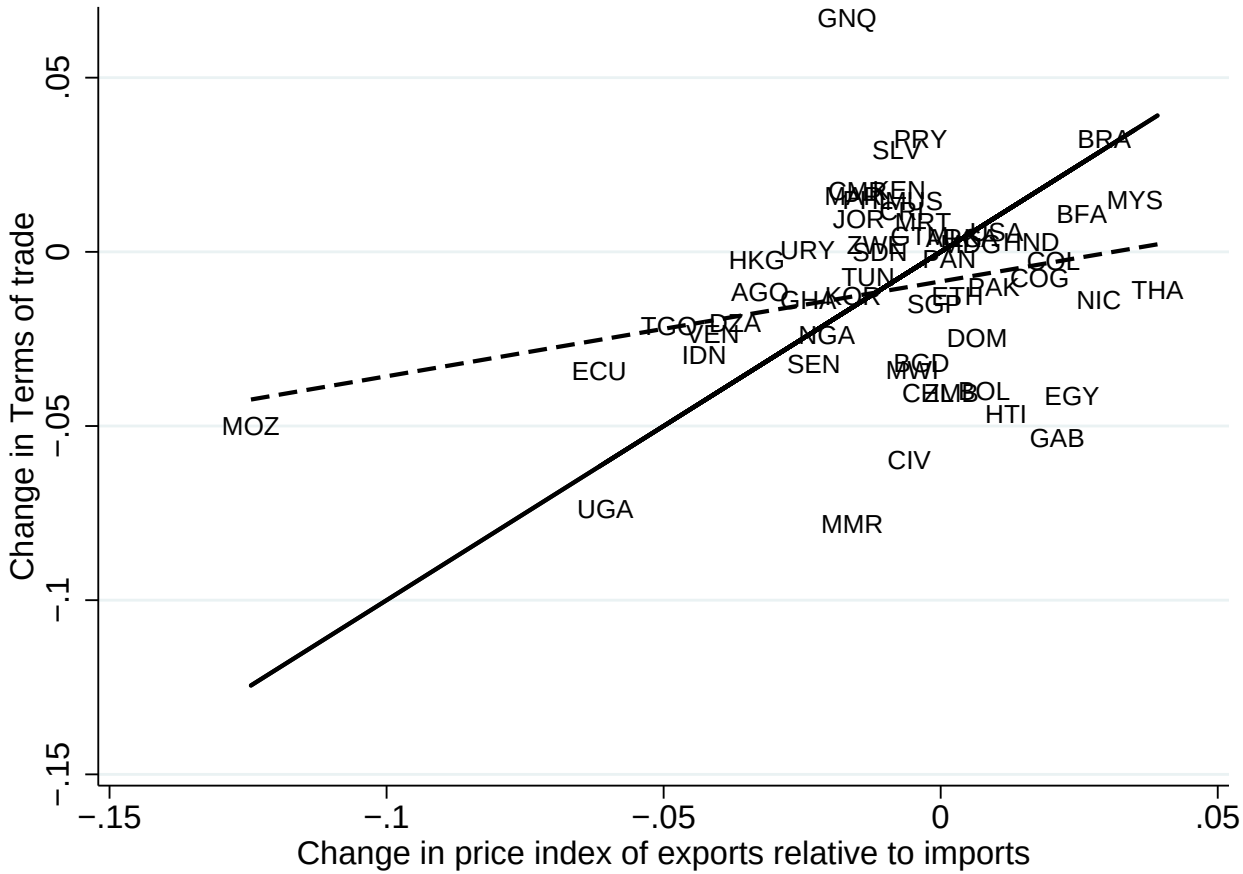


Table of Contents

In sum

This paper presents:

- evidence documenting: $g_A < g_M$.
- model showing this fact can explain divergence of A-economies.

Our model:

- provides a new explanation for falling TT for S
- links tech. differences and expenditure shifts between sectors

The mechanism could prove useful for other groups of products (or services) where diversification happens at consistently different rates.

Table of Contents

Thanks!

Table of Contents

List of A-goods in SITCRev2 4digits

Table: List of Ai and E-goods ($\forall i = 1, 2, 3$) as classified in SITCRev2 (4-digits)

Code	Description	A1	A2	A3	E
0011-0XXX	Food and live animals chiefly for food	X	X	X	
1110-1XXX	Beverages and tobacco	X	X	X	
2111-2320	Hides, skins and furskins, raw; Oil-seeds and oleaginous fruit; Natural rubber Cork and wood; Pulp and waste paper; Textile fibres (other than wool tops and other combed wool) and their wastes (not manufactured into yarn or fabric)	X	X	X	
2331-23XX	Synthetic or reclaimed rubber, waste and scrap of unhardened rubber.				X
2440-271X	Cork and wood; Pulp and waste paper; Textile fibres (other than wool tops and other combed wool) and their wastes (not manufactured into yarn or fabric); Fertilizers, crude	X	X	X	
2731-28XX	Stone, sand and gravel; Sulphur and unroasted iron pyrites; Natural abrasives, N.E.S. (including industrial dymonds); Other crude minerals; Metalliferous ores and metal scrap				X
2911-29XX	Crude animal and vegetable materials, N.E.S.	X	X	X	

List of A-goods in SITCRev2 4digits

Table: List of Ai and E-goods ($\forall i = 1, 2, 3$) as classified in SITCRev2 (4-digits)

Code	Description	A1	A2	A3	E
3221-3XXX	Mineral fuels, lubricants and related materials				X
4111-4XXX	Animal and vegetable oils, fats and waxes	X	X	X	
5111-51XX	Organic Chemicals		X	X	
5221-55XX	Inorganic chemicals; Dyeing, tanning and colouring materials; Medicinal and pharmaceutical products; Essential oils and perfume materials; Toilet, polishing and cleansing preparations				
5621-56XX	Fertilizers, manufactured		X	X	
5721-5XXX	Explosives and pyrotechnic products; Artificial resins and plastic materials, and cellulose esters and ethers; Chemical materials and products N.E.S.				

List of A-goods in SITCRev2 4digits

Table: List of Ai and E-goods ($\forall i = 1, 2, 3$) as classified in SITCRev2 (4-digits)

Code	Description	A1	A2	A3	E
6112-65XX	Leather, leather manufactures, N.E.S., and dressed furskins; Rubber manufactures, N.E.S.; Cork and wood manufactures (excluding furniture); Paper, paperboard and articles of paper pulp, of paper or of paperboard; Textile yarn, fabrics, made-up articles, N.E.S. , and related products			X	
6611-6XXX	Non-metallic mineral manufactures, N.E.S.; Iron and steel; Non-ferrous metals; Manufactures of metals, N.E.S.				X
7111-7XXX	Machinery and transport equipment				
8121-8XXX	Miscellaneous manufactured articles				
9110-9XXX	Commodities and transactions not classified elsewhere in the SITC				

back

List of A-goods in SITCRev2 4digits

Table: Summary stats for the elasticity of substitution within each list of goods

i	Ai				Mi			
	mean	median	sd	Obs.	mean	median	sd	Obs.
1	9.773	3.498	20.614	186	5.837	2.564	13.983	438
2	8.896	3.440	19.316	215	6.019	2.566	14.440	409
3	7.415	3.072	16.439	310	6.611	2.584	16.234	314

Data g

PROXIMITY BY SECTOR

Table: Summary statistics by sector: proximity of goods

i	Ai			Mi		
	mean	sd	Obs.	mean	sd	Obs.
1	0.143	0.047	195	0.179	0.044	423
2	0.147	0.048	222	0.179	0.044	396
3	0.158	0.051	312	0.177	0.043	306

i	Ai			Mi		
	mean	sd	Obs.	mean	sd	Obs.
1	0.159	0.045	195	0.201	0.051	423
2	0.156	0.044	222	0.203	0.051	396
3	0.163	0.046	312	0.208	0.052	306

g

CONTROLLING FOR SS

Figure: Changes in Terms of trade and GDP growth controlling for SS