A Note on the Interplay among Trade Facilitation, Global value chains and Income Inequality

WTO Public Forum, Geneva, September, 2016

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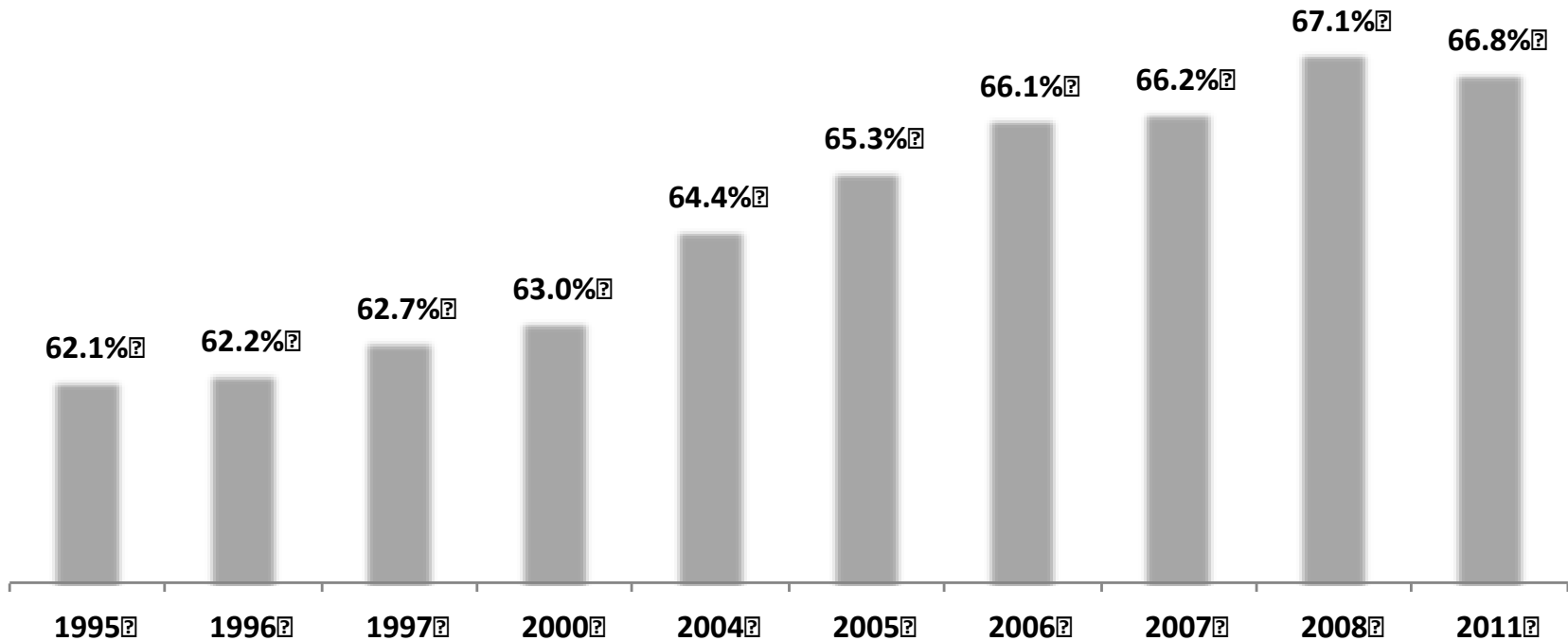**Getulio Vargas foundation**

Outline

1. Motivation: The increasing relevance of time as a trade barrier;

2. The relationship between time and Global Value Chains (capital intensive goods are more sensitive to time);

3. Can the TFA promote a new wave of fragmentation?;

4. How the TFA is likely to impact on global and country level income inequality?

5. Final remarks

1. An important trend in trade policy over the last decades is the remarkable reduction of tariff barriers worldwide, particularly in Developed and some Newly Industrialized economies (Kee et al, 2009).
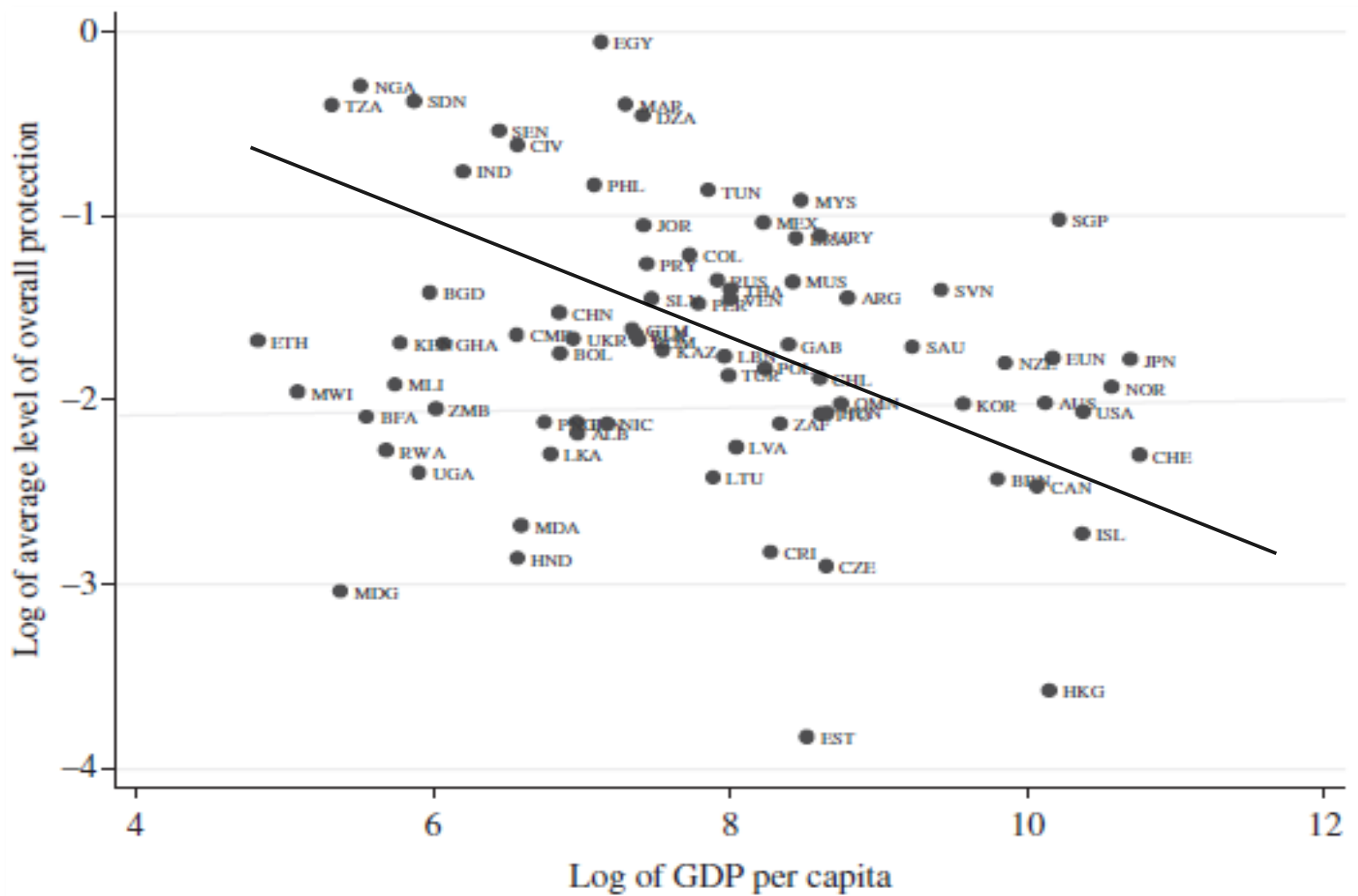
2. Lower Transport Costs and advances in communication technology have accelerated supply chain trade. Nowadays, over 2/3 of global exports corresponds to trade in intermediate goods...

| Year	Percentage
1995	62.1%
1996	62.2%
1997	62.7%
2000	63.0%
2004	64.4%
2005	65.3%
2006	66.1%
2007	66.2%
2008	67.1%
2011	66.8%

Source: WIOD-2011

3. At the same time, nearly 400 PTAs have been notified at the WTO over the last decades. Nowadays, Intra-PTA trade represents over 50% of global trade and that share may reach 60% once the TPP is in force...
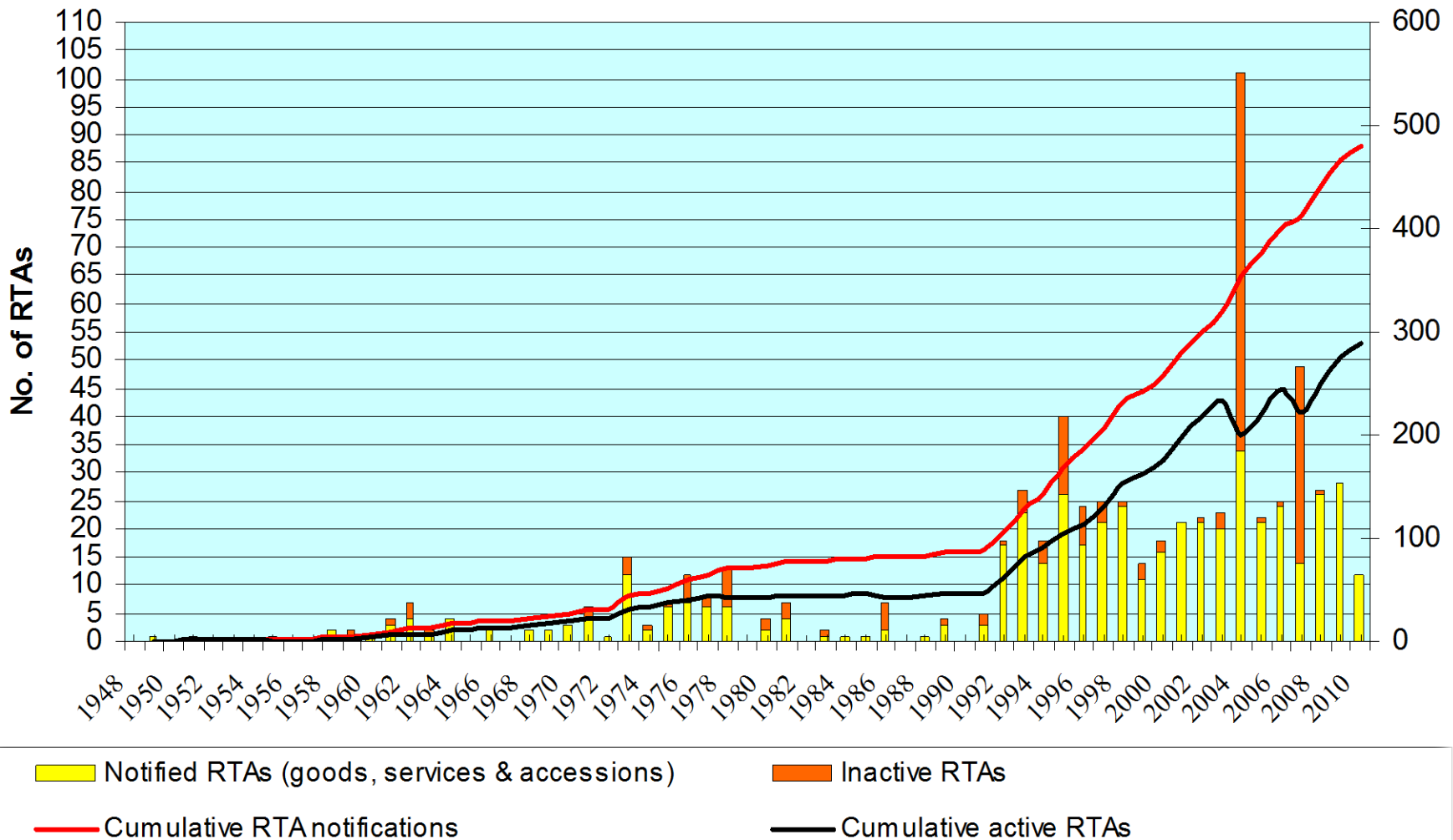
4. The more a given country is connected into global/regional value chains, the lower the domestic content embedded in its gross exports. In the era of fragmentation, "what you sell is not what you gain"…
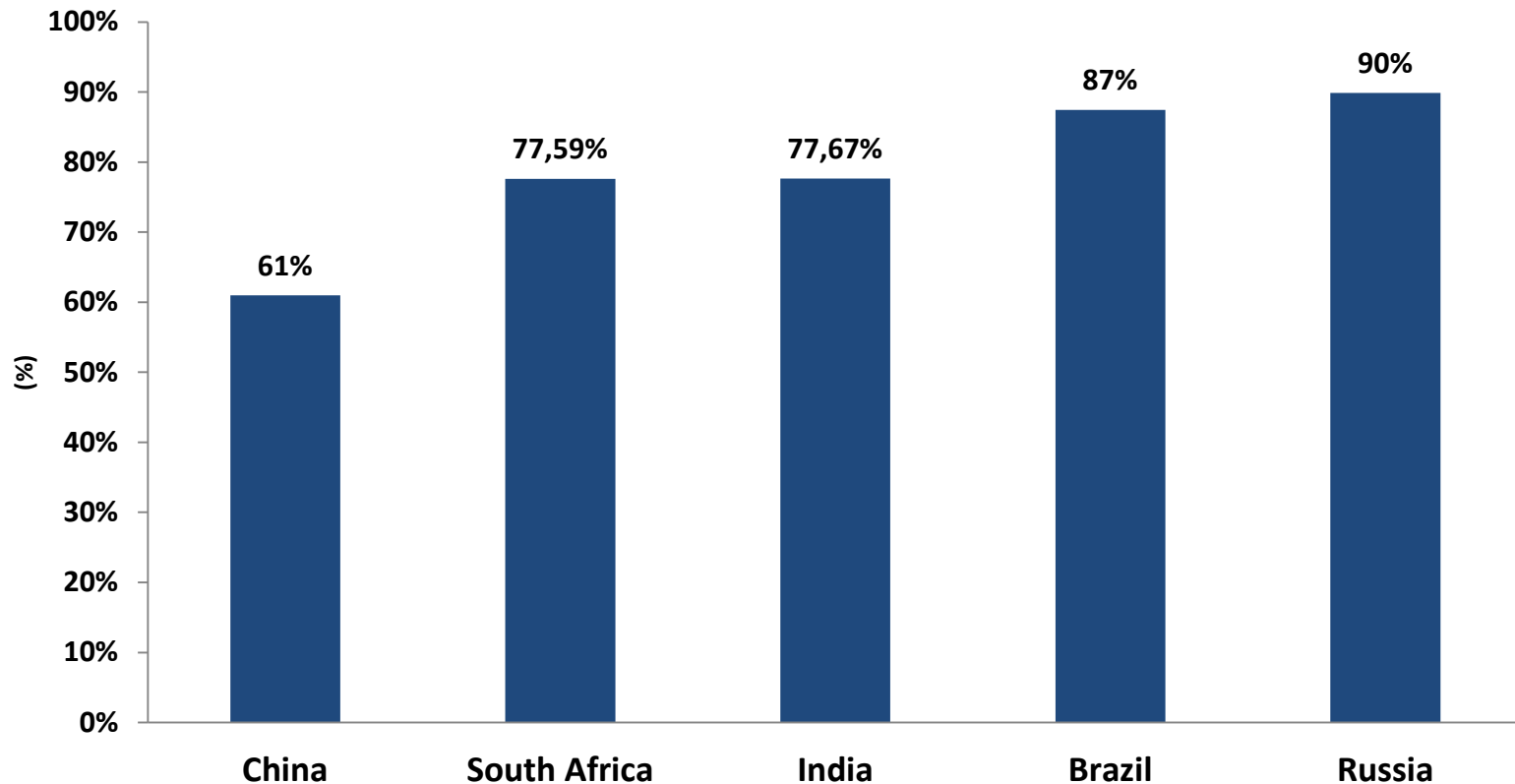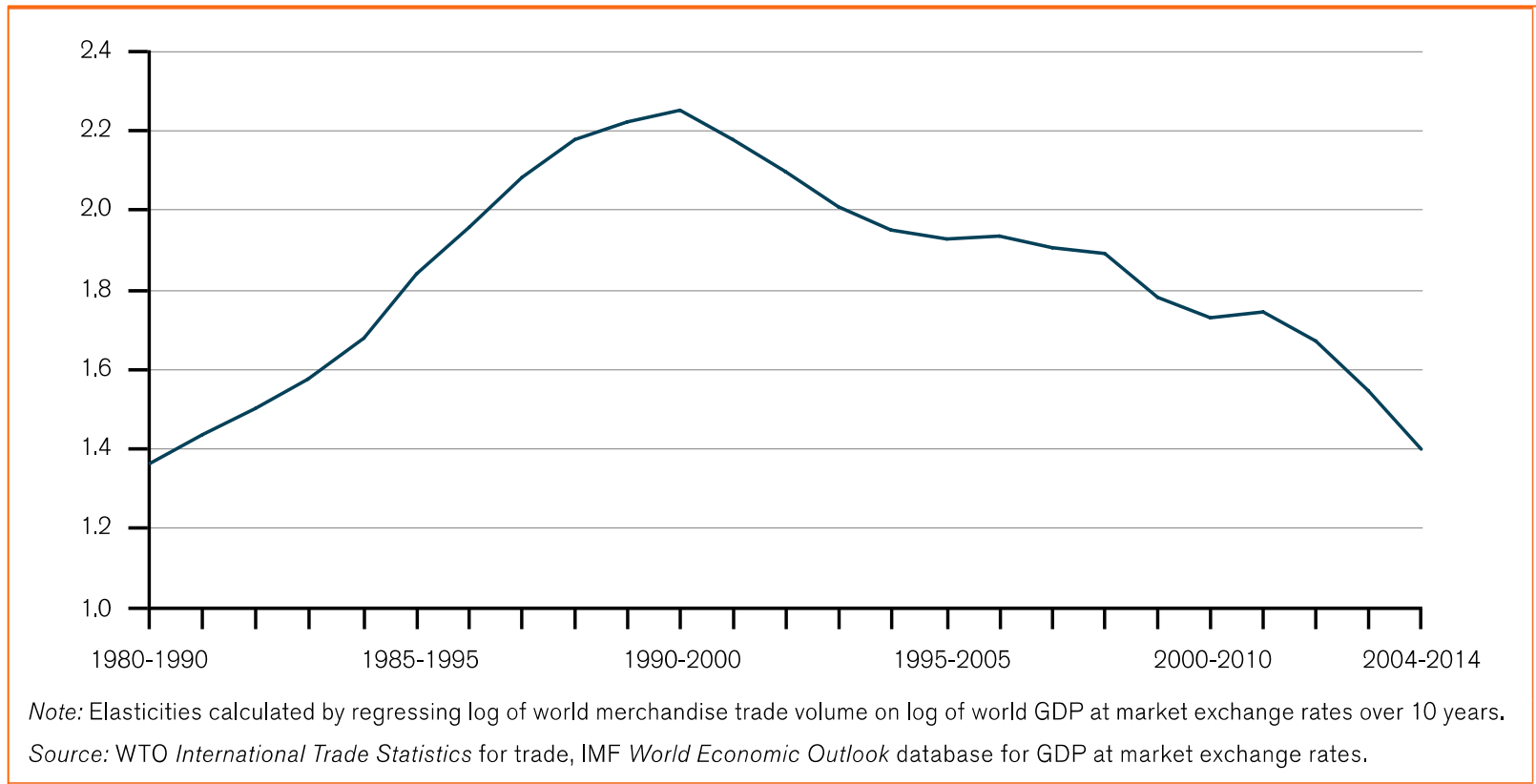

Source: WIOD-2011

5. The relevance of time as a Trade Barrier

- Over the last decades, the use of air cargo has risen 2.6 times faster than ocean cargo, reflecting the increasing importance of time as a trade barrier.

- While many products are time sensitive due to inventory holding costs, perishability and rapid technological obsolescence, these problems become even more important when factories are interconnected through Global Value Chains (Baldwin, 2013; Hummels, 2013, Timer, 2013);

- According to estimates by Hummels and Schaur (2013), each day of delay at customs may cost from 0.6% up to 2.1% of the value of traded cargo;

- Furthermore, time sensitiveness of trade in intermediates (parts and components) is over 60% higher in comparison to trade in final goods;

- According to a report from OECD (2009), total costs of delays at customs may represent from 1% up to 30% of the value of the traded cargo;

6. Despite the recent explosion of fragmentation, trade has been growing at a slower pace over the last few years. The rough two-to-one relationship that prevailed for many years between world trade growth and world GDP growth appears to have broken down...

Note: Elasticities calculated by regressing log of world merchandise trade volume on log of world GDP at market exchange rates over 10 years.

Source: WTO *International Trade Statistics* for trade, IMF *World Economic Outlook* database for GDP at market exchange rates.

Source: WTO-2015

7. Several Explanations have been offered for the recent slower rate of global trade growth, including:

- Adverse macroeconomic conditions in rich economies and China;

- The maturation of GVCs (the focus of this paper);

- The accumulation of post-crises protectionist measures;

QUESTIONS

- Given the relevance of time as a trade barrier, particularly to the supply-chain trade, can the TFA give a new momentum to the ongoing global fragmentation of production?

- Given the asymmetric impact of delays at customs among production sectors, how is the TFA likely to affect global and domestic income inequality ?

- Beyond traditional Stolper-Samuelson effects for trade in final goods, what is the possible contribution of fragmentation to alleviate/exacerbate pre-existing income inequality patterns at the country level?

- Those are crucial policy questions for the multilateral trade system, particularly at a moment where the TFA agreement is finally getting closer to be ratified by 2/3 of its WTO members;

8.0. The existing empirical literature on the benefits of trade facilitation

- Most of the existing studies are based on either Gravity Equations or CGE models;

- ## Some drawbacks on the existing empirical literature:

  - Most of the studies using Gravity models suffer from problems of misspecification due to sample selection bias as well as firm heterogeneity, among others (Helpman, Melitz and Rubenstein, QJE, 2008; Silva and Tenreyro, 2006);

  - Gravity models doesn't give the "big picture", since cross-price effects among sectors and countries are ignored;

  - CGE models may circumvent some of this problems but most of the existing studies are based on *ad hoc* estimates of trade transaction costs and therefore their results are hardly comparable...

8.1. Some examples of the existing empirical literature on the benefits of trade facilitation using CGE MODELS

Study	Base Year	Model Characteristics		Scenario Specification			Annual Income Gains	
		Competition	Dynamics	Regional Coverage	Sector Coverage	Reduction in trade value	bi US$	% do GDP
Dee (1998)	1992	Imperfect	Dynamic	APEC	All goods and transport services	Uniform a) 5% b) 10%	a) 216 b) 442	a) 1.1 b) 2.3
APEC (1999)	1996	Perfect	Dynamic	APEC	All goods	By country group a) 1% & 2% b) 2% & 3%	a) 45.8 b) 64	a) 0.25 b) 0.4
Hertel et al (2001)	1995-2020	Perfect	Dynamic	Japan and Singapure	All goods	By goods sector 0,21-3,5%	6.6 (Japan) 0.17 (Singapore)	0.16 (Japan) & 0.29 (Singapore)
UNCTAD (2001)	1997	Perfect	Static	Developed Countries	a) Serviços comerciais b) Transporte aéreo e marítmo c) Todos os serviços	Uniform 1%	a) 47.9 b) 6.1 c) 117.9	a) 0.22 b) 0.04 c) 0.54
APEC (2002)	1997	Perfect	Static	Intra-APEC	All goods	a) 5% *** (uniforme) b) 2,9-7,7% *** (por grupo de países)	a) 154.0, b) 100.9-203.5	a) 0.98 b) 0.64-1.30
Fox et al. (2003)	1997	Perfect	Static	EUA e México (Bilateral)	Goods shipped by truck	1% (northbound) 5% (southbound)	1.4 (US) 1.8 (Mex)	0.02 (US) 0.47 (Mex)
Francois el al. (2003)	1997	Imperfect	Dynamic	World	All goods	Uniform a) 1.5% b) 3%	a) 72.3 b) 150.9	a) 0.25 b) 0.52
OECD (2003)	1997	Perfect	Static	World	All goods and services	Uniform 1%	76.4	0.26

Most of the studies measure reductions in "ad hoc" direct as well as indirect costs (delays)

9.0. Measuring the costs of delays at Customs at the product level (Hummels and Schaur, AER, 2013)

- ## The costs of time:
  - Lengthy shipping times impose **inventory-holding and depreciation costs** which include **spoilage** and **rapid technological obsolescence**;
  - **Long lags between ordering and delivery** require firms to commit to product specifications and quantities supplied before **uncertain demand** is resolved;

- The authors examine the **modal choice** decisions of firms engaged in trade and use the **trade-off** between **fast and expensive air transport** versus **slow and inexpensive ocean shipping** to identify the value of **time saving**…

9.1. Measuring the costs of delays at Customs at the product level (Hummels and Schaur, AER, 2013)

- In the model, Consumers have CES type preferences over a bundle of differentiated goods:

$$U = \left(\sum_j \sum_z \lambda_j^z (q_j^z)^\theta \right)^{1/\theta} \qquad \theta = (\sigma - 1)/\sigma,$$

- The time of delivery by firms is treated as a product quality dimension, according to:

$$\lambda_j^z = \nu_j^z \exp(-\tau \cdot days_j^z)$$

*Slow delivery reduces consumer's perception of product quality*

- With real expenditures given by "E", utility maximization gives the following domestic demand for the product exported by firm "z" located in foreign country j:

$$q_j^z = E \left(\frac{p_j^{z*}}{\nu_j^z \exp(-\tau \cdot days_j^z)} \right)^{-\sigma}.$$

- The equation above shows that, for the same prices and consumer's income, demand will be higher for goods that arrives sooner than later...

9.3. This idea can be illustrated by the graphic below. For the equilibrium quantity Q^*, consumers are willing to pay P^* for a good that arrives late. They would pay P^1 for a zero delay good. Therefore, the implicit Ad valorem cost of delay will be $(P^1-P^*)/P^*$.

Supply Demand and Welfare Impacts (Partial Equilibrium) of Reducing a Delay in Trade
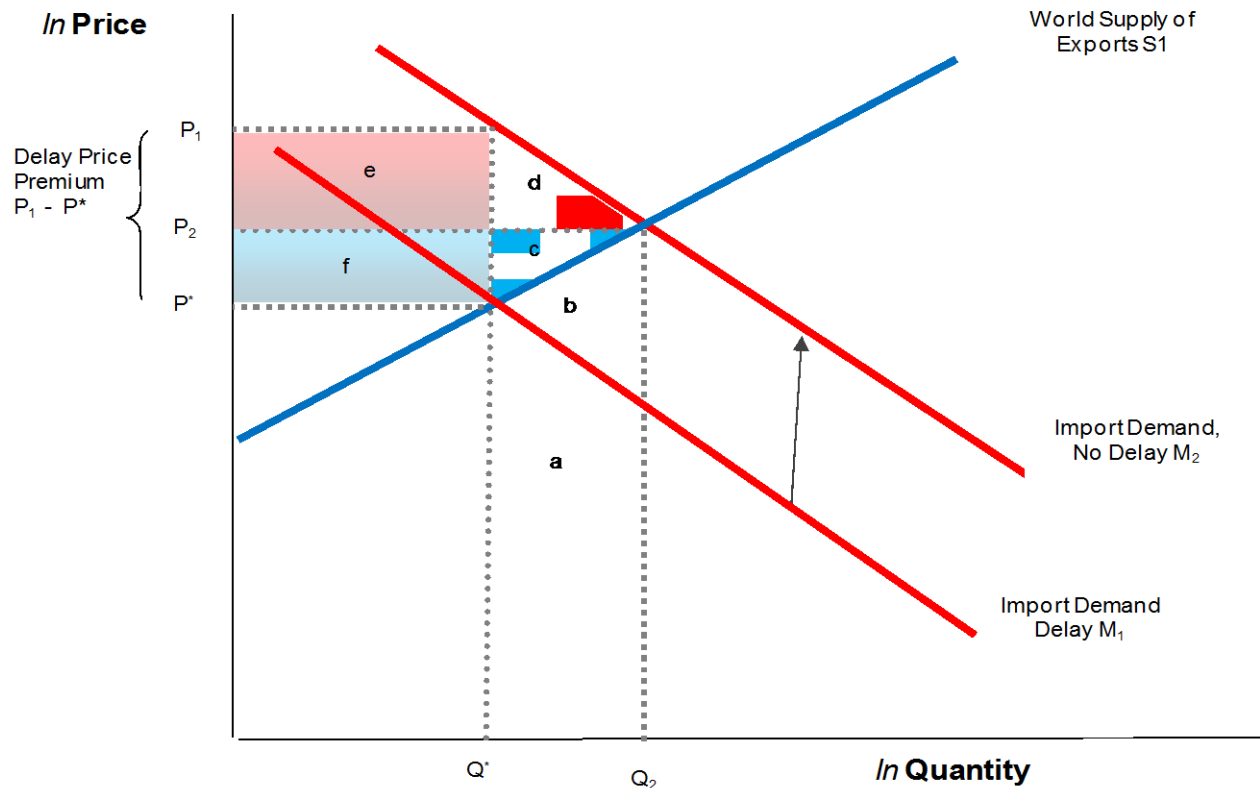
Source: Author's analysis. The Author recognizes the contribution of Dr. David Hummels on the formulation of this representation.

9.4. Measuring the costs of delays at Customs at the product level (Hummels and Schaur, AER, 2013)

- Hummels and Schaur (2013) estimate the per day costs of delays for thousand of products at the HS6 digit level. This information, in conjunction with bilateral trade flows (World Bank, WITS) and average lengthy of delays in ports for several countries (World Bank, Doing Business), allows one to estimate the ad valorem equivalents of delays at customs (Minor, 2013; Minor and Tsigas (2008)).

10. Methodology and Modeling Issues...

Static CGE Model

- **Data base: GTAP – 9** (Base year 2011);

- **Perfect competition** model which accommodates 140 regions and 57 sectors by region;

- **Perfect** capital and labor mobility; **Imperfect** land and natural resources mobility;

- Investment equalizes regional returns;

- Results of simulations will be evaluated according to the traditional gross trade analysis as well as trade-in-value-added logic;

The model is aggregated into 118 regions, according to World Bank's income classification

Income Classification (GNI per capita)	
Low Income	≤ US$ 1,025
Lower-Medium Income	US$ 1,026 - US$ 4,035
Upper-Medium Income	US$ 4,036 - US$ 12,475
High Income	> US$ 12,475

Source: World Bank

| Country Distribution	Number of Countries	
Low Income	17	14.4%
Lower-Medium Income	28	23.7%
Upper-Medium Income	29	24.6%
High Income	43	36.4%
Rest of the World	1	0.8%
Total	118	100.0%

Source: World Bank and GTAP

Weighted Average Time delays at customs (2012)
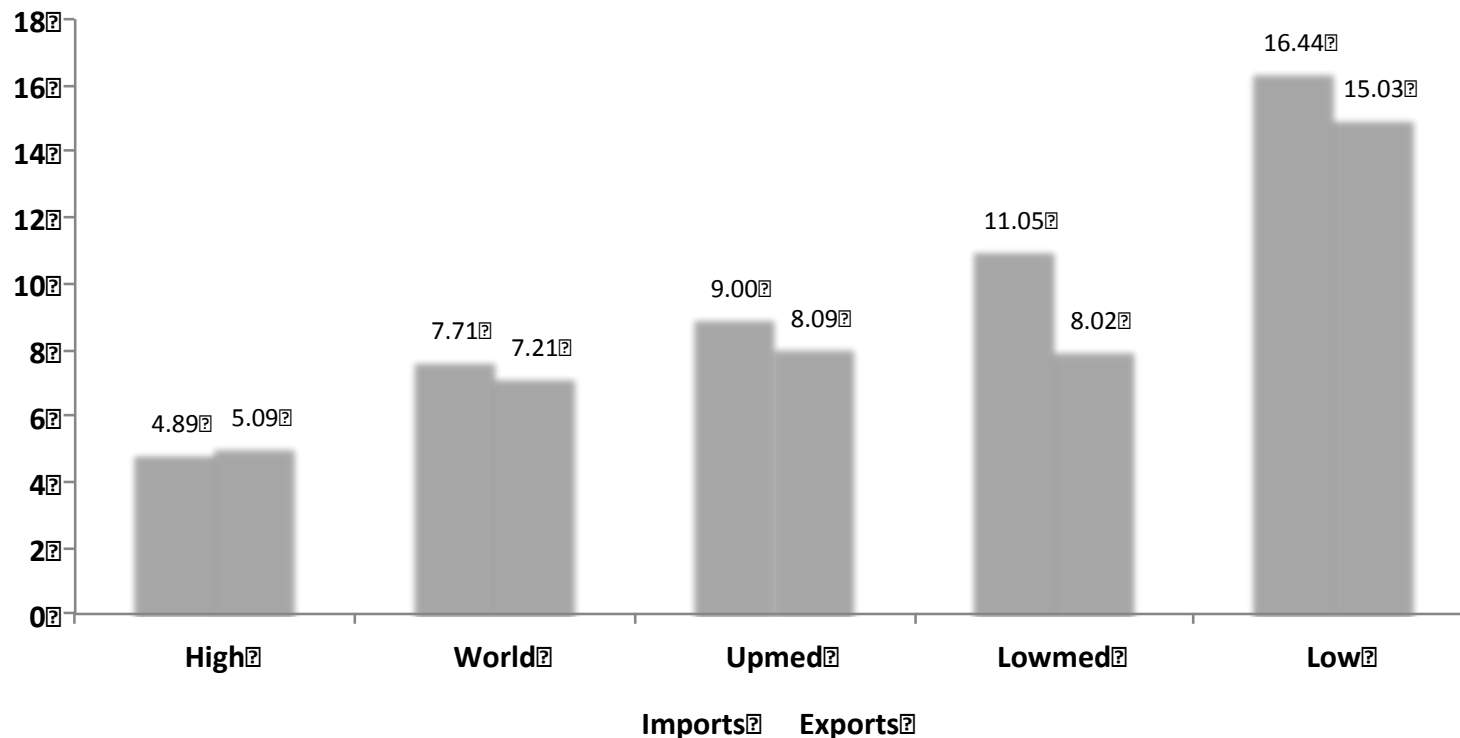
1. Rich countries have more efficient customs;
2. For all regions, time delays are higher against imports. Protectionism?
3. Gains from trade facilitation will be potentially higher for developing regions in the world (they clearly have more room form improvement!)

Source: World Bank (2012)

Weighted average Ad valorem equivalents of delays at ports for imports
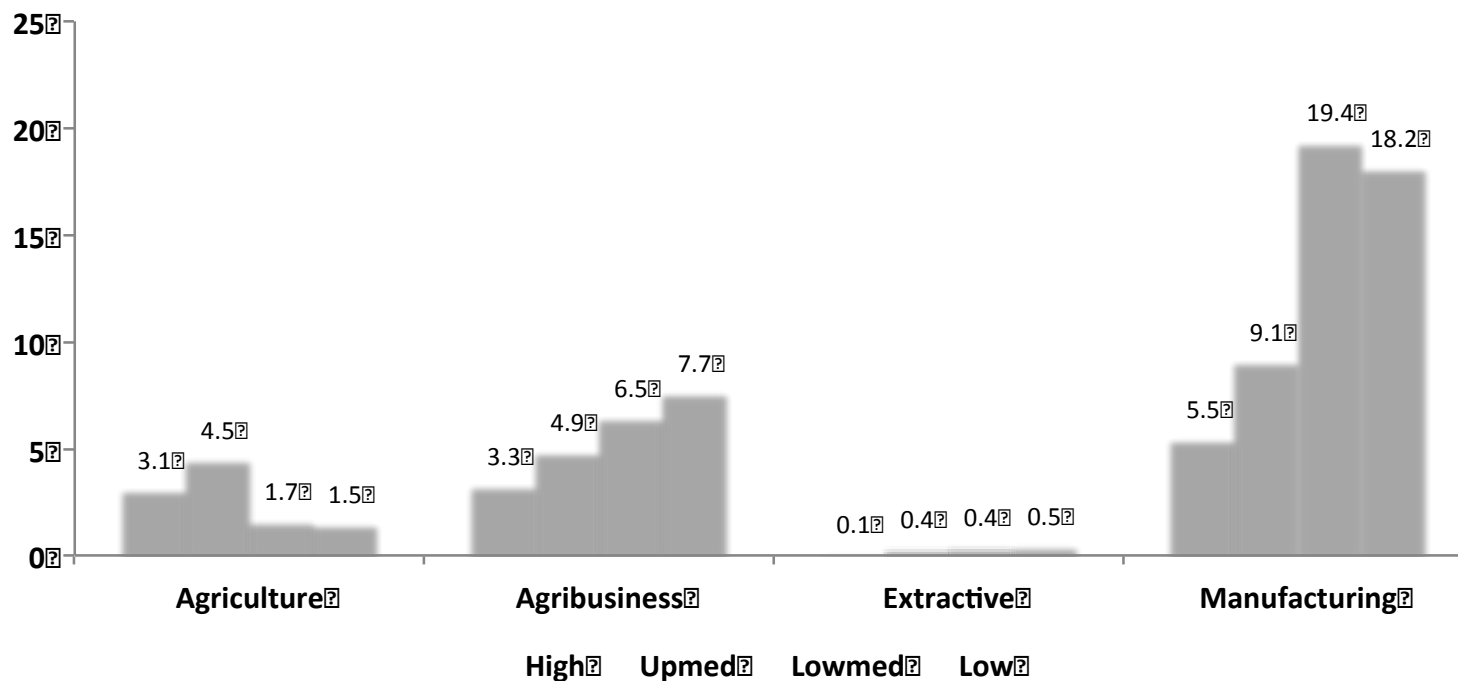
1. Time barriers tend to be higher for capital intensive goods, followed by perishable products;
2. The TFA is likely to affect relative prices mainly in capital intensive sectors. Therefore, it is expected to impact supply-chain trade;

The costs of delays at customs are relatively higher for importers of capital intensive goods in the Brazilian economy...

Equivalente Tarifário por setor Importador
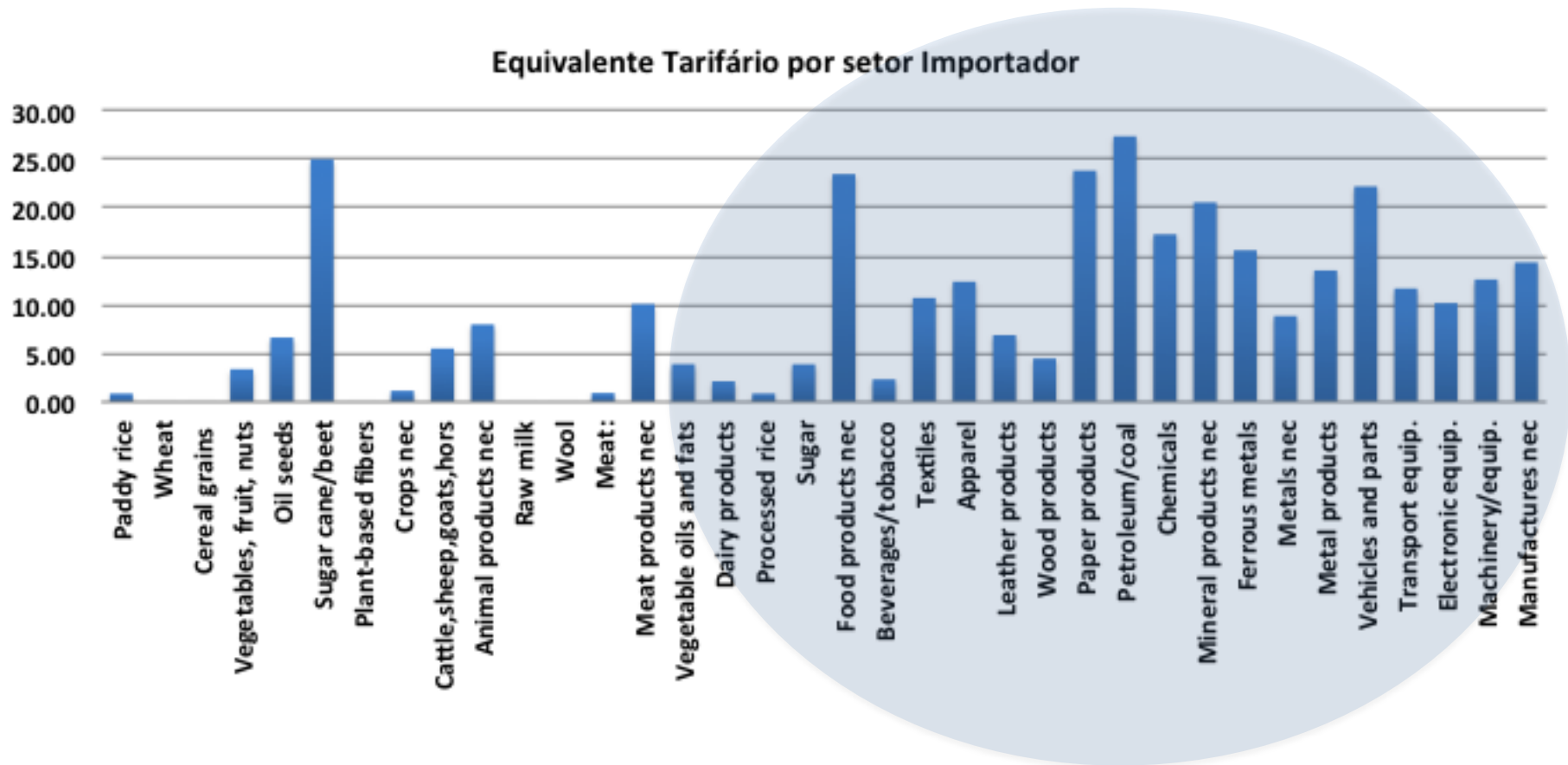
Source: CGTI-FGV

Costs of delays are also relatively higher for exporters of capital intensive goods in Brazil...

Imposto Equivalente por setor Exportador

Trade-in-Value-Added Analysis

- Trade in value added will be analyzed according to two measures of vertical specialization first proposed by Hummels et al (2001) and explained in details in Koopman et al (2014);

  - **VS:** Refers to the imported content in a country´s exports. It includes both directly and indirectly imported input content in exports; **(backward linkages)**

  - **VS1:** Looks at vertical specialization from the export side, and measures the value of intermediate exports sent indirectly through third countries to other final destinations; **(forward linkages)**

The architecture of Global Value Chains in 2011, from the perspective of VS, broken down by factor of production

VS

	Land	Skilled	Unskilled	Capital	NatRes	VS
High	0.12	4.93	5.64	10.01	1.73	22.44
Upmed	0.13	4.14	4.68	7.86	1.36	18.18
Lowmed	0.17	4.49	5.54	9.71	2.02	21.93
Low	0.37	4.84	6.7	10.07	1.09	23.08

1. Trade in intermediates is reality in the four country groups presented (VS);

1. Global/regional value chains are concentrated in manufacturing sectors (Capital);

1. Unskilled labor tasks tend to be offshored at a higher degree in comparison to skilled labor tasks...(Unskilled/Skilled)

Source: GTAP-9 (2011)

The architecture of Global Value Chains in 2011, from the perspective of VS1, broken down by factor of production

VS1

	Land	Skilled	Unskilled	Capital	NatRes	VS1
High	0.07	6.90	6.50	8.62	0.85	22.94
Upmed	0.16	1.89	3.37	6.25	1.20	12.88
Lowmed	0.30	1.23	2.54	5.93	1.26	11.26
Low	0.30	1.27	3.10	4.02	0.51	9.20

1. Rich countries are predominantly suppliers of capital/skilled labor intensive tasks to the world (Skilled/capital);

1. Less developed/developing countries are predominantly suppliers of less sophisticated unskilled labor intensive tasks (Unskilled);

Modeling the Efficiency Shocks at Brazilian Customs

- The GTAP model does not include a representation of customs activities or costs of border procedures;

- The methodology adopted in this work follows **Hertel et al (2001) and Fugazza & Maur (2008),** and assumes that trade facilitation takes the form of technical progress in trading activities;

- **CES type demand equation for good "i", exported from country "r" to destination country "s" is written in the GTAP model as follows:**

$$qxs_{irs} = -ams_{irs} + qim_{is} - \sigma_m^i . [pms_{irs} - ams_{irs} - pim_{irs}]$$

- A technical progress in trading activities due to reduction in delays at customs may be represented by a **positive shock on the variable AMS$_{IRS}$. This corresponds to an upward shift in import demand;**

- *Most important, All countries are supposed to reach the same port standards as the best performer in the region it belongs to;*

Macro Results (Typical country)

(%)	High	Upmed	lowmed	Low
GDP	0.88	1.53	2.90	3.33
Export volume	2.67	4.63	5.35	3.56
Import volume	2.56	8.00	7.13	3.59
Investment	1.20	3.74	7.93	1.29
Real Wages Skill	1.38	2.00	3.85	5.18
Real Wages Unskill	1.21	1.71	2.89	4.92
Real Returns on capital	1.31	1.66	2.93	4.13
Real Returns on land	2.59	0.32	2.75	9.49

1. Given the asymmetric impact on GDP growth, The TFA is likely to contribute to alleviate global income inequality, even though local income inequality may see a slightly increase;

2. Given the higher time sensitivity of capital intensive sectors, the TFA will tend to benefit international trade in more sophisticated sectors, particularly in regions with a higher gap in customs efficiency, contributing to increase capital returns as well as wage inequality;

3. For less developed economies (Low), returns on land will predominate, reflecting comparative advantages;

4. Its important to keep in mind that trade facilitation will impact trade in final goods as well as trade in intermediates;

The Impact onTrade in value added

(%)	High	Upmed	lowmed	Low
VS	0.81	6.53	4.26	1.04
VS1	1.58	6.14	11.46	14.52
VS+VS1	1.18	5.33	7.37	4.97

1. The TFA is likely to positively affect supply-chain trade for all regions. The impacts are biased towards a greater inclusion of developing/less developed regions in regional/global value chains (VS+VS1) (last line)

2. With the exception of developing economies (upmed economies), where offshoring will slightly predominate (VS >VS1), less and least developed regions will tend to integrate through a greater supply of intermediates to other countries exports (VS1>VS);

Breaking down by factors of production

VS (%)

	Land	Skilled	Unskilled	Capital	NatRes	VS
High	-0.02	2.13	1.34	0.85	-5.04	0.81
Upmed	4.97	6.55	7.65	7.14	-1.07	6.53
Lowmed	4.14	6.45	6.39	3.87	-3.53	4.26
Low	-0.50	1.82	1.20	1.17	-4.25	1.04

VS1(%)

	Land	Skilled	Unskilled	Capital	NatRes	VS1
High	18.38	1.86	1.91	1.64	-10.24	1.58
Upmed	5.87	6.87	7.54	6.81	4.77	6.14
Lowmed	4.26	11.27	12.04	12.39	1.25	11.46
Low	10.16	16.95	12.92	15.78	6.36	14.52

1. Offshoring in developing countries (Upmed), less (lowmed) and least developed economies(Low) tend to be concentrated in more sophisticated capital and land intensive tasks;

2. Trade facilitation will allow a relatively higher participation of poorer economies in the supply of more sophisticated capital, land and natural resource intensive tasks (VS1);

3. As a whole the TFA is expected to favor the participation of poorer economies in global/regional value chains. The increase in the participation of developed economies tend to be marginal and relatively concentrated in the supply of agricultural intermediates;

Supply –chain trade and income inequality

1. The significant increase in international trade and FDI and the proliferation of GVCs over the last decades have coincided with rising developing countries' per capita incomes and reduction in poverty (Subramanian et al, 2013; Dollar et al, 2013);

1. In parallel, **income inequality has risen in a large number of OECD countries and some emerging economies (OECD, 2014), becoming, once again, a hotly debated policy concern;**

1. The bulk of the existing empirical literature on trade and inequality focuses on the question of the extent to which trade has contributed to **increasing inequality not only in wages but also on other factors of production; The evidence is mixed** (WTO, 2008; OECD, 2012);

2. The **literature on GVCs** is still **on its early stages** (Grossman and Rossi-Hansberg, 2008; Baldwin et al, 2013; Johnson and Noguera, 2012; Koopman et al, 2014); **The role of GVCs on the academic inequality debate remain largely unexplored, even though quite explored by politicians ;**

3. **A recent OECD report (2016), using panel data analysis,** suggests that offshoring has contributed to alleviate wage inequality, despite its recent observed increase; According to the authors, the impact of GVCs on wage inequality, following the logic proposed by Grossman and Rossi-Hansberg (2008), will be **negative when offshoring is concentrated on unskilled labor tasks**; This is the dominant global pattern so far!!

What should be expected about the relationship between GVCs and wage inequality, according to the seminal perfect competition trade in tasks model of Grossman and Rossi-Hansberg (2008)?

- **VS (backward linkages):**

  - A higher degree of low-skilled task offshoring may be associated with lower wage inequality, if offshoring those tasks leads to a productivity boost to remaining low-skilled workers and therefore an increase in their wages thereby reducing the gap between high and low skilled wages;
  - By the same token, offshoring high-skilled tasks may be associated with higher wage inequality;

- **VS1 (forward linkages):**

  - When it is a low-skill (high-skill) task that is received, then the labor-augmenting productivity effect pushes the wages of low-skilled (high-skilled) workers up thereby reducing (increasing wage inequality);

GVC and Wage Inequality

Whole sample (118 regions/countries)

	VS+VS1	VS	VS1
Wsk/Wunsk	-0.513	-0.295	0.233
t statistics	-5.15	-4.93	3.61

1. More connection to GVC (VS_VS1) seems to be associated with lower wage inequality, with a significantly different from zero correlation;

1. However, as in the OECD (2016) report, the type of offshoring appears to matter. Backward linkages tend to be associated with lower wage inequality, whereas forward linkages tend to be associated with higher wage inequality;

Breaking down VS and VS1 confirms the Grossman and Rossi-Hansberg model predictions...

Whole sample (118 regions/countries)

	VS_Unsk	VS_(Sk - Unsk)
Wsk/Wunsk	-0.306	0.539
t statistics	-4.90	1.81

1. Offshoring low-skilled tasks is correlated with lower wage inequality;

2. Offshoring high-skilled tasks is correlated with higher wage inequality;

Whole sample (118 regions/countries)

	VS1_Sk	VS1_(Unsk - Sk)
Wsk/Wunsk	0.222	-0.127
t statistics	3.93	-1.65

1. Being the recipient of offshored high-skilled tasks is correlated with higher wage inequality;

2. Being the recipient of offshored low-skilled tasks is correlated with lower wage inequality;

Final Remarks

- The implementation of TFA seems to have the potential to promote a new wave of fragmentation, with a higher participation of developing/less/ least developed economies. This new wave is likely to be biased towards agribusiness and natural resource intensive activities;

- While contributing to decrease global income inequality, local wage inequality might see a slightly increase, as the impacts of the TFA are biased towards capital intensive sectors that demand skilled labor force;

- The effects of supply chain trade on country level income inequality must be disentangled from the effects of trade in final goods. The findings in this work appear to be in agreement with recent theoretical predictions in the GVC literature.

- The potential role of the TFA in increasing domestic income inequality is predominantly a typical trade-in-final goods Stolper-Samuelson effect. In the average, this effect tends to be counterbalanced in countries where the impacts on supply-chain trade are expected to be higher;

Merci!

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