Global Production Networks and Trade Policy

Davide Del Prete [1] Valerio Leone Sciabolazza [2] Gianluca Santoni [3]

[1]IMT Lucca and FAO [2]University of Naples Parthenope [3]CEPII

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Main Motivations

Global Value Chains (GVCs) are re-shaping the political process through which trade policy is made:

- 2011 WTO "Made in the World Initiative"
- TPP focus on supply chains (Wall Street Journal, 2013)
- China's 'One Belt, One Road' intiative (The Economist, 2017)
- Supply Chains consequences of Brexit (Financial Times, 2017)

Their complexity makes it harder to understand trade and to formulate policies that allow workers, firms, and governments to capitalize on GVCs while mitigating negative side-effects (Dollar, 2017)

Main Motivations

Blanchard, Bown and Johnson (2016) show that GVCs linkages modify incentives to impose protection:

$$t_{ijst} = \frac{1}{\epsilon_{ijs}} + \rho FVA_{ist} + DVA_{ijst}$$

- where:
  - $\frac{1}{\epsilon_i js}$: inverse export supply elasticity
  - ρFVA_{ist}: i) ρ inverse import penetration ratio ii) foreign value added
  - DVA_{ijst}: domestic value added from the importing country(i) embodied in final production in industry s in the exporting country (j). It can be decomposed into a **direct** and **indirect** price effects.

Aim of the paper

Analyze the incentives of a country to impose import tariffs taking into account also these indirect effects. To this aim:

1. We decompose the Leontief inverse matrix to quantify the contribution of direct and indirect connections separately.

2. We show that final goods tariffs tend to decrease in the domestic content of foreign-produced final goods but at a different rate when distinguishing the effect of direct partner country from third countries.

Data

GVC bilateral/sectoral measures:

- We compute GVC income as defined, for instance, in Los, Timmer and de Vries (2015).
- Eora provides a detailed multi-regional I-O table: 185 countries and 25 harmonized sectors from 1990 to 2013.

Trade policy:

- effectively applied tariff rates at 2-digit level (WITS-TRAINS).

GVC income

- Gross output from each country and industry is used by final or intermediate purchasers as:

$$y_{i,1} = \sum_{j=1}^{NS} Z_{i,j} + \sum_{k=1}^{N} F_{i,j} \tag{1}$$

- Define the matrix $A = Z\ diag(\frac{1}{y})$ then, the global input-output system can be written as:

$$y = Ay + F, \tag{2}$$

$$y = (I - A)^{-1}F \tag{3}$$

- This can be translated into value-added content requirements as:

$$GVC = V(I - A)^{-1}F \tag{4}$$

Direct and Indirect connections

- Recalling that if A is economically feasible, the Newman series converges to the Taylor expansion process:

$$(I - A)^{-1} = I + A + A^2 + A^3.... = \sum_{t=0}^{\infty} A^t \tag{5}$$

- therefore by subtracting the term $(I + A)$ on both sides:

$$(I - A)^{-1} - (I + A) = \sum_{t=2}^{\infty} A^t \tag{6}$$

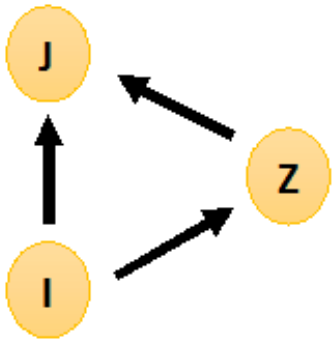
- we can get the direct and indirect value added contributions:

$$\textbf{GVC direct} = V(I + A)F \tag{7}$$

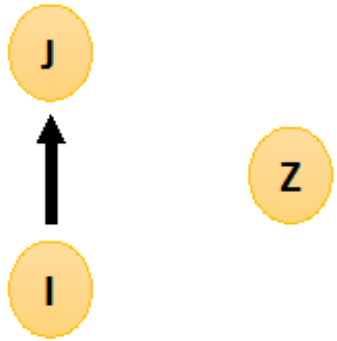
$$\textbf{GVC indirect} = V[(I - A)^{-1} - (I + A)]F \tag{8}$$

$$\textbf{GVC} = \textbf{GVC direct} + \textbf{GVC indirect}$$

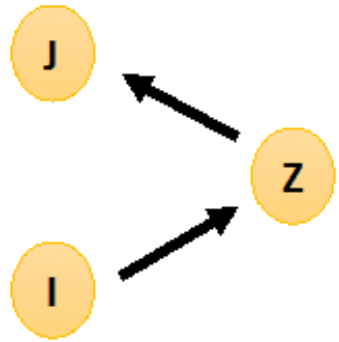
GVC direct and indirect



GVC



GVC direct



GVC indirect

Empirical Strategy - Baseline

$$t_{ijst} = \phi_{ist} + \phi_{jst} + \beta_1 ln(DVA)_{ijst} + \beta_2 \Omega_{ijst} + \varepsilon_{ijst}$$

- where:
  - t_{ijst}: applied bilateral tariff of country i in industry s against exporter j at time t.
  - ϕ_{ist} *and* ϕ_{jst}: importer-sector-year and exporter-sector-year fixed effects.
  - $ln(DVA)_{ijst}$: domestic value added from the importing country(i) embodied in final production in industry s in the exporting country (j).
  - Ω_{ijst}: ratio of indirect connections to direct connections from the importing country (i) embodied in final production in industry s in the exporting country (j).

Baseline estimates, OLS

Dep. Var :	$\ln(1 + Tariff_{ijst})$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(DVA_{ijst})$	-0.035***			-0.036***	-0.038***	-0.042***
	(0.002)			(0.002)	(0.002)	(0.002)
$\ln(DVAdir_{ijst})$		-0.018***				
		(0.001)				
$\ln(DVAind_{ijst})$			-0.038***			
			(0.002)			
Ω_{ijst}				-0.032***		
				(0.004)		
$\Omega_{ijst}median$					-0.019***	
					(0.002)	
$\Omega_{ijst}2$						-0.035***
						(0.003)
$\Omega_{ijst}3$						-0.037***
						(0.003)
$\Omega_{ijst}4$						-0.054***
						(0.004)
$\Omega_{ijst}5$						-0.073***
						(0.005)
Observations	5,673,836	5,673,836	5,673,836	5,673,836	5,673,835	5,673,836
R-squared	0.851	0.851	0.851	0.851	0.851	0.851
FEs	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt
Cluster	ij	ij	ij	ij	ij	ij

Standard errors, clustered at the country pair level *ij*, in parenthesis. *, **, *** denote statistical significance at the 10%, 5%, and 1% level. Tariff: applied tariff (simple average) by country *i* against country *j* in sector *s* in year *t*. DVA: domestic value added from the importing country *i* embodied in final production in industry *s* in the exporting country *j* in year *t*. Omega: ratio of indirect connections to direct connections in the link *ijk* in year *t*.

Robustness checks, OLS

Dep. Var :	$\ln(1 + Tariff_{ijst})$				
	(1)	(2)	(3)	(4)	(5)
$\ln(DVA_{ijst})$	-0.013***	-0.018***	-0.008***	-0.013***	
	(0.002)	(0.002)	(0.002)	(0.002)	
$\ln(DVA_{ijst})90$					0.003
					(0.002)
$\ln(DVA_{ijst})00$					-0.028***
					(0.002)
$\ln(DVA_{ijst})07$					-0.071***
					(0.003)
Ω_{ijst}	-0.016***		-0.010***		
	(0.003)		(0.004)		
$\Omega_{ijst}2$		-0.021***		-0.021***	
		(0.002)		(0.002)	
$\Omega_{ijst}3$		-0.020***		-0.021***	
		(0.003)		(0.003)	
$\Omega_{ijst}4$		-0.035***		-0.036***	
		(0.004)		(0.004)	
$\Omega_{ijst}5$		-0.053***		-0.057***	
		(0.005)		(0.005)	
RTA_{ijt}	-0.186***	-0.185***			
	(0.004)	(0.004)			
Observations	5,673,836	5,673,836	5,673,836	5,673,836	5,673,836
R-squared	0.853	0.854	0.852	0.852	0.851
FEs	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt
Cluster	ij	ij	ij	ij	ij
Gravity ctrl	NO	NO	YES	YES	NO

Standard errors, clustered at the country pair level *ij*, in parenthesis. *, **, *** denote statistical significance at the 10%, 5%, and 1% level. Tariff: applied tariff (simple average) by country *i* against country *j* in sector *s* in year *t*. DVA: domestic value added from the importing country *i* embodied in final production in industry *s* in the exporting country *j* in year *t*. Omega: ratio of indirect connections to direct connections in the link *ijk* in year *t*.

IV estimates

Dep. Var :	$\ln(1 + Tariff_{ijst})$			
	(1)	(2)	(3)	(4)
$\ln(DVA_{ijst})$	-0.039***			-0.040***
	(0.002)			(0.002)
$\ln(DVAdir_{ijst})$		-0.022***		
		(0.002)		
$\ln(DVAind_{ijst})$			-0.043***	
			(0.002)	
Ω_{ijst}				-0.087*
				(0.052)
Instrument	$\overline{Serv}$	$\overline{Serv}$	$\overline{Serv}$	$\overline{Serv}$
Observations	5,671,620	5,667,538	5,671,769	5,671,620
R-squared	0.851	0.851	0.851	0.851
FEs	ikt & jkt	ikt & jkt	ikt & jkt	ikt & jkt
Cluster	ij	ij	ij	ij
F-test	323908	117656	557074	209

Standard errors, clustered at the country pair level *ij*, in parenthesis. *, **, *** denote statistical significance at the 10%, 5%, and 1% level. Tariff: applied tariff (simple average) by country *i* against country *j* in sector *s* in year *t*. DVA: domestic value added from the importing country *i* embodied in final production in industry *s* in the exporting country *j* in year *t*. Omega: ratio of indirect connections to direct connections in the link *ijk* in year *t*.

Conclusions and follow ups

- Final goods tariffs tend to decrease in the domestic content of foreign-produced final goods, but at a different rate when distinguishing the effect of direct partner countries from third countries.
- Specifically, the latter effect seems to prevail, i.e. higher shares of indirect connections are associated to lower incentives to import protection. Furthermore, we find this effect to be increasing over time.
- This calls for a refinement of current trade policy priorities and for the design of a new multilateral approach to mitigate the adverse effects of the recent backlash against free trade.

Next steps:

- Alternative IV strategy (dva_{jz})
- Show the increasing importance of indirect connections (diameter)

Thank you

davide.delprete1986@gmail.com
https://sites.google.com/site/davidedelprete1986/