Positioning and bargaining power in agri-food global value chains

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Motivation

- **Division of surplus** are at the heart of GVCs
  - More productive and strongest firms and those with critical resources capture more value, (Emerson, 1962; Brandenburger and Stuart, 1996; Crook and Combs, 2007; Hillman et al., 2009; Drees and Heugens, 2013)
  - Property rights model (Antràs and Chor, 2013; Alfaro et al., 2019)

    $\Rightarrow$ Final good producers organize their production processes upstream, integrating or not their suppliers depending on their hold-up situation

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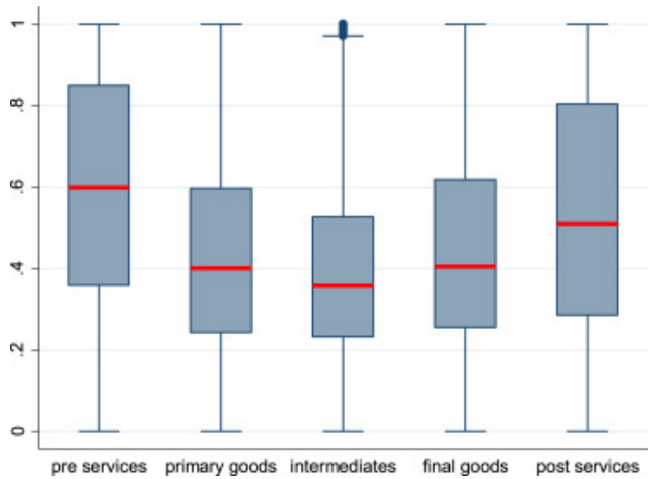
- How can suppliers act strategically to increase their bargaining power with respect to buyers?
  - **Suppliers' strategic positioning in GVCs** matters
    - ★ Upper and lower ends of the value chain provide higher value added and profit margins (the *smile curve*: Mudambi, 2008; Rungi and del Prete, 2018; Baldwin and Ito, 2021)



Value added content as share of value added on sales.
Source: Fig. 1 from Rungi and del Prete, 2018

Literature

- Further downstream firms perform more production stages and capture more value
  - Self-selection mechanism (Melitz, 2003)

    ⇒ Productivity is higher downstream than upstream (Costinot et al., 2013)

    ⇒ "Value additivity assumption": Most productive firms integrate more production stages and capture higher value (Alfaro et al., 2019; Chor et al., 2021)

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- Further upstream position is monotonically associated with more value creation
  - Fixed capital stocks are higher further upstream (Reshef and Santoni, 2023; Fontagne et al., 2023)
  - Intensive R&D and innovations activities further upstream (Ju and Yu, 2015; Mahy et al., 2021)

Outline of the presentation

Question: How does the **position of suppliers (food processing firms)** affect **power distribution or surplus along GVCs**?

1. Theoretical framework
2. Data
   - ★ Data sources
   - ★ Bilateral bargaining power and division of surplus
   - ★ Upstreamness / position in GVC
3. Test main hypotheses: OLS, Sub-sample regressions
4. Robustness tests
5. Conclusion

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Results:

1. Pricing through bilateral negotiations allows for variable mark-ups due to two-sided bargaining power
2. Specialization in further upstream stages, and expansion of firms producing closer to final demand, positively affect the division of surplus in GVCs
3. The specialization effect outweighs the expansion effect

Theoretical framework: Importer-Exporter Nash-in-Nash bargaining game

- Timing of the game
  - (i) Exporter and importer bargain over exporter price that maximizes total rents
  - (ii) Importer and Exporter then take exporter price as given, so that:
    - ★ Importer maximizes its profits with respect to final price
    - ★ Exporter minimizes its cots by choosing inputs for a given output level

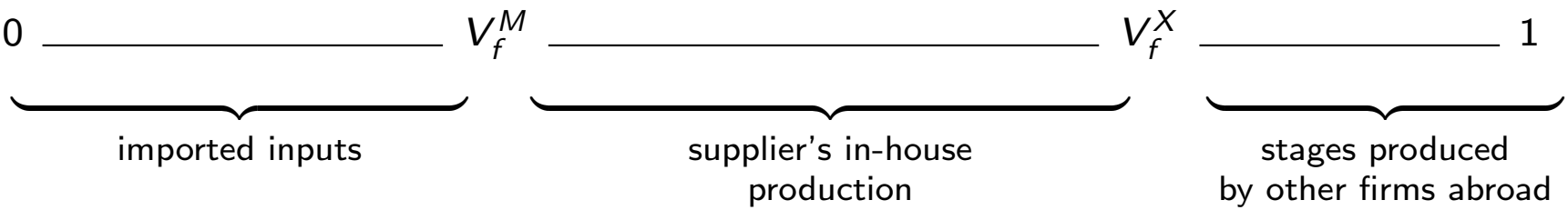
- Importer (buyer or intermediary) of variety variety υ of product k faces an aggregate demand in country j:

$$q_{jk}(\upsilon) = A_{jk} \left[\lambda_{fjk}(\upsilon)\right]^{\varepsilon_{jk}-1} \left[p_{jk}(\upsilon)\right]^{-\varepsilon_{jk}}$$

- Exporter (suppliers) f of k from country i performs a continuum of tasks ν in GVCs, indexed by their remoteness from final demand (upstreamness), using a CES aggregator:

$$q_{fk} = \varphi_f \, \lambda_{fjk}^{-\gamma} \left(\int_{V_f^M}^{V_f^X} x_f(\nu)^{\frac{\sigma-1}{\sigma}} \, du + q_{-if}^{M\,\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

Production/value chain



Theoretical framework: Importer-Exporter Nash-in-Nash bargaining game

- Solving the game via backward induction

(ii) suppose that Exporter supplies a compatible good to Importer $q_{fk} = q_{jk} = q_{fjk}$:

★ Knowing p_{fjk}, Importer maximizes π_{jk} with respect to p_{jk}, as follow:

$$\max_{p_{jk}} \pi_{jk} \quad = \quad p_{jk} q_{fjk} - p_{fjk} q_{fjk}$$

★ Exporter minimizes cost for a given output, as follow:

$$\min_{q^M_{-if}, x_f(\nu)} p^M_{-if} q^M_{-if} + \int_{V_f^M}^{V_f^X} c_f(\nu) x_f(\nu) d\nu$$

$$s.t. \qquad \overline{q}_{fjk} = \varphi_f \lambda_{fjk}^{-\gamma} \left(\int_{V_f^M}^{V_f^X} x_f(\nu)^{\frac{\sigma-1}{\sigma}} d\nu + q^{M\,\frac{\sigma-1}{\sigma}}_{-if} \right)^{\frac{\sigma}{\sigma-1}}$$

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(ii) suppose that Exporter supplies a compatible good to Importer $q_{fk} = q_{jk} = q_{fjk}$:

★ Result of Importer maximization problem:

$$\begin{aligned} p^*_{jk} &= \frac{\varepsilon_{jk}}{\varepsilon_{jk}-1} p_{fjk} \\ q^*_{fjk} &= A_{jk} \lambda_{fjk}^{\varepsilon_{jk}-1} \left(\frac{\varepsilon_{jk}}{\varepsilon_{jk}-1} \right)^{-\varepsilon_{jk}} p_{fjk}^{-\varepsilon_{jk}} \end{aligned}$$

★ Result of Exporter minimization problem:

$$C^*_{fjk} = q_{fjk} \frac{\tau_{ijk} \lambda_{fjk}^{-\gamma}}{\varphi_f} \left(p_{-if}^{M\,1-\sigma} + \int_{V_f^M}^{V_f^X} c_f(\nu)^{1-\sigma} d\nu \right)^{\frac{1}{1-\sigma}}$$

(i) Exporter and Importer reach the equilibrium price that solves the generalized Nash product:

$$\max_{p_{fjk}} \left(p_{fjk} q_{fjk} - C_{fjk} \right)^{\beta_{fjk}} \left(p_{jk} q_{fjk} - p_{fjk} q_{fjk} \right)^{1-\beta_{fjk}}$$

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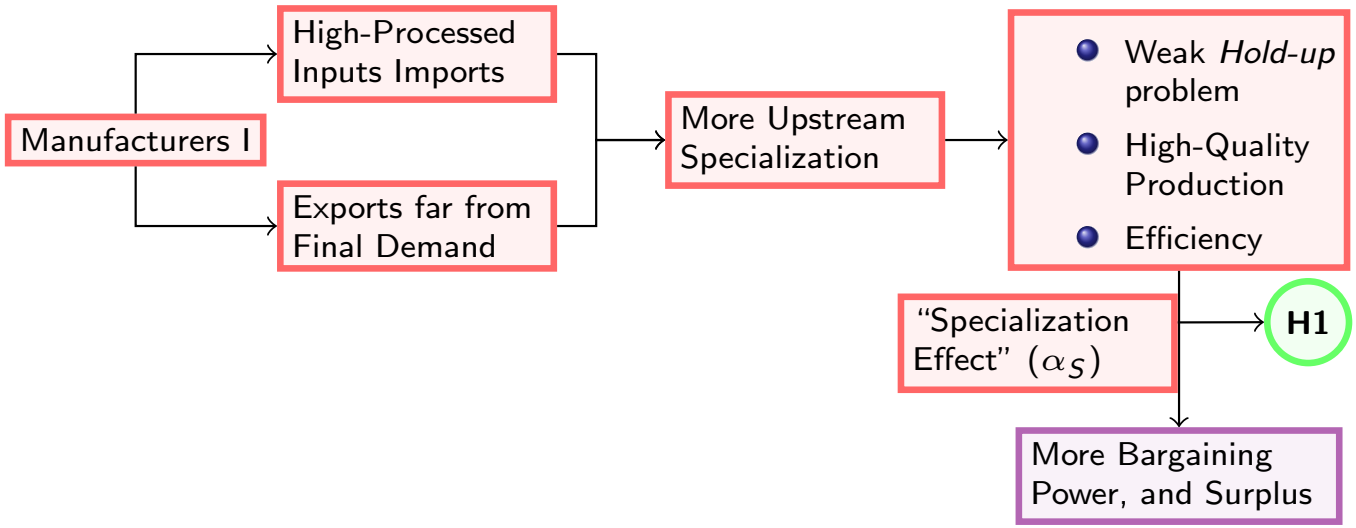
(i) Solving for the generalized Nash product gives the full expression of optimal prices as follows:

$$p^*_{fjk} = \frac{\varepsilon_{ft} - 1 + \boldsymbol{\beta_{fjk}}}{\varepsilon_{ft} - 1} \left(p_{-if}^{M\,1-\sigma} + \int_{V_f^M}^{V_f^X} c_f(\nu)^{1-\sigma} d\nu \right)^{\frac{1}{1-\sigma}} \frac{\lambda_{fjk}^{\gamma}}{\varphi_f} \tau_{ijk}$$

Back

Theoretical framework: Positioning in GVCs and bargaining power

- Mechanisms at work and theoretical hypotheses



H1: The division of surplus of a manufacturer in its export market is positively affected:

(i) by the import of more processed inputs;

(ii) by the export of goods far from final demand;

(iii) and thus, by the specialization in the most upstream stages of the production process in agri-food GVCs.

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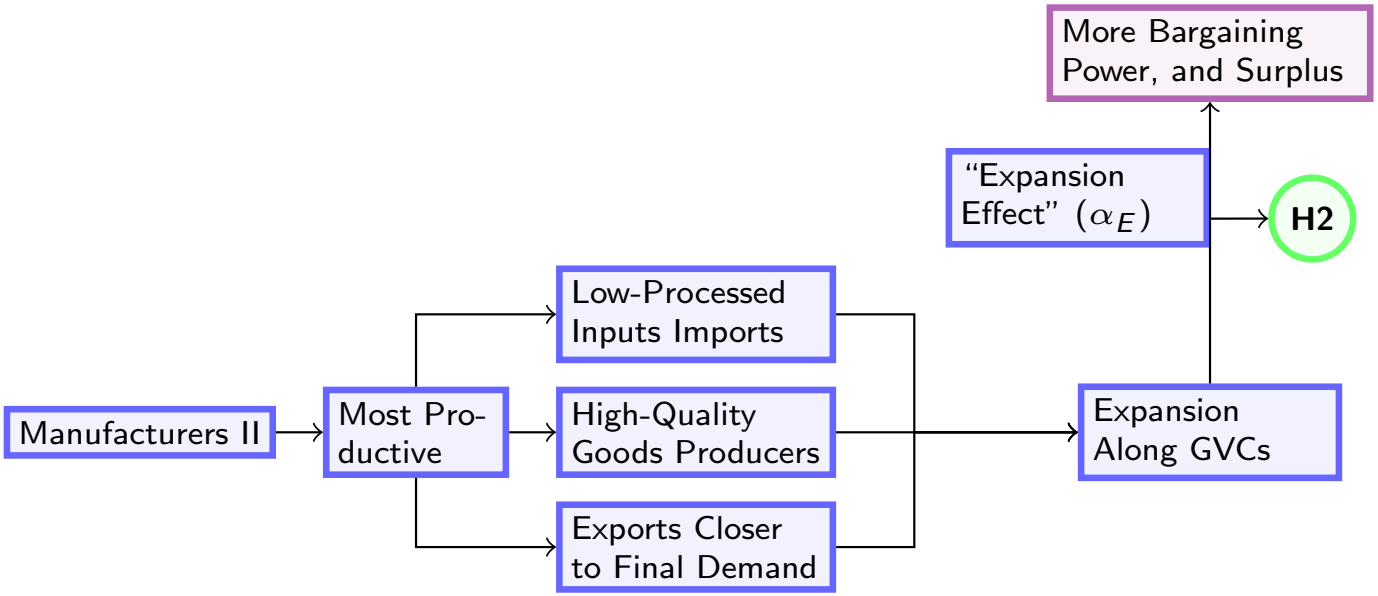

H2: Manufacturer that produce and export more processed goods increase its division of surplus in export markets:

(i) by importing more upstream inputs;

(ii) by exporting closer and closer to final demand;

(iii) and, thus by performing a larger number of production stages in GVCs.

Theoretical framework: Positioning in GVCs and bargaining power

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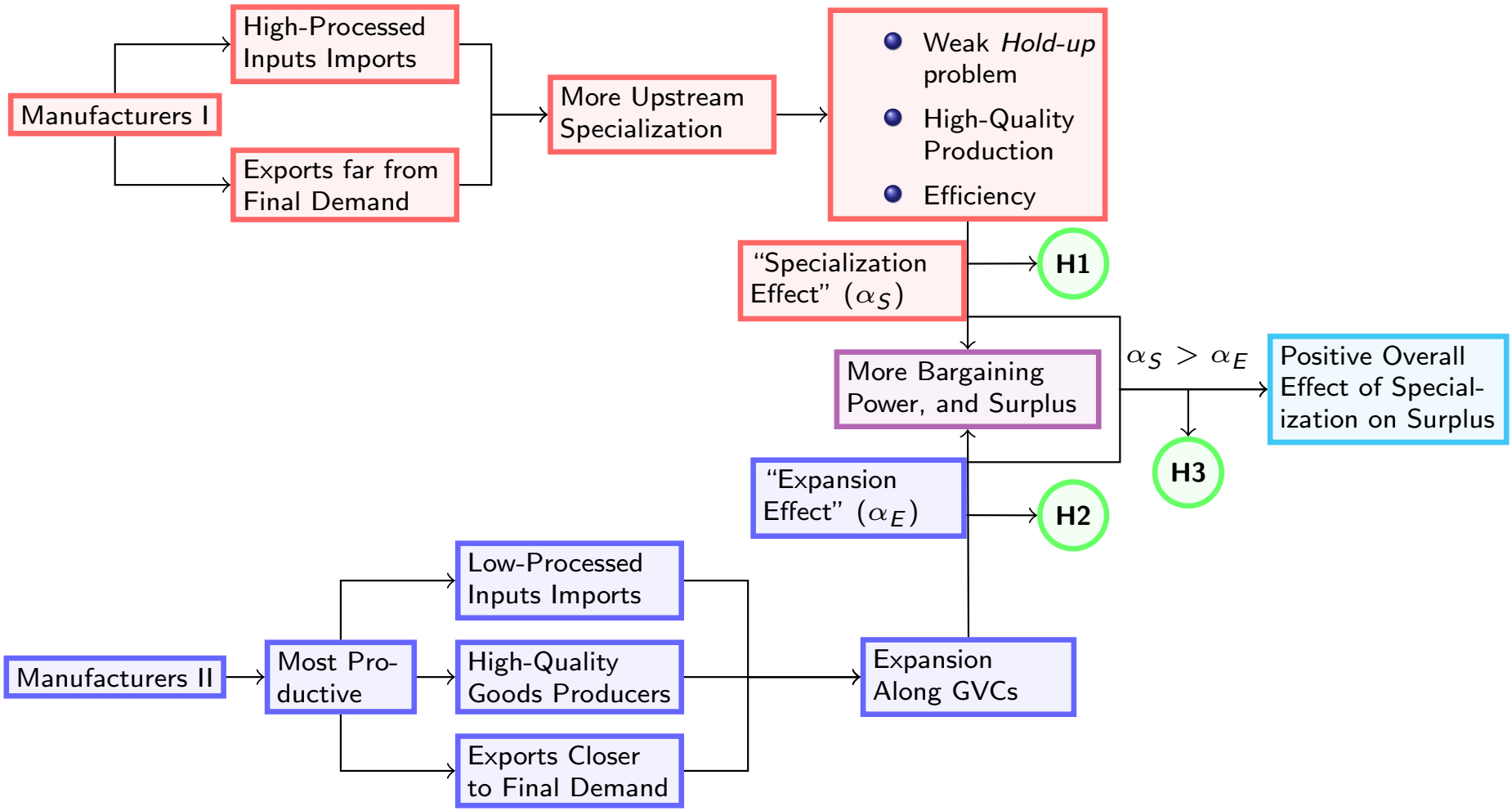

H3: Overall, the "specialization effect" outweighs the "expansion effect", resulting in a global positive effect of specialization on the division of surplus.

Data

Necessary data (firm and country level):

- GVC bargaining power index or surplus
- upstreamness ($\neg$ transformation) of purchased inputs and produced goods
- firm level controls
- country level controls

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Employed data: French agri-food firms and destination markets, 2002–2017

- AMADEUS
- French customs
- WDI and CEPII

Sample: firms in GVCs: Re-export excluded sample and All transaction sample

US input-output table (BEA)

+ US/French industry correspondences

+ for multiple correspondences, assume equal weights for all industry pairs

$\Rightarrow$ an input-output table at the level of French industries

405 US industries (42 agrifood) $\longrightarrow$ 604 NACE industries (88 agrifood) NACE I-O table

GVC bargaining power index at firm-product-country-year level

- Two-stage two-tier stochastic frontier model (Polachek and Yoon, 1987, 1996; Kumbhakar and Parmeter, 2009):

$$p_{fjkt} = \mu(x) + \beta_{fjkt}\left(\overline{p_{jfkt}} - \mu(x)\right) - (1 - \beta_{fjkt})\left(\mu(x) - \underline{p_{fjkt}}\right)$$

p_{fjkt} – export price (unit value observed in data)

$\overline{p_{jfkt}}$ – highest import price that the importer is willing to pay

$\underline{p_{fjkt}}$ – lowest export price that the exporter can accept

- Based on log price equation from the theoretical framework: Theoretical price

$$\begin{aligned}
\ln p_{fjkt} &= \mu(x) + \xi_{fjkt}, \\
\mu(x) &= \text{Controls}_{ft} + \text{Controls}_{jt} + \alpha_b b_{fjkt} + \alpha_s s_{fjkt} + FE_t + FE_k + FE_r + FE_j \\
\xi_{fjkt} &= \omega_{fjkt} - u_{fjkt} + e_{fjkt}
\end{aligned}$$

$$\begin{aligned}
e_{fjkt} &\sim i.i.d.\ N(0, \delta_e^2) \\
\omega_{fjkt} &\sim i.i.d.\ Exp(\delta_\omega, \delta_\omega^2) \\
u_{fjkt} &\sim i.i.d.\ Exp(\delta_u, \delta_u^2)
\end{aligned}$$

- Construction of IVs for the bilateral shares (Alviarez et al., 2023)

Buyer share – purchases of f 's other importers from exporters other than f
Supplier share – sales of j's other exporters to importers other than j

- Estimation of $\ln p_{fjkt}$ by the maximum likelihood (ML) method

$$NS_{fjkt} = \omega_{fjkt} - u_{fjkt}$$

GVC bargaining power index at firm-product-country-year level

Estimation results

Table: Summary of surplus extracted and variance analysis– Two-stage Two-tier frontier

Sample	Panel A: Re-exports excluded		
Summary	# observations= 178,805		
	ω_{fjkt} (Firms)	u_{fjkt} (Countries)	NS_{fjkt}
Mean	56.71	41.93	14.78
Q1	29.37	25.77	-16.49
Q2	40.39	31.82	8.56
Q3	65.01	45.86	39.24
	Variance analysys		
$\delta^2_\omega + \sigma^2_u + \delta^2_\nu$	66.59		
$(\delta^2_w + \delta^2_u)/(\delta^2_\omega + \delta^2_u + \delta^2_\nu)$	74.70		
$\delta^2_w/(\delta^2_\omega + \delta^2_u)$	64.66		
$\delta^2_u/(\delta^2_\omega + \delta^2_u)$	35.34		

Notes: Value expressed in percent.

Upstreamness and position in GVC

- Following Fally (2012), Antràs et al. (2012), Antràs and Chor (2013)

- Industry upstreamness = weighted average of the number of production stages from final demand for which the industry provides inputs:

$$U_r = 1 \cdot \frac{F_r}{Y_r} + 2 \cdot \frac{\sum_s b_{rs} F_s}{Y_r} + 3 \cdot \frac{\sum_s \sum_k b_{rk} b_{ks} F_s}{Y_r} + \ldots \qquad \in [1, \infty]$$

F_r, Y_r, and b_{rs} from a highly disaggregated input-output table

high U_r: close to production factors; **low U_r**: close to final demand

- Firm-level upstreamness: combine industry-level upstreamness with the product composition of firm's imports and exports

Upstreamness of imports:	$U_f^M = \sum_r \frac{M_{fr}}{M_f} U_r \Rightarrow V_f^M = \frac{1}{U_f^M}$	purchased inputs
Upstreamness of exports:	$U_f^X = \sum_r \frac{X_{fr}}{X_f} U_r \Rightarrow V_f^X = \frac{1}{U_f^X}$	produced output
Position in GVC:	$GVC_f = V_f^X - V_f^M$	span of in-house production stages

Details upstreamness indicators

Empirical strategy

- Setting of linear forms:

$$NS_{fjkt} = \alpha_0 + \alpha_\nu\{\{\mathbf{V}^X_{ft}, \mathbf{V}^M_{ft}\}, \mathbf{V}^X_{ft} - \mathbf{V}^M_{ft}\} + \alpha_c \text{Controls}_{ft} + FE_f + FE_{rt} + FE_{rj} + FE_{jk} + \epsilon_{fjkt}$$

NS_{fjkt}	–	GVC bargaining power index (division of surplus)
V^M_{ft} (V^X_{ft})	=	inverse of upstreamness of imports (exports) of firms
$V^X_{ft} - V^M_{ft}$	=	Intensity of GVC participation
Controls_{ft}	=	time-varying firm characteristics (productivity and size group)
FE_i	–	industry-by-year dummies (firm's main activity NACE Rev.2 4-digit) , firm, industry-by-country and product-by-country fixed effects
ϵ_{fjt}	–	error term

- OLS estimates and sub-sample regressions

Baseline results: Sub-sample regressions (H1 & H2)

- **Re-exports excluding sample** Results with All transactions sample

Table: Firm's position in GVCs and division of surplus – low versus high level of upstreamness of the core activity of firms

Sample	Re-exports excluded							
Sub-sample	More downstream firms **(H2)**		More Upstream firms **(H1)**		More downstream firms **(H2)**		More Upstream firms **(H1)**	
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
V_{ft}^{M}	0.0177	0.0040	0.0465	0.0743***				
	(0.0205)	(0.0208)	(0.0285)	(0.0277)				
V_{ft}^{X}	0.0052	0.0131	-0.5522***	-0.4988***				
	(0.0536)	(0.0540)	(0.0969)	(0.0931)				
$(V_{ft}^{X} - V_{ft}^{M})$					-0.0149	-0.0020	-0.1115***	-0.1293***
					(0.0169)	(0.0177)	(0.0247)	(0.0245)
ln Productivity$_{ft}$		0.1029***		0.0869***		0.1029***		0.0892***
		(0.0140)		(0.0082)		(0.0140)		(0.0085)
Firm size:								
Small$_{ft}$		reference		reference		reference		reference
Medium$_{ft}$		0.1004***		0.1232***		0.1004***		0.1285***
		(0.0103)		(0.0123)		(0.0103)		(0.0131)
Large$_{ft}$		0.1947***		0.1995***		0.1948***		0.2111***
		(0.0166)		(0.0225)		(0.0166)		(0.0238)
Fixed effects	firm, industry-year, industry-country, product-country							
Observations	52,725	52,725	52,977	52,977	52,725	52,725	52,977	52,977
R^2	0.735	0.736	0.684	0.685	0.735	0.736	0.683	0.685

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Return

Baseline results (H3)

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Table: Firm's position in GVCs and division of surplus

Sample	Re-exports excluded			
Variable	(1)	(2)	(3)	(4)
V_{ft}^{M}	0.0375**	0.0431**		
	(0.0169)	(0.0175)		
V_{ft}^{X}	-0.2533***	-0.2258***		
	(0.0547)	(0.0528)		
$(V_{ft}^{X} - V_{ft}^{M})$			-0.0659***	-0.0672***
			(0.0158)	(0.0167)
ln Productivity$_{ft}$		0.0919***		0.0923***
		(0.0084)		(0.0084)
Firm size:				
Small$_{ft}$		reference		reference
Medium$_{ft}$		0.1070***		0.1084***
		(0.0082)		(0.0084)
Large$_{ft}$		0.1892***		0.1909***
		(0.0137)		(0.0138)
Fixed effects	firm, industry-year, industry-country, product-country			
Observations	107,994	107,994	107,994	107,994
R^2	0.684	0.685	0.684	0.685

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Robustness check

1. **Placebo test** Placebo test
2. **Sub-sample regressions using upstreamness of exports** Sub-sample with upstreamness of exports
3. **Quality-adjusted effects** Quality-adjusted effects

Conclusion

Main findings:

- More upstream position of production process and specialization along GVCs is associated with a higher bargaining power, thus more value capture in agri-food GVCs
- The effects are mainly due to the upgrading of the product mix and the reduction of the *hol-up* problem
- Weak support, mainly downstream, of the "smile curve" hypothesis using the "within" upstream/midstream sectors (agri-food sector) anf firms (food processors)

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What strategies for food processors firms?

- Develop dominant positions by specializing further upstream in the value chain.
- Upgrade product quality (position themselves in niche markets)
- Characteristics of each economy, industry and in particular of tasks matters in the design of industrial policies

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Perspectives:

- Building a theoretical framework that endogenizes bilateral bargaining power, by analyzing suppliers in GVCs
- Introduce the availability of substitutes in the market (other suppliers and/or buyers)
- Take into account the selection effect that can potentially arise from focusing on GVC firms.

Results two-stage two-tier stochastic frontier

Back

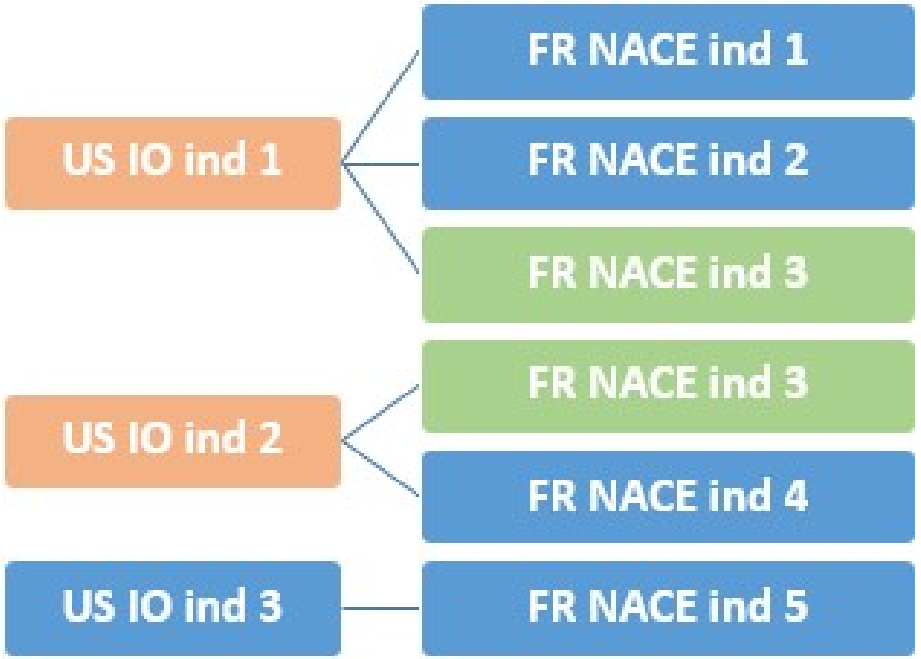
Sample	Re-exports excluded			All		
	Fist stage		Second stage	Fist stage		Second stage
Variables	ln (x_{fjkt}) (1)	ln (s_{fjkt}) (2)	ln p_{fjkt} (3)	ln (x_{fjkt}) (1)	ln (s_{fjkt}) (2)	ln p_{fjkt} (3)
ln $Inst_{fjkt}(x_{fjkt})$	-0.3288***	0.0989***		-0.3488***	0.1023***	
	(0.0026)	(0.0026)		(0.0021)	(0.0021)	
ln $Inst_{fjkt}(s_{fjkt})$	0.1118***	-0.4017***		0.1276***	-0.4250***	
	(0.0024)	(0.0026)		(0.0018)	(0.0020)	
ln Productivity$_{ft\,ft}$	-0.0500***	0.3408***	-0.0927***	-0.0364***	0.4437***	-0.0894***
	(0.0073)	(0.0080)	(0.0028)	(0.0055)	(0.0061)	(0.0022)
Small$_{ft}$	reference	reference	reference	reference	reference	reference
Medium$_{ft}$	-0.2707***	0.4584***	-0.0672***	-0.2938***	0.6497***	-0.0759***
	(0.0119)	(0.0131)	(0.0047)	(0.0095)	(0.0104)	(0.0038)
Large$_{ft}$	-0.6613***	0.9529***	-0.0736***	-0.7773***	1.4124***	0.0349***
	(0.0160)	(0.0175)	(0.0067)	(0.0113)	(0.0124)	(0.0053)
ln GDP per capita	-0.0916*	-0.8456***	-0.0271	0.0550*	-0.6976***	-0.0651***
	(0.0469)	(0.0514)	(0.0181)	(0.0332)	(0.0364)	(0.0126)
Share of industrial value added	-0.0004	0.0066**	-0.0030***	0.0004	0.0084***	-0.0002
in GDP	(0.0028)	(0.0031)	(0.0011)	(0.0020)	(0.0022)	(0.0007)
Share of agricultural value added	0.0142*	0.0011	-0.0144***	-0.0040	-0.0067	-0.0090***
in GDP	(0.0082)	(0.0090)	(0.0032)	(0.0055)	(0.0060)	(0.0021)
ln Buyer share (b_{fjkt})			0.0825***			0.1179***
			(0.0030)			(0.0022)
ln Supplier share (s_{fjkt})			-0.0946***			-0.0888***
			(0.0022)			(0.0016)
Error term decomposition						
ω_{fjkt}			0.5671 ***			0.5988***
			(0.0000)			(0.0000)
u_{fjkt}			0.4193***			0.4190***
			(0.0000)			(0.0000)
ν_{fjkt}			0.4105***			0.4054***
			(0.0000)			(0.0000)
Year fixed effects	YES	YES	YES	YES	YES	YES
Firm's main activity fixed effects	YES	YES	YES	YES	YES	YES
Country fixed effets	YES	YES	YES	YES	YES	YES
4-digit product fixed effets	YES	YES	YES	YES	YES	YES
Observations	181,571	183,165	181,562	329,652	331,762	329,638
R^2	0.279	0.341		0.312	0.372	
Partial R^2	0.0825			0.0801		
F-stat	6007.1002			11457.0474		
Endogeneity test	6922.0862			15743.7082		
p-value	0.0000			0.0000		

Notes: Small: 1 to 49 employees; Medium: 50 to 499 employees; Large: 500 employees or more. The sample comprises all importers and all exporters of French agri-food industry firm-year observations between 2002-2017. Standard errors in brackets. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Build a detailed input-output table for France

		Used inputs and value added			Final use	Total use
		US IO ind 1	US IO ind 2	US IO ind 3		
Supply of inter-mediate inputs	US IO ind 1	a_{11}	a_{12}	a_{13}	F_1	Y_1
	US IO ind 2	a_{21}	a_{22}	a_{13}	F_2	Y_2
	US IO ind 3	a_{31}	a_{21}	a_{33}	F_3	Y_3
Value added		VA_1	VA_2	VA_3		
Total output		Y_1	Y_2	Y_3		

(a) US input-output table



(b) Multiple industry correspondences

Figure: US input-output table structure and correspondences with NACE Rev.2

Data

Build a detailed input-output table for France

		US IO ind 1			US IO ind 2		US IO ind 3
		FR NACE ind 1	FR NACE ind 2	FR NACE ind 3	FR NACE ind 3	FR NACE ind 4	FR NACE ind 5
US IO ind 1	FR NACE ind 1	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{6}a_{12}$	$\frac{1}{6}a_{12}$	$\frac{1}{3}a_{13}$
	FR NACE ind 2	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{6}a_{12}$	$\frac{1}{6}a_{12}$	$\frac{1}{3}a_{13}$
	FR NACE ind 3	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{9}a_{11}$	$\frac{1}{6}a_{12}$	$\frac{1}{6}a_{12}$	$\frac{1}{3}a_{13}$
US IO ind 2	FR NACE ind 3	$\frac{1}{6}a_{21}$	$\frac{1}{6}a_{21}$	$\frac{1}{6}a_{21}$	$\frac{1}{4}a_{22}$	$\frac{1}{4}a_{22}$	$\frac{1}{2}a_{13}$
	FR NACE ind 4	$\frac{1}{6}a_{21}$	$\frac{1}{6}a_{21}$	$\frac{1}{6}a_{21}$	$\frac{1}{4}a_{22}$	$\frac{1}{4}a_{22}$	$\frac{1}{2}a_{13}$
US IO ind 3	FR NACE ind 5	$\frac{1}{3}a_{31}$	$\frac{1}{3}a_{31}$	$\frac{1}{3}a_{31}$	$\frac{1}{2}a_{21}$	$\frac{1}{2}a_{21}$	a_{33}

Figure: Equal weights for all correspondences within each pair of industry codes

Data

Build a detailed input-output table for France

	FR NACE ind 1	FR NACE ind 2	FR NACE ind 3	FR NACE ind 4	FR NACE ind 5
FR NACE ind 1	$b_{11} = \frac{1}{9} a_{11}$	$b_{12} = \frac{1}{9} a_{11}$	$b_{13} = \frac{1}{9} a_{11} + \frac{1}{6} a_{12}$	$b_{14} = \frac{1}{6} a_{12}$	$b_{15} = \frac{1}{3} a_{13}$
FR NACE ind 2	$b_{21} = \frac{1}{9} a_{11}$	$b_{22} = \frac{1}{9} a_{11}$	$b_{23} = \frac{1}{9} a_{11} + \frac{1}{6} a_{12}$	$b_{24} = \frac{1}{6} a_{12}$	$b_{25} = \frac{1}{3} a_{13}$
FR NACE ind 3	$b_{31} = \frac{1}{9} a_{11} + \frac{1}{6} a_{21}$	$b_{32} = \frac{1}{9} a_{11} + \frac{1}{6} a_{12}$	$b_{33} = \frac{1}{9} a_{11} + \frac{1}{6} a_{12} + \frac{1}{6} a_{21} + \frac{1}{4} a_{22}$	$b_{34} = \frac{1}{6} a_{12} + \frac{1}{4} a_{22}$	$b_{35} = \frac{1}{3} a_{13} + \frac{1}{2} a_{13}$
FR NACE ind 4	$b_{41} = \frac{1}{6} a_{21}$	$b_{42} = \frac{1}{6} a_{21}$	$b_{43} = \frac{1}{6} a_{21} + \frac{1}{4} a_{22}$	$b_{44} = \frac{1}{4} a_{22}$	$b_{45} = \frac{1}{2} a_{13}$
FR NACE ind 5	$b_{51} = \frac{1}{3} a_{31}$	$b_{52} = \frac{1}{3} a_{31}$	$b_{53} = \frac{1}{3} a_{31} + \frac{1}{2} a_{21}$	$b_{54} = \frac{1}{2} a_{21}$	$b_{55} = a_{33}$

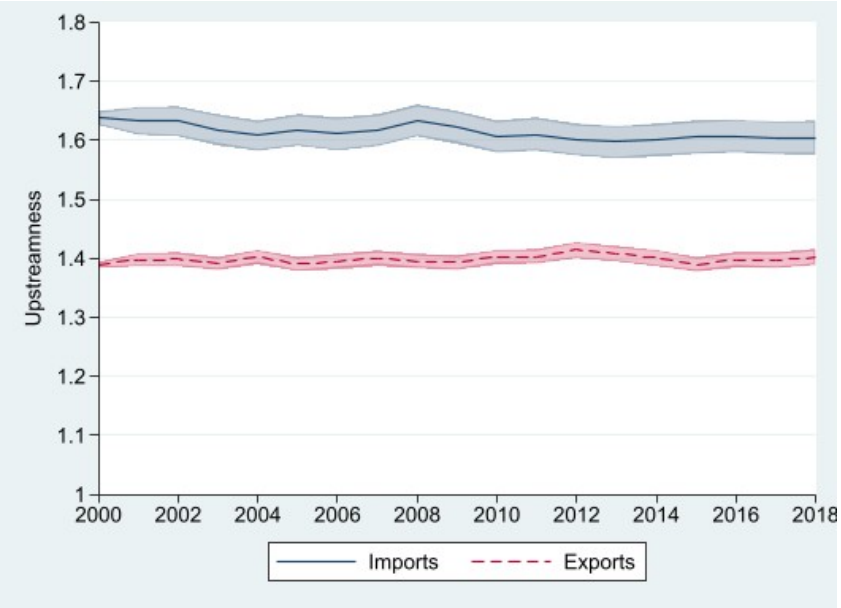
Figure: Group weights across NACE industries

Data

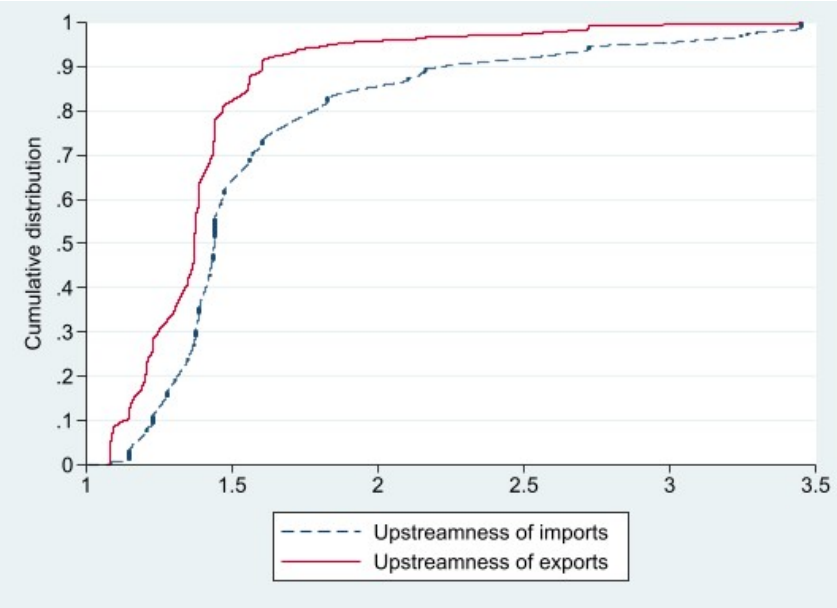
Upstreamness and position in GVC

back

NACE industry	Upstreamness
Seed processing for propagation	3.61
Growing of cereals (except rice), leguminous crops and oil seeds	3.45
Raising of dairy cattle	2.98
Manufacture of oils and fats	2.72
Manufacture of starches and starch products	2.16
Processing of tea and coffee	1.47
Processing and preserving of meat	1.44
Manufacture of wine from grape	1.23
Manufacture of prepared meals and dishes	1.20
Manufacture of bread; manufacture of fresh pastry goods and cakes	1.10
Retail sale of bread, cakes, flour confectionery and sugar confectionery in specialised stores	1.01
Retail sale of fruit and vegetables in specialised stores	1.01



(a) Sector-level average



(b) Cumulative distribution of French firms

Baseline results for All transaction sample

back to baseline

- H1 & H2

Table: Firm's position in GVCs and division of surplus – low versus high level of upstreamness of the core activity of firms

Sample	All transactions							
Sub-sample	More downstream firms **(H2)**		More Upstream firms **(H1)**		More downstream firms **(H2)**		More Upstream firms **(H1)**	
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
V^M_{ft}	-0.0329**	-0.0345**	0.0398	0.0745**				
	(0.0146)	(0.0155)	(0.0314)	(0.0320)				
V^X_{ft}	0.2520***	0.2453***	-0.1920**	-0.1723**				
	(0.0574)	(0.0567)	(0.0879)	(0.0823)				
$(V^X_{ft} - V^M_{ft})$					0.0591***	0.0600***	-0.0633**	-0.0896***
					(0.0164)	(0.0169)	(0.0295)	(0.0299)
ln Productivity$_{ft}$		0.0947***		0.1063***		0.0954***		0.1066***
		(0.0063)		(0.0051)		(0.0063)		(0.0052)
Firm size:								
Small$_{ft}$		reference		reference		reference		reference
Medium$_{ft}$		0.1100***		0.1673***		0.1087***		0.1672***
		(0.0078)		(0.0084)		(0.0078)		(0.0084)
Large$_{ft}$		0.1425***		0.1546***		0.1397***		0.1548***
		(0.0099)		(0.0154)		(0.0098)		(0.0154)
Fixed effects	firm, industry-year, industry-country, product-country							
Observations	120,880	120,880	133,401	133,401	120,880	120,880	133,401	133,401
R^2	0.727	0.728	0.641	0.643	0.727	0.728	0.641	0.643

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Baseline results for All transaction sample

back to baseline

- H3

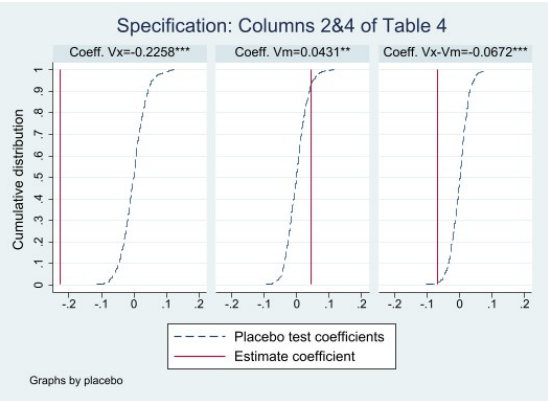
Table: Firm's position in GVCs and division of surplus

Sample	All transactions			
Variable	(1)	(2)	(3)	(4)
V_{ft}^{M}	0.0053	0.0130		
	(0.0165)	(0.0177)		
V_{ft}^{X}	0.0755	0.0816		
	(0.0576)	(0.0560)		
$(V_{ft}^{X} - V_{ft}^{M})$			0.0058	-0.0000
			(0.0175)	(0.0183)
ln Productivity$_{ft}$		0.1028***		0.1028***
		(0.0033)		(0.0033)
Firm size:				
Small$_{ft}$		reference		reference
Medium$_{ft}$		0.1369***		0.1366***
		(0.0048)		(0.0048)
Large$_{ft}$		0.1452***		0.1444***
		(0.0087)		(0.0087)
Fixed effects	firm, industry-year, industry-country, product-country			
Observations	258,160	258,160	258,160	258,160
R^2	0.660	0.662	0.660	0.662

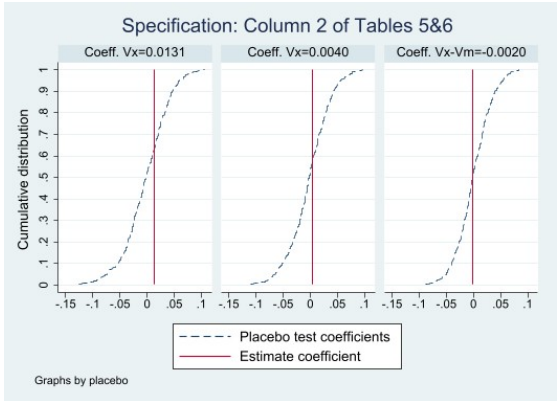
Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Placebo test

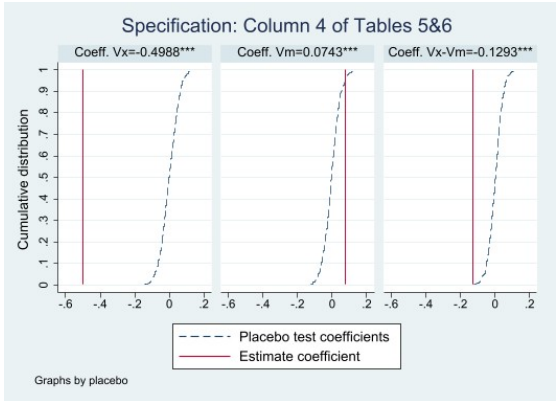
back to Robustness



(a) Regressions with whole Re-export excluded sample



(b) Sub-sample regressions on more downstream firms in the Re-export excluded sample



(c) Sub-sample regressions on more upstream firms in the Re-export excluded sample

Figure: Distribution of V_{ft}^X and V_{ft}^M, and $V_{ft}^X - V_{ft}^M$ **placebo coefficients** versus **estimated coefficients**

Sub-sample regressions using upstreamness of exports

back to Robustness

Table: Robustness test IV: Firm's position in GVCs and division of surplus – low versus high level of upstreamness of exports

Sample	Panel A: Re-exports excluded				Panel B: All			
Sub-sample	More downstream firms (H2)		More Upstream firms (H1)		More downstream firms (H2)		More Upstream firms (H1)	
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
V_{ft}^{M}	-0.0356	-0.0613**	0.1937***	0.1903***	0.0066	0.0039	0.1443***	0.1160**
	(0.0321)	(0.0302)	(0.0386)	(0.0385)	(0.0210)	(0.0216)	(0.0539)	(0.0521)
V_{ft}^{X}	-0.3327	-0.3736	-0.4498***	-0.3573***	0.0743	-0.1570	-0.4182***	-0.0851
	(0.2832)	(0.2700)	(0.1241)	(0.1271)	(0.2264)	(0.2163)	(0.0980)	(0.1045)
$Controls_{ft}$	NO	YES	NO	YES	NO	YES	NO	YES
Fixed effects	firm, industry-year, industry-country, product-country							
Observations	18,055	18,055	21,476	21,476	41,802	41,802	53,414	53,414
R^2	0.729	0.730	0.741	0.741	0.715	0.717	0.725	0.726

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sub-sample regressions using upstreamness of exports

back to Robustness

Table: Robustness test IV: Firm's expansion along GVCs and division of surplus – low versus high level of upstreamness of exports

Sample	Panel A: Re-exports excluded				Panel B: All			
Sub-sample	More downstream firms **(H2)**		More Upstream firms **(H1)**		More downstream firms **(H2)**		More Upstream firms **(H1)**	
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
$(V_{ft} - V_{ft}^{M})$	0.0250	0.0494	-0.2271***	-0.2112***	-0.0063	-0.0046	-0.2016***	-0.1101**
	(0.0322)	(0.0299)	(0.0339)	(0.0353)	(0.0209)	(0.0214)	(0.0451)	(0.0446)
$Controls_{ft}$	NO	YES	NO	YES	NO	YES	NO	YES
Fixed effects	firm, industry-year, industry-country, product-country							
Observations	18,055	18,055	21,476	21,476	41,802	41,802	53,414	53,414
R^2	0.729	0.730	0.741	0.741	0.715	0.717	0.725	0.726

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Quality-adjusted effects

- Estimate of the quality-adjusted GVC bargaining power index, $\tilde{NS}_{fjkt}$
- Use it as an explained variable

Table: Firm's position in GVCs and quality-adjusted surplus – low versus high level of upstreamness of the core activity of firms

Sample	Re-exports excluded							
Sub-sample	More downstream firms **(H2)**		More Upstream firms **(H1)**		More downstream firms **(H2)**		More Upstream firms **(H1)**	
Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
V_{ft}^{M}	0.0222	0.0148	0.0100	0.0218				
	(0.0287)	(0.0281)	(0.0194)	(0.0200)				
V_{ft}^{X}	-0.1446*	-0.1408*	-0.1353***	-0.1036**				
	(0.0783)	(0.0763)	(0.0410)	(0.0406)				
$(V_{ft} - V_{ft}^{M})$					-0.0365	-0.0295	-0.0273	-0.0332*
					(0.0280)	(0.0272)	(0.0174)	(0.0179)
ln Productivity$_{ft}$		0.0418***		0.0244***		0.0418***		0.0251***
		(0.0100)		(0.0059)		(0.0100)		(0.0059)
Firm size:								
Small$_{ft}$		reference		reference		reference		reference
Medium$_{ft}$		0.0708***		0.0594***		0.0710***		0.0605***
		(0.0120)		(0.0095)		(0.0120)		(0.0096)
Large$_{ft}$		0.1136***		0.1085***		0.1129***		0.1108***
		(0.0172)		(0.0125)		(0.0172)		(0.0124)
Fixed effects	firm, industry-year, industry-country, product-country							
Observations	50,396	50,396	51,911	51,911	50,396	50,396	51,911	51,911
R^2	0.465	0.466	0.514	0.514	0.465	0.466	0.513	0.514

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Compared to to baseline results from the sub-sample regressions back to Robustness

Quality-adjusted effects

- Estimate of the quality-adjusted GVC bargaining power index, $\tilde{NS}_{fjkt}$
- Use it as an explained variable

Table: Firm's position in GVCs and quality-adjusted surplus

Sample	Re-exports excluded **(H3)**			
Variable	(1)	(2)	(3)	(4)
V_{ft}^{M}	0.0102	0.0138		
	(0.0144)	(0.0141)		
V_{ft}^{X}	-0.1470***	-0.1303***		
	(0.0477)	(0.0465)		
$(V_{ft}^{X} - V_{ft}^{M})$			-0.0286*	-0.0294**
			(0.0150)	(0.0146)
ln Productivity$_{ft}$		0.0302***		0.0307***
		(0.0049)		(0.0049)
Firm size:				
Small$_{ft}$		reference		reference
Medium$_{ft}$		0.0631***		0.0641***
		(0.0095)		(0.0096)
Large$_{ft}$		0.1067***		0.1078***
		(0.0110)		(0.0110)
Fixed effects	firm, industry-year, industry-country, product-country			
Observations	104,656	104,656	104,656	104,656
R^2	0.457	0.458	0.457	0.458

Notes: Standard errors clustered by country in parentheses. Removal of 2% from the distribution tails of the GVC bargaining power index. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Compared to to baseline results from the whole samples back to Robustness

Quality-adjusted GVC bargaining power

Back to results

- Purge of the export unit prices, and thus the division of surplus from quality components Khandelwal et al., 2013; Fan et al., 2015
  1: Estimate the the following linear form with OLS, using the demand elasticities from Ossa (2015)

$$\ln q_{fjkt} + \varepsilon_k \ln p_{fjkt} = FE_{jkt} + e_{fjkt}$$

  2: Recover the quality measure from residual e_{fjkt} as follow

$$\ln \widehat{\lambda}_{fjkt} = \frac{\widehat{e}_{fjkt}}{\varepsilon_k - 1} \tag{1}$$

  3: Compute the quality-adjusted prices

$$\ln \tilde{p}_{fjkt} = \ln p_{fjkt} - \ln \widehat{\lambda}_{fjkt}$$

  4: Estimation of quality-adjusted GVC bargaining index, $\tilde{NS}_{fjkt}$, using $\ln \tilde{p}_{fjkt}$

Quality-adjusted GVC bargaining power

Back to results

- Two-stage two-tier stochastic frontier model (Polachek and Yoon, 1987, 1996; Kumbhakar and Parmeter, 2009):

$$p_{fjkt} = \mu_{fjkt}(x) + \beta_{fjkt}\left(\overline{jfkt} - \mu_{fjkt}(x)\right) - (1-\beta_{fjkt})\left(\mu_{fjkt}(x) - \underline{p_{fjkt}}\right)$$

- Based on price equation from the theoretical framework:

$$\begin{aligned}
\ln \tilde{p}_{fjkt} &= \tilde{\mu}_{fjkt}(x) + \tilde{\xi}_{fjkt}, \\
\tilde{\mu}_{fjkt}(x) &= \text{Controls}_{ft} + \text{Controls}_{jt} + \alpha_b b_{fjkt} + \alpha_s s_{fjkt} + FE_t + FE_k + FE_r + FE_j \\
\tilde{\xi}_{fjkt} &= \tilde{\omega}_{fjkt} - \tilde{u}_{fjkt} + \tilde{e}_{fjkt}
\end{aligned}$$

$$\begin{aligned}
\tilde{e}_{fjkt} &\sim i.i.d.\ N(0, \delta_e^2) \\
\tilde{\omega}_{fjkt} &\sim i.i.d.\ Exp(\delta_\omega, \delta_\omega^2) \\
\tilde{u}_{fjkt} &\sim i.i.d.\ Exp(\delta_u, \delta_u^2)
\end{aligned}$$

- Construction of IVs for the bilateral shares (Alviarez et al., 2023)

Buyer share	–	purchases of f 's other importers from exporters other than f
Supplier share	–	sales of j's other exporters to importers other than j

- Estimation of $\ln \tilde{p}_{fjkt}$ by the maximum likelihood (ML) method

$$\tilde{NS}_{fjkt} = \tilde{\omega}_{fjkt} - \tilde{u}_{fjkt}$$