Firm-Level Determinants of GVC Positioning and Span: Evidence from the Netherlands

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This paper in a nutshell

- Measure the GVC position and span of firms in the Netherlands
- Firms increase their GVC span with productivity and sales
- Dutch firms *grow by expanding downstream*
  (different from Chinese firms, Chor et al. (2021))

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GVCs Shape the Global Economy

- Globalisation of manufacturing driven by technological and policy factors over recent decades (Antràs and Chor, 2022; Baldwin, 2019).
- GVCs extended until the early 2010s, then plateaued or retracted.
- GVCs fundamentally shape the business environment and outcomes of firms, and transmit shocks.
- Firm-level evidence on GVC participation relatively limited.

GVC Position & Span

GVC Position & Span

1. Import Upstreamness U_I: Distance of a firm's **imports** from final demand (Chor et al., 2021; Antràs et al., 2012).

   $U_I(i) = \sum_{\rho \in P_i} \omega(\rho) u(\rho)$

2. Export Upstreamness U_X: Distance of a firm's **exports** from final demand.

3. GVC Span: **Operational scope** within GVCs
   $\hookrightarrow$ here: difference between U_I and U_X

Theory: Firm-Level Drivers of GVC Position & Span

What determines choice of
U_I, U_X, and GVC Span at the firm level?

Theory: Firm-Level Drivers of GVC Position & Span

1. **Fally and Hillberry (2018):**
2. Alfaro et al. (2019)
3. Chor et al. (2021)

- Two factors determine firm GVC span:
  1. Within-firm diseconomies of scope
  2. Firm-to-firm transaction costs
- Lower diseconomies lead to:
  - 'Larger' firms
  - Comparative advantage $\rightarrow$ downstream

Theory: Firm-Level Drivers of GVC Position & Span

1. Fally and Hillberry (2018)
2. **Alfaro et al. (2019):**
3. Chor et al. (2021)

- Productivity increases GVC span

  $\hookrightarrow$ need to cover fixed cost of integrating stages

- Supply chain shaped by:
  1. Elasticity of demand of final good
  2. Substitutability & contractability of stages

Theory: Firm-Level Drivers of GVC Position & Span

1. Fally and Hillberry (2018)
2. Alfaro et al. (2019)
3. **Chor et al. (2021):**

- When moving U_I and U_X outwards, firm trades off:
  1. Better input/output prices
  2. Higher fixed and variable costs of production
- Productivity increases span & inputs if:
  - Decreasing returns to scale not too strong
  - In-house production cheaper than inputs on margin

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Data

Data

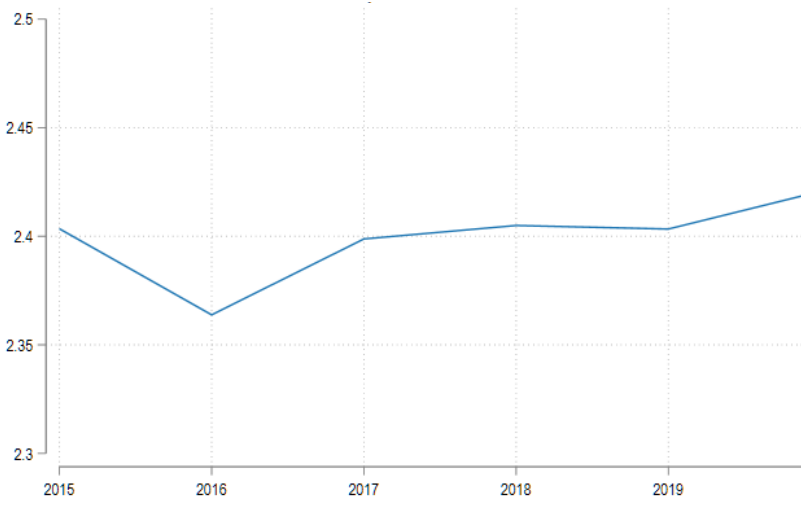
- Firm-level microdata from Statistics Netherlands
- Data between 2010 - 2021
- "Intersection" sample : 2015 - 2020

  $\hookrightarrow$ ~40,000 obs.
- Focus on "structural exporters" (positive exports in 3/4 most recent years)

Variables

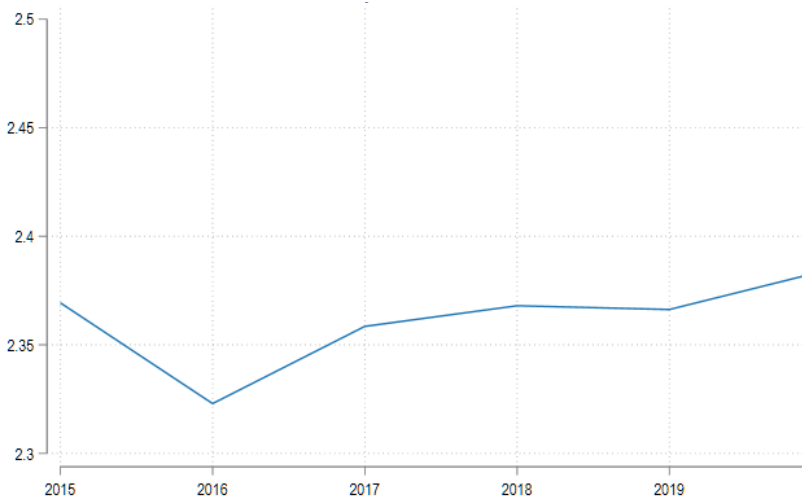
- GVC indicators, including GVC position and span (Chor et al., 2021)
- Other firm characteristics (productivity, age, wage bill, MNE, ...)

Average Import Upstreamness (U_I), 2015 - 2020



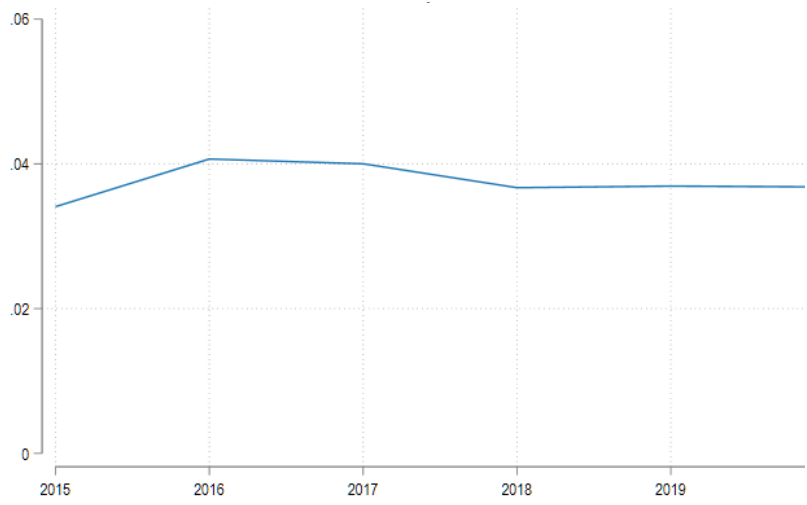
Note: Average of Import Upstreamness (U_I) across firms in the core sample, 2015 - 2020

Export Upstreamness (U_X), 2015 - 2020



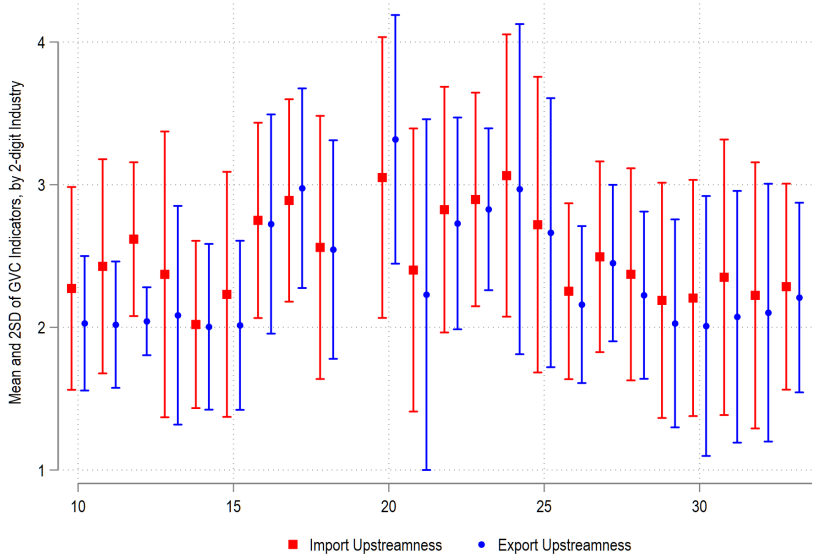
Note: Average of Export Upstreamness (U_X) across firms in the core sample, 2015 - 2020

GVC Span ($U_I - U_X$), 2015 - 2020

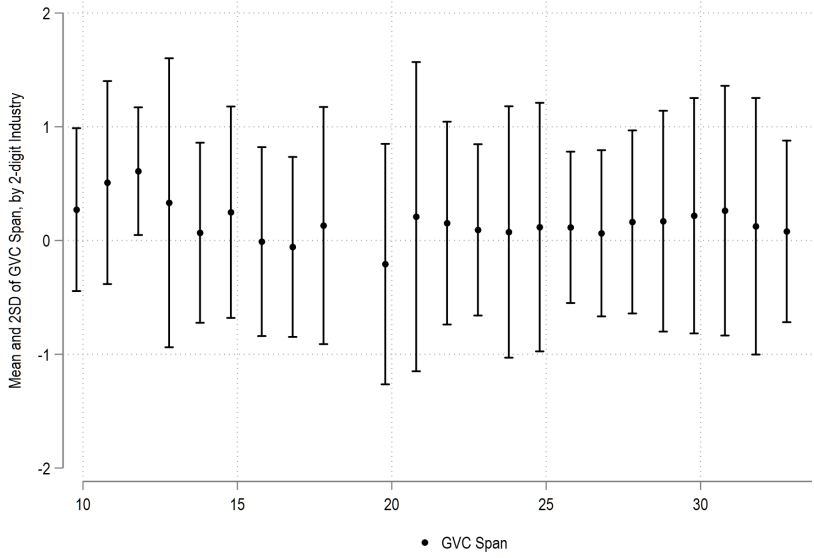


Note: Average of GVC Span ($U_I - U_X$) across firms in the core sample, 2015 - 2020

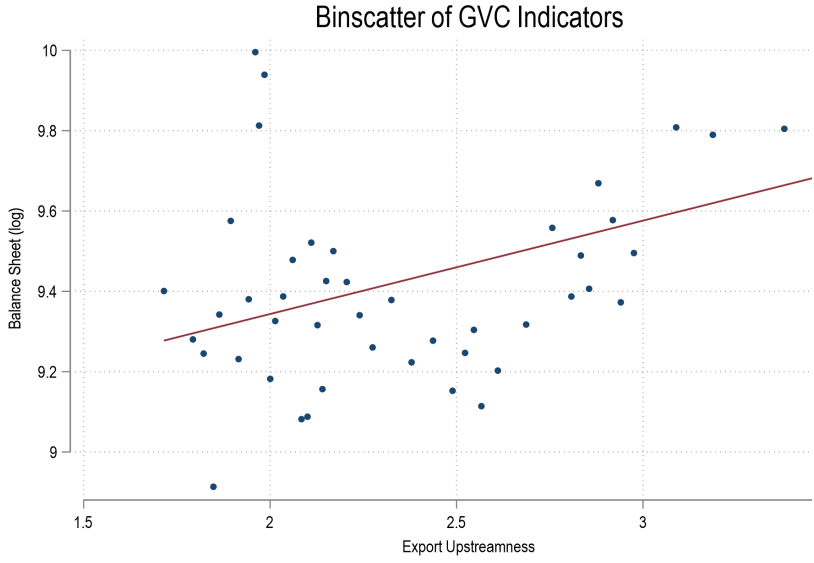
Import & Export Upstreamness (U_I, U_X), by Industry



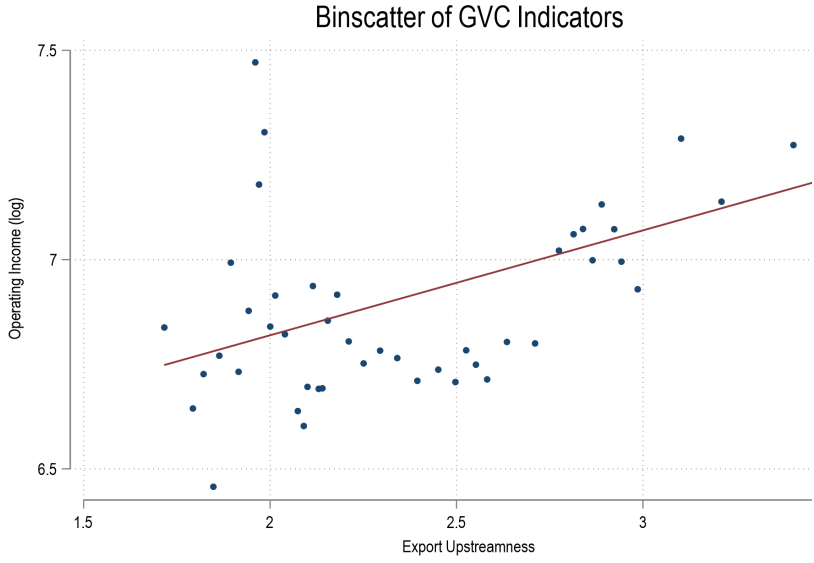
GVC Span ($U_I - U_X$), by Industry



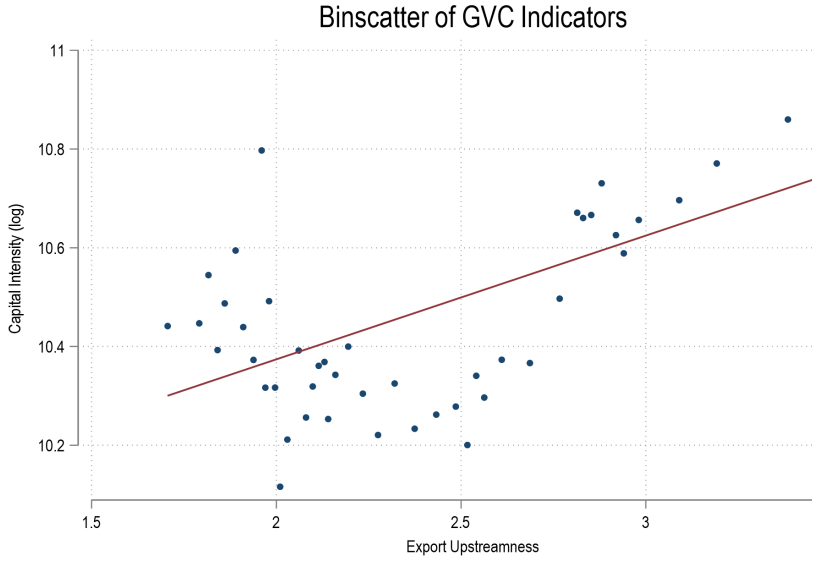
Export Upstreamness U_X and Balance Sheets



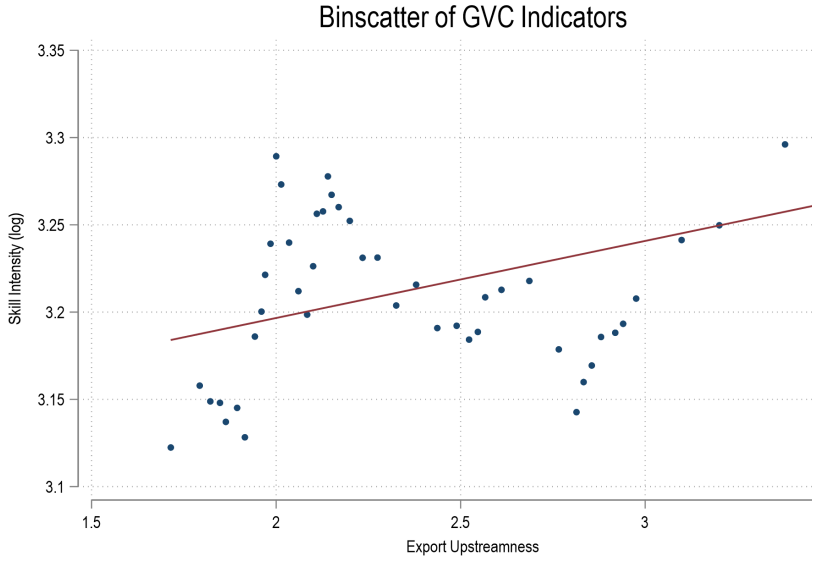
Export Upstreamness U_X and Operating Result



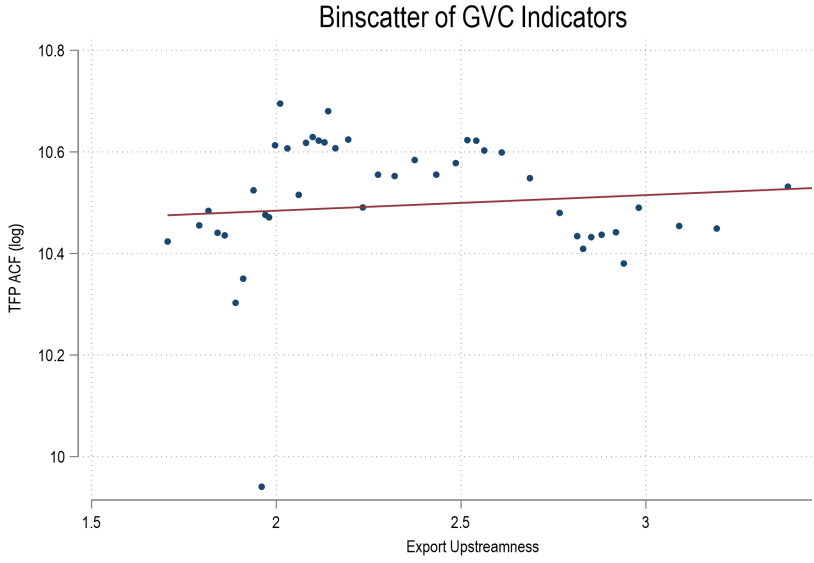
Export Upstreamness U_X and Capital Intensity



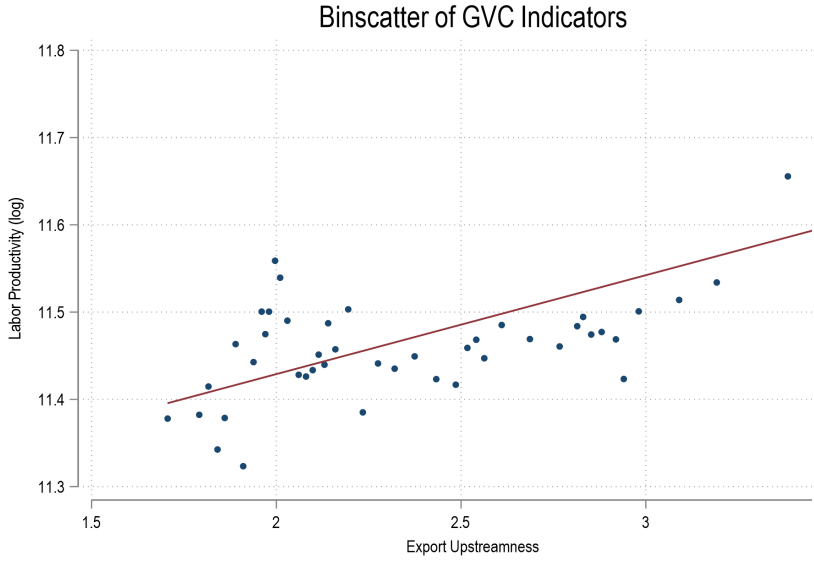
Export Upstreamness U_X and Skill Intensity



Export Upstreamness U_X and TFP



Export Upstreamness U_X and Labour Productivity



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- GVC Position & Span: Drivers

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GVC Position & Span: Drivers

- What explains the position that firms occupy in GVCs?

  $\hookrightarrow$ Do firms change their GVC position/span as they become more productive, larger, or older?

- Regress GVC position ($G_{i,t} \in \{U_I, U_X, Span\}$) on firm characteristics ($X_{i,t}$):

  $$G_{i,t} = \beta \cdot X_{i,t} + \mu_{t,s} + \xi_i + \varepsilon_{i,t}$$

- Firm characteristics $X_{i,t}$: Productivity, age, revenue, capital-intensity, skill intensity

- Work in Progress: IV for productivity

Firms increase GVC span with productivity

	U_I	U_X	*Span*	U_I	U_X	*Span*
	(1)	(2)	(3)	(4)	(5)	(6)
TFP ACF	0.00427	-0.00744*	0.0117**			
	(0.00422)	(0.00380)	(0.00566)			
Lab. Prod.				0.00373	-0.00712*	0.0108*
				(0.00431)	(0.00381)	(0.00572)
Observations	40,846	40,846	40,846	40,846	40,846	40,846
FEs:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at the firm-level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All RHS variables are lagged by one year and in logs. U_I, U_X, and *Span* are *Import Upstreamness*, *Export Upstreamness*, and *GVC Span*, respectively.

... controlling for capital and skill intensity

	U_I	U_X	*Span*	U_I	U_X	*Span*
	(1)	(2)	(3)	(4)	(5)	(6)
Capital Intensity	-0.00180	0.00284	-0.00463	-0.00214	0.00351	-0.00565
	(0.00253)	(0.00246)	(0.00354)	(0.00250)	(0.00245)	(0.00351)
Skill Intensity	0.00805	0.0148	-0.00677	0.00808	0.0149	-0.00686
	(0.0148)	(0.0137)	(0.0197)	(0.0148)	(0.0137)	(0.0197)
TFP ACF	0.00375	-0.00717*	0.0109*			
	(0.00427)	(0.00381)	(0.00570)			
Lab. Prod.				0.00364	-0.00761**	0.0113**
				(0.00430)	(0.00382)	(0.00573)
Observations	40,846	40,846	40,846	40,846	40,846	40,846
FEs:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at the firm-level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All RHS variables are lagged by one year and in logs. U_I, U_X, and *Span* are *Import Upstreamness*, *Export Upstreamness*, and *GVC Span*, respectively.

Stronger effects for manufacturing firms

	U_I	U_X	*Span*	U_I	U_X	*Span*
	(1)	(2)	(3)	(4)	(5)	(6)
TFP ACF	0.00390	-0.00678*	0.0107*			
	(0.00425)	(0.00383)	(0.00570)			
× Manuf.	0.00155	-0.00284*	0.00439**			
	(0.00161)	(0.00146)	(0.00209)			
Lab. Prod.				0.00327	-0.00629	0.00956*
				(0.00438)	(0.00387)	(0.00580)
× Manuf.				0.00134	-0.00242*	0.00376**
				(0.00148)	(0.00135)	(0.00192)
Observations	40,846	40,846	40,846	40,846	40,846	40,846
FEs:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year	Yes	Yes	Yes	Yes	Yes	Yes

Note: Clustered standard errors at the firm-level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All RHS variables are lagged by one year and in logs. U_I, U_X, and *Span* are *Import Upstreamness*, *Export Upstreamness*, and *GVC Span*, respectively.

Firms adapt GVC position with size

	U_I	U_X	*Span*
	(1)	(2)	(3)
Sales (log)	0.00489	-0.00912**	0.0140**
	(0.00473)	(0.00465)	(0.00647)
Age + 1 (log)	0.0316	-0.00584	0.0374
	(0.0218)	(0.0201)	(0.0286)
Observations	40,846	40,846	40,846
FEs:			
Firm	Yes	Yes	Yes
Sector-Year	Yes	Yes	Yes

Note: Clustered standard errors at the firm-level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. All RHS variables are lagged by one year and in logs. U_I, U_X, and *Span* are *Import Upstreamness*, *Export Upstreamness*, and *GVC Span*, respectively.

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Conclusion

- We measure the GVC position and span of firms in the Netherlands
- Firms increase their GVC span with productivity and sales

  $\hookrightarrow$ *Trade openness and participation in GVCs* are important conditions for firms to grow.

- Dutch firms expand downstream as they grow
  (different from Chinese firms)

  $\hookrightarrow$ different comparative advantage of firms in NLD?

Thank You!

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Overview

Appendix
- Background
- Literature
- Data

Background: Project 3 *Global Value Chains*

- Third project within the research line *Global Value Chains* (Min BuZa)
- Follow-up on project 2 "The importance of Dutch services in global goods production" (Wache et al., 2024)

↪ Conclusion: *Professional services are becoming increasingly important for the Netherlands*

Drivers of GVC Participation

GVC participation is influenced by (Ignatenko et al., 2019; Urata and Baek, 2020; World Bank, 2020; Fernandes et al., 2022):

- Economic Size
- Factor Endowments
- Geographic Proximity
- Trade and Investment Policies
- Institutional Frameworks
- Domestic Industrial Capacity

Impact of GVC Participation

- **Country-Level Evidence**:
  - Positive impact on **economic growth** (World Bank, 2020).
  - Boosts **productivity**, more so if far from tech frontier (Pahl and Timmer, 2020).
- **Firm-Level Impact**:
  - Positive influence on **productivity** (Criscuolo and Timmis, 2017; Altomonte et al., 2018; Constantinescu et al., 2019; Banh et al., 2020; Antràs and Chor, 2022).
  - Specialisation in stages of production with comparative advantage (Grossman and Rossi-Hansberg, 2008; Baldwin and Robert-Nicoud, 2014).
  - Helps **tech & knowledge transfer** (Javorcik, 2004; Banh et al., 2020; Merlevede and Theodorakopoulos, 2021; Ayerst et al., 2023; Rachapalli, 2021, 2024).
  - Mixed impact on **employment and wages** (Szymczak, 2024).

Smile Curve Hypothesis

- Position within GVCs influences value extraction ('smile curve hypothesis') and productivity.
- Ju and Yu (2015) and Mahy et al. (2022): Nonlinear relationship between upstreamness and productivity.
- Rungi and Del Prete (2018): Linear relationship.
- de Vries et al. (2021): No significant relationship.
- Baldwin and Ito (2021): Recent shift of value-added from manufacturing to service sectors.

Predictors of GVC Position

- **Country-Level Evidence**:
  - Credit-to-GDP ratios & schooling negatively affect upstreamness; GDPpc, rule of law & capital intensity not significant (Antràs et al., 2012).
  - Central stages tend to be downstream (Antràs and de Gortari, 2020).
  - Trade-off: transaction costs & diseconomies of scope (Fally and Hillberry, 2018).
- **Firm-Level Evidence**:
  - Productivity, size & age increase import upstreamness & GVC span (Chor et al., 2021).
  - Congested courts lead to larger vertical spans (Boehm and Oberfield, 2020).
  - High elasticity of demand leads firms to buy upstream inputs (Alfaro et al., 2019).

GVC Position and Firm Outcomes

- **Mixed Results**:
  - Ju and Yu (2015): Upstream firms in China (2000-2006) are more capital-intensive, with higher productivity and profitability.
  - Chor et al. (2021): Increased GVC span in Chinese firms (2000-2006) leads to higher value added, input purchases, wage bill, fixed costs, assets, and profits.
  - de Vries et al. (2021): No significant link between upstreamness and productivity in Dutch firms (2012-2017), but profitability rises with downstream position.
  - Mahy et al. (2022): Belgian firms (2002-2010) show higher productivity, wage costs, and profitability with upstreamness.

Other Drivers of GVC Position & Span

What determines choice of U_I, U_X, and GVC Span at the firm/industry/country level?

Other Drivers of GVC Position & Span

1. **Antràs and de Gortari (2020):**
2. Boehm and Oberfield (2020)
3. Antràs et al. (2012)
4. Alfaro et al. (2019)

- Trade costs are proportional to value of good
  - Firms minimise total production costs
  - Downstream trade costs 'matter more'
- Centrality-downstreamness nexus
  - Countries differ in geography/centrality
  - Central countries have comparative advantage in downstream industries

Other Drivers of GVC Position & Span

1. Antràs and de Gortari (2020)
2. **Boehm and Oberfield (2020):**
3. Antràs et al. (2012)
4. Alfaro et al. (2019)

- Intermediate inputs differ in relationship specificity
  - Some goods require customisation or are relationship-specific; others are standardised

    $\hookrightarrow$ Legal system matters more or less
- Legal system & institutions in country shape
  - Comparative advantage via specific inputs
  - Firms compensate lack of courts with vertical span

Other Drivers of GVC Position & Span

1. Antràs and de Gortari (2020)
2. Boehm and Oberfield (2020)
3. **Antràs et al. (2012):**
4. Alfaro et al. (2019)

- At the country level:
  - Financial development (*Credit*/*Y*) predicts downstreamness
  - Human capital predicts downstreamness
  - GDPpC, rule of law, and capital-intensity (*K*/*Y*) not conditionally significant

Other Drivers of GVC Position & Span

1. Antràs and de Gortari (2020)
2. Boehm and Oberfield (2020)
3. Antràs et al. (2012)
4. **Alfaro et al. (2019):**

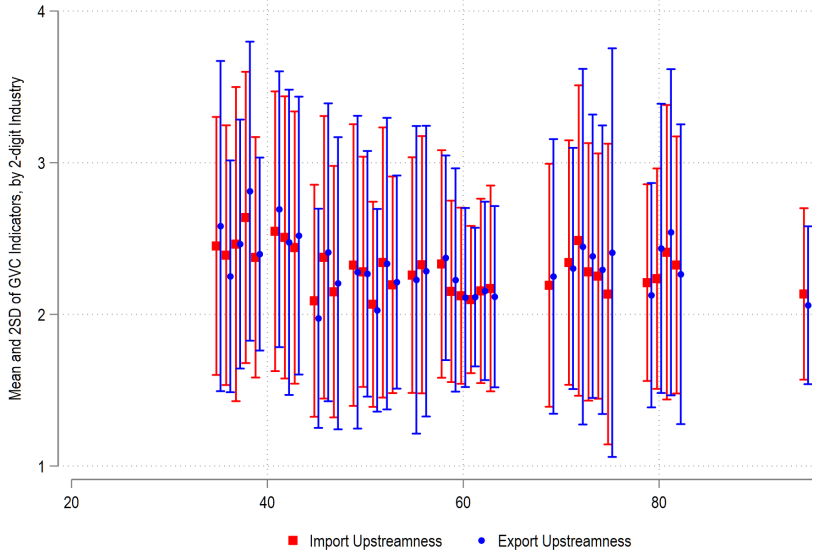
Descriptive Statistics - Intersection Sample

Variable	Observations	Mean	SD
Import Upstreamness U_I	54,790	2.458	0.466
Export Upstreamness U_X	54,790	2.399	0.497
GVC Span	54,790	0.059	0.474
Industry	43,827	39.555	14.546
TFP ACF (log)	43,608	10.496	0.791
TFP GA (log)	43,608	9.156	1.265
Labor Productivity (log)	43,801	11.474	0.698
Capital Intensity (log)	43,634	10.473	1.477
Skill Intensity (log)	54,720	3.214	0.312
Sales (log)	43,167	16.31	1.591
Age + 1 (log)	43,827	3.126	0.69
MNE	43,827	0.513	0.5
Foreign MNE	43,827	0.268	0.443
Dutch MNE	43,827	0.245	0.43

Descriptive Statistics - Full Sample

Variable	Observations	Mean	SD
Import Upstreamness U_I	447,717	2.312	0.464
Export Upstreamness U_X	262,454	2.342	0.5
GVC Span	136,318	0.035	0.473
Industry	953,158	48.558	15.201
TFP ACF (log)	925,595	10.201	0.766
TFP GA (log)	925,595	9.222	1.125
Labor Productivity (log)	947,458	11.136	0.714
Capital Intensity (log)	930,928	9.991	1.61
Skill Intensity (log)	1,200,685	3.022	0.42
Sales (log)	919,324	14.536	1.525
Age + 1 (log)	953,158	2.705	0.927
MNE	953,158	0.147	0.355
Foreign MNE	953,158	0.079	0.27
Dutch MNE	953,158	0.069	0.253

Import & Export Upstreamness (U_I, U_X), by Industry



GVC Span ($U_I - U_X$), by Industry