Inside the GVC: Supplier-buyer relationships and firm performance - evidence from a new survey

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ERWIT 2020

Look inside GVC

1. Global value chains (supply chains) are important ...
   - Being part of GVCs as integration into international production chains is considered evidence of competitiveness.
   - But also fear of globalization and asymmetric relationships.
2. We know relatively little about the governance modes of these relationships
   - Vertical integration
   - Market-like transactions
   - Cooperative *relational* transactions between these two extremes
3. Policies often aim at helping SMEs become part of GVCs (promotion agency, clusters, fairs).
   - If relational and market-like transactions differ in terms of knowledge transfer and other outcomes, policy needs to look beyond making matches

Governance structures in GVCs

- The literature has started from comparing vertical integration and outsourcing (Lafontaine & Slade 2007, Gibbons 2005, Alfaro et al. 2019, Atalay et al. 2014).
- However, as Schmitt & Van Biesebroeck (2020) writes: "It has been recognized, however,that a choice to buy rather than make, is not the end of the story. Sourcing relationships are not one-size fits all and are often tailored to the specific situation."
- Building on Schmitt & Van Biesebroeck (2020) 's (and, in turn, Gereffi et al. (2005)) interpretation of the GVC and transaction costs literature we can distinguish between 3 key governance mechanisms:
  - Market
  - Relational (different types based on "power" within the relationship)
  - Hierarchy (vertical integration)
- Also related to (Atalay et al. 2014) - vertical integration in the US - not there to help inter-firm trade.

Determinants of the choice of governance structure

- According to Schmitt & Van Biesebroeck (2020)'s interpretation of the literature, the main forces are:

	Complexity of transaction	Codifiability	Capability of supplier
Market	Low	High	High
Relational	High	Low	High
Hierarchical	High	Low	Low

- Further variables
  - Dominant marginal returns from specific investment, technology complexity (Acemoglu et al. 2010, Nunn & Trefler 2013)
  - Knowledge flows, elasticity of demand, productivity (Atalay et al. 2014)

This paper

- Uses a unique survey to distinguish between market, relational and vertical relationships
  - 1500 manufacturing firms in Hungary, Romania and Slovakia
  - Linked to financial data from ORBIS
  - Ask about their partner portfolio and the main features of their relationship with largest (key) buyers and suppliers
    - Product specificity
    - Innovation and cooperation
- Based on this information on **actual cooperation**, we classify each of the respondent's supplier relationships into **market**, **relational** and **within business group** (vertically integrated)
- Research questions:
  1. How prevalent are these three key relationship types?
  2. What factors are associated with this choice?
  3. Is the type of relationship related to firm performance?

What we do: This talk

1. Describe the survey
2. Categorize supplier-buyer connection: market, relational, vertically integrated
3. Results
   - How important are the different relationship types?
   - Which firms choose which type of relationship?
   - How the type of relationship is related to firm performance?

Some key results

1. Prevalence
   - About *75%* of the transaction value in GVC are not market-based
   - Within business group sales are about *30-40%* of all sales for firms in the group.
2. Choice of relationship type
3. Relationship type and performance
   - Firms with a relational connection are more productive and grow faster
   - The TFP premium of relational connection is comparable to the export premium
   - The quality of buyers and the relationship more important than location

The Business Relations Survey: Concept

- Aim is to learn about relationships between customers and suppliers
- Carried out a survey on over 1500 Hungarian, Romanian and Slovakian firms More info
- Manufacturing firms with at least 10 employees in 2015, in key industries (e.g., auto, electronics, chemicals, machinery)
- Joint project: Central European University, Hungarian Academy of Sciences, Gfk Hungaria
  - Started in 2015, carried out in 2016-2017, matched with Orbis in 2020.
  - High data protection: anonymization, secure storage, only scientific use, available for participants only.

More about the survey can be found with an OVERVIEW HERE. Also, you may GET SURVEY HERE.

The Business Relations Survey: Key Variables

- Respondent level variables
  - Location, main activity, number of customers, suppliers, share of new buyers, suppliers, type of typical buyer (industrial, wholesale)
  - Number of employees and key financial variables
- Relationship-specific variables
  - Respondents were asked additional questions about their 3 most important (key) customers and suppliers + anyone with 10% share of sales
  - Here the level of observation is the respondent-partner dyad
  - variables: identity of partner, length of relationship, share in sales, information about co-operation
  - We have information about both the respondents' suppliers and buyers. Today: focus on buyers.

Linking to financial data

- We surveyed firms based on their BvD IDs and, therefore, financial data is available for them
- Respondents reported the name, country, size category and broad industry of their key partners
  - We matched key partners to Orbis, based on this information both with text matching algorithms and manually
  - 80% of reported key partners were identified
- Variables we use
  - Both for respondent and buyers
  - Orbis financial accounts, 40+ countries
  - 2015 is used for levels
  - TFP is created using country- industry level coefficients for for K and L estimates from full Orbis based on COMPNET
  - Sales growth is log difference, winsorized, 3 year total - 2018/2015

Proxis for relational transactions

We define non-market relationships based on actual cooperation between the firms

1. **Partner specific product**: It is impossible/hard to sell to someone else the main product sold to this buyer.(41%)
2. **Innovation to modify - recently** : The company has had to modify its product or production process *recently* (in the past two years) to satisfy the needs of this buyer (23%)
3. **Innovation to modify - at start**: The company had to modify its product or production process *at the start* of the relationship to satisfy the needs of this buyer. (32%)

The specific questions and definitions come from the Community Innovation Survey and the EFIGE survey

Market vs relationship vs vertical integration

- We differentiate three categories by type of relationship
- **Vertical integration:** the seller and buyer are in the same business group (survey+ORBIS GUO information)
- **Relational:** the seller and buyer are not in the same business group, and:
  - The main product sold to the buyer can **not** be easily sold to someone else (it is buyer specific)
  - The seller has carried out innovation to modify products or processes for the buyer, either at the start of the relationship of recently
- **Market-based:** the seller and the buyer are not in the same business group, and:
  - The main product sold to the buyer could be easily sold to someone else
  - The seller has not carried out innovation to modify products or processes for the buyer

Types of key partners (dyadic)

rel. type	Count share (%)	Value share(%)
Market	35%	25%
Relational	51%	32%
Vertical Integration	14%	43%

In GVCs relational / vertical transactions dominate

rel. type	Count share (%)	Value share(%)
Market	35%	25%
Relational	51%	**32%**
Vertical Integration	14%	**43%**

- In terms of value, we observe that 75% of important transactions are not market based
  - Upward biased for firms in this sample: as we do not observe small transactions, likely market based.
  - Downward biased for economy: our sample does not include the largest companies like Audi Hungaria, that would mostly have relational and vertically integrated transactions.

Calculating within group sales

- We only know 56% of transactions, we need to make assumptions
  1. Lower bound: unobserved transactions all outside the business group.
  2. Representativeness: unobserved transactions have the same likelihood to be vertically integrated. Probably upward biased.
  3. Upper bound: unobserved transactions all within the business group

Value share of within group sales for firms part of business groups

Assumption type	Simple share	Sales weighted share
Lower bound	23%	28%
Representativeness assumed	33%	43%
Upper bound	66%	75%

- The share of within group transactions in value is around 1/3 of sales
- Higher for export sales, higher for foreign groups

Relative frequencies by relationship type

Compare relative values (and frequencies) of key variables by relationship types

Rel. Type	Length (ys)	share (%)	export (%)	resp foreign (%)
Market	8.4	18	21	18
Relational	9.5	19	34	25
Within group	10.2	36	53	53

- Little difference in terms of length.
- Within firm sales share twice when within group.
- export and foreign firms: Relational and vertical more and more frequent

Selection into relational transactions

Focus on relational vs market and vertical vs market

- Distance (now: export) - proxy for contractual incompleteness and communication cost
- Size and length of transaction - proxy for potential return of specific investments
- Number of buyers, ownership - proxy for supplier quality
- Industry controls for complexity and codifiability

Simple linear probability models, market is base.

Selection into relational transactions

In terms of products (industries):

- *Relational/VI*: auto/vehicles, equipment, electronics.
- *Market*: non-metallic (cement, glass), chemicals (plastics)

Notes: Linear probability models, base is market transactions. Includes 2-digit industry dummies.

Depvar:	(1) Relational	(2) Vertical
Export sale	0.138***	0.404***
	(0.0240)	(0.0641)
Res: Independent w/ foreign owner	0.0144	0.284***
	(0.0383)	(0.0833)
Res: Group: Domestic	-0.300***	-0.0975
	(0.0549)	(0.0844)
Res: Group: Foreign	0.0472	0.717***
	(0.0420)	(0.0938)
Res: Has 5 or more buyers	0.106**	-0.229***
	(0.0416)	(0.0744)
Buyer length: Medium (5-14 ys)	0.00347	0.110**
	(0.0263)	(0.0548)
Buyer length: Long (15ys+)	0.109***	0.241***
	(0.0339)	(0.0767)
Buyer: commerce	-0.110***	-0.0749
	(0.0280)	(0.0629)
Buyer: service	-0.0959***	0.224***
	(0.0330)	(0.0772)
Observations	2,845	1,593
R-squared	0.109	0.225

Standard errors, clustered at respondent level in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Firm performance and buyers

- Investigates whether
  - Supplier quality makes non-market transactions more likely
  - Having non-market relationships is associated with better performance afterwards
- Measurement
  - OLS regression of performance measures and relationship.
  - Industry controls
  - Weighted by relative share of transactions
  - Filter a few respondents, where we know too little. (about 5%) where the sum of transactions is below 10% of total sales

Performance and relationship type

Performance: Non-market firms are larger, more productive and grow faster

Dep var:	(1) Log sales	(2) TFP	(3) Growth rate (3ys)
Relational	0.215**	0.237***	0.107***
	(0.0881)	(0.0570)	(0.0415)
Within group	0.874***	0.448***	0.0776
	(0.130)	(0.0858)	(0.0555)
Observations	3,266	3,113	3,090
R-squared	0.146	0.191	0.011

Standard errors, clustered at respondent level, are in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: OLS, weighted by relative sales share. Includes respondent's 2-digit industry dummies.

Performance - comparing similar firms

Performance: Non-market firms are larger, more productive and grow faster - even when taking into account key selection variables.

Dep var:	(1) Log sales	(2) TFP	(3) Growth rate (3ys)
Relational	0.0956	0.219***	0.0990**
	(0.0838)	(0.0549)	(0.0437)
Vertically integrated	0.180	0.192**	0.0775
	(0.124)	(0.0841)	(0.0639)
Export sale	0.382***	0.0540	0.0388
	(0.0802)	(0.0535)	(0.0364)
Resp: Independent: Has foreign owner	1.148***	0.550***	0.0403
	(0.134)	(0.0877)	(0.0583)
Resp: Group: Domestic	0.343*	-0.267**	-0.129
	(0.179)	(0.111)	(0.102)
Resp: Group: Foreign	1.656***	0.886***	0.0720
	(0.154)	(0.0983)	(0.0645)
Resp: Has 5 or more buyers	0.604***	0.388***	0.132**
	(0.114)	(0.0808)	(0.0632)
Rel length: Medium (5-14 ys)	0.333***	0.128*	0.0330
	(0.0982)	(0.0669)	(0.0540)
Rel length: Long (15ys+)	0.651***	0.189**	-0.0432
	(0.120)	(0.0765)	(0.0648)
Buyer in commerce	0.129	0.201***	0.0257
	(0.0894)	(0.0622)	(0.0421)
Buyer in service	-0.0802	-0.00383	-0.0209
	(0.120)	(0.0772)	(0.0575)
Observations	3,142	2,992	2,972
R-squared	0.309	0.307	0.027

Notes: OLS, weighted by relative sales share. Includes share, length; respondent FOE, partner industry included as well as respondent's 2-digit industry dummies.

Summary

- Relationships that are longer, with partners abroad and in industry, and respondents with more than a few partners tend to be relational
- Having a larger number of relational partners matters for both TFP and growth
- Interestingly, TFP premium is above exporter premium
- Firms with a higher share of vertical relationships tend to be more productive - even with same export, ownership structure

Conclusions

- When we look at firms in GVC, relationships matter: compared to market, relational and vertical integration both positively correlated with TFP and future growth.
- Relational aspect especially important for export transactions and when partner is also in manufacturing
- Transactions within vertically integrated firms is important, around one-third of total volume

Respondents

	Country			
	Hungary No.	Romania No.	Slovakia No.	Total %
Number of employees				
less than 20	203	214	166	**38.2 %**
21-50	135	167	93	**25.9 %**
51-250	185	170	80	**28.5 %**
more than 250	35	37	43	**7.5 %**
Ownership				
Domestic	410	446	236	**71.5 %**
Foreign	148	142	146	**28.5 %**
Industry				
20. Chemicals	19	25	17	**4 %**
21. Pharmaceuticals	3	6	4	**0.9 %**
22. Rubber and plastic	67	80	50	**12.9 %**
23. Non-metallic mineral	37	70	35	**0.93 %**
24. Basic metals	13	19	7	**2.6 %**
25. Fabricated metals	251	235	121	**39.7 %**
26. Comuter, electronic and optical	24	23	27	**4.8 %**
27. Electrical equipment	36	28	42	**6.9 %**
28. Machinery	78	61	46	**12.1 %**
29. Motor vehicles	26	25	26	**5 %**
30. Other transportation equip.	4	16	7	**1.8 %**
Total	**558**	**588**	**382**	**100 %**

The Business Relations Survey: Key Variables

- Buyers' business: Industrial (55%), Commerce (25%), Services (16%)
  - Service: construction is most important
  - Commerce often the wholesale arm of manufacturing multinational
- Buyer is 65% Large company, 35% SME

Respondent: Owners / business groups

Owner type	Count	%
Independent: Only domestic owner	968	63.3%
Independent: Has foreign owner	212	13.9%
Group: Domestic	97	6.3%
Group: Foreign	219	14.3%
No direct holder	33	2.2%

- 20.5% of firms are part of a business group (could be affiliate, head or in the middle)
- 17% if transactions we observe the buyer in same business group

Number of buyers per respondent

- We asked: Top 3 buyers + anyone above 10% market share + special reason
- Most firms offered 1-3 answers, some more.

Number of buyers	Count	%
1	411	26.5%
2	431	28 %
3	482	31.5%
4	150	9.5%
5	55	3.5%

Share of key partners

- Most companies are **not** dependent on a single majority buyer, but 9.2% are
- Largest group by far: 10-24%

b_share_cut	Freq.	Percent
Not important (<=9%)	413	13
Important (10-24%)	1732	54.9
Essential (25-50%)	723	22.9
Single majority buyer (>51%)	289	9.2

Relation level performance means

- Relationship level correlations, (unweighted) average value for respondent with a given buyer type

type	Freq (%)	ln sales	emp	TFP	Sales growth
Market	35%	7.3	83	4.04	-0.04
Relationship	51%	7.6	115	4.32	0.08
Within group	14%	8.2	186	4.78	0.00

Relational linkages

As we think about what goes in a GVC, we look at the supplier-buyer relationship (dyad)

- A supplier-buyer **relationship** is a (series of) sales transactions that the seller deems important.
- A relationship is **relational** when partners invest into creating buyer-specific products and use processes often involving meetings or technology transfer.
- **Vertical integration** is when the buyer and the seller are integrated through (majority) ownership directly or indirectly.

Our relationship classification

- Typical approach to capture linkages
  - Consider intermediate goods
  - Differentiate by destination: domestic sales or export
  - Differentiate by short and long duration
- These typically cannot measure the actual cooperation within the relationship
- Our approach
  - A starting point is Gereffi, Humphrey, Sturgeon (2005) classification of relationships in a GVC: Market, Modular, Relational and Captive
  - We simplify to Market vs non-Market (call it "relational") and separate vertical integration from relational
  - Use the actual type of cooperation to classify relationships independently from being (i) domestic of export; (ii) short or long; (iii) share from seller's sales

Look inside GVC: empirical literature

1. Administrative firm-level data on transactions
   - sources of firm-size heterogeneity (Bernard, Moxnes & Saito 2019)
   - effects of international trade on costs (Tintelnot et al. 2018)
   - outsourcing (Bernard, Dhyne, Magerman, Manova & Moxnes 2019)
2. Survey data on firm-level transactions
   - financial constraints and participation in GVCs (Minetti et al. 2018)
   - knowledge spillovers from FDI (Newman et al. forthcoming), (Javorcik 2008)
   - interfirm relationships in automobile industry (Schmitt & Van Biesebroeck 2020)
3. Studies of vertical integration with firm-level data
   - share of trade within vertically integrated firms (Atalay et al. 2014)
   - technology and vertical integration (Acemoglu et al. 2010)
   - firm's boundary choices along the value chain (Alfaro et al. 2019)
   - output prices and vertical integration (Alfaro et al. 2016)

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