Internalizing Global Value Chains: A Firm-Level Analysis

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Preamble

- Production processes of global firms have become increasingly complex:
  - Procurement and assembly of *multiple* inputs from *multiple* countries.
- Global production lines feature (at least some element) of sequentiality:
  - Example: Production of integrated circuits in semiconductors industry

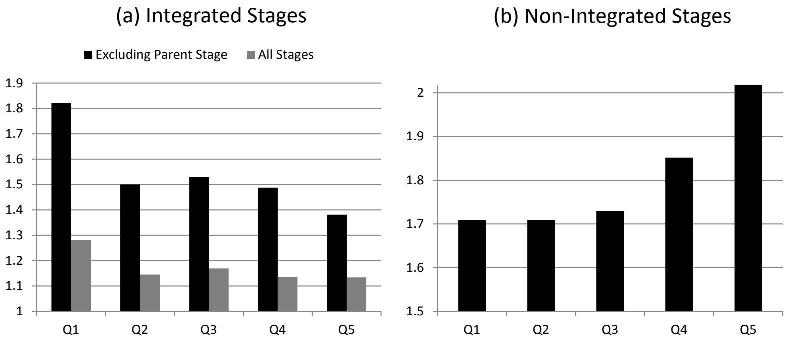
    Design $\longrightarrow$ Wafer Fabrication $\longrightarrow$ Assembly $\longrightarrow$ Testing $\longrightarrow$ Distribution
  - Sequentiality particularly relevant when production crosses national boundaries.
- Growing interest in how the sequential nature of production affects location and organizational decisions of global firms.

  (Harms, Lorz and Urban 2012; Baldwin and Venables 2013; Costinot, Vogel and Wang 2013; Antràs and Chor 2013; Kikuchi, Nishimura and Stachurski 2014; Fally and Hillberry 2014)
- However: Firm-level tests of the implications of these theories still relatively sparse.

Introduction and Overview: This Project

- A firm-level exploration of integration patterns. . .
- . . . using detailed information on ownership linkages *and* the SIC activities of parents/subsidiaries from around the world, contained in Dun & Bradstreet WorldBase
- For each industry pair, compute a measure of the upstreamness of input i in the production of j, using U.S. Input-Output Tables.
- Find strong and robust evidence that patterns of integration over SIC activities correlate with upstreamness, as in Antràs and Chor (2013).
  - Key role of demand elasticity versus input substitutability in shaping whether integration happens upstream or downstream.
  - Extend the framework to variation in contractibility along the value chain (Nunn, 2007).

A Sneak Preview



- Upstreamness of integrated inputs declines, and that of non-integrated inputs increases, when the elasticity of demand faced by the parent company increases.
- Result holds in *cross-firm* as well as *within-firm* specifications.

Contributions

- Theory: Extend stylized model in Antràs and Chor (2013) to include various sources of heterogeneity along the value chain
  - Novel implications for the effect of the path of contractibility along the value chain on integration patterns
- Empirics: Improvement over earlier work using industry-level data based on: (i) U.S. intrafirm trade shares; (ii) the *average* position of each industry in production processes (upstreamness relative to final demand).
  - Caveat: outsourcing not observed but is rather imputed based on U.S. Input-Output data

Related Literature

1. Theoretical work on integration vs outsourcing decisions of global firms

   (Grossman and Helpman 2002, 2005; Antràs 2003; Antràs and Helpman 2004, 2008; Acemoglu, Antràs and Helpman 2007)

2. Empirical work based on detailed industry/product-level variation

   (Nunn and Trefler 2008, 2013; Bernard et al. 2010; Fernandes and Tang (2012); Antràs 2013; Díez 2014; Luck 2014)

3. Empirical work based on firm-level data

   (Tomiura 2007; Debeare et al. 2009; Novak and Stern 2009; Corcos et al. 2013; Defever and Toubal 2013; Kohler and Smolka 2014)

4. Empirical work based on the D&B (and other related datasets)

   (Fan and Lang 2000; Acemoglu, Johnson and Mitton 2009; Alfaro and Charlton 2009; Alfaro and Chen 2012; Alfaro, Conconi, Fadinger and Newman 2013; Fajgelbaum, Grossman and Helpman 2014; Del Prete and Rungi 2014)

Plan of Talk

1. Introduction and Motivation
2. **Theory**
   - Baseline model
   - The role of contractibility
3. Empirical Setting
   - Data and measures
   - Regression specifications
4. Findings
   - From cross-firm variation
   - From within-firm, cross-input variation
5. Conclusions

The Model

- Firm/"Parent" produces quality-adjusted output via a sequence of stages:

$$q = \theta \left(\int_0^1 \left(\psi\left(i\right) x(i)\right)^{\alpha} I(i) di \right)^{1/\alpha}, \tag{1}$$

$$I\left(i\right) = \begin{cases} 1, & \text{if input } i \text{ is produced after all inputs } i' < i, \\ 0, & \text{otherwise.} \end{cases}$$

  where $x(i)$ is the services of compatible stage-i inputs.

- Analogous to Antràs and Chor (2013) but includes $\psi(i)$.
- Firm lives in a Dixit-Stiglitz industry and faces demand $q = Ap^{-1/(1-\rho)}$.

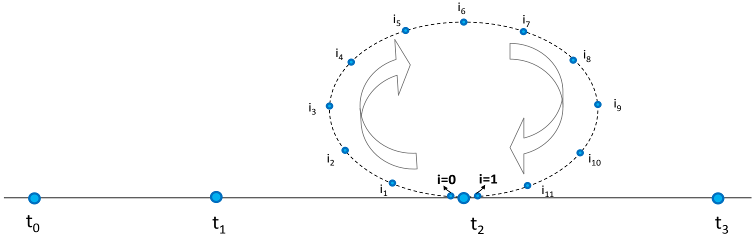
Two key parameters:

- $\alpha \in (0, 1)$: degree of substitutability between stage inputs
- $\rho \in (0, 1)$: degree of concavity of revenue function

Contracting Environment

- Each i is sourced from a distinct supplier (facing a marginal cost $c(i)$).
- Firm specifies integration or outsourcing for each stage before contracting with suppliers.
- Property rights model in the tradition of Grossman-Hart-Moore.
- Contracts are incomplete. Agents' payoffs are determined in ex-post (generalized) Nash Bargaining.
- Baseline: Bargain with stage-i supplier over the *incremental marginal revenue* at that stage.
- Tradeoff: Outsourcing provides supplier with better incentives to invest in quality, but integration confers the firm a better bargaining position by virtue of her residual rights of control ($\beta_V > \beta_O$).
- Sequentiality: Organizational decisions made upstream have *spillovers on downstream stages*.

Timing of Events



Firm posts **contracts** for each stage i ∈[0,1]

Contract states whether i is integrated or not

Suppliers apply and the firm **selects** one supplier for each i

Sequential production. At each stage i:

- the supplier is handed the semi-finished good completed up to i;
- after observing its value, the supplier chooses an input level, x(i);
- After observing x(i), the firm and supplier bargain over the supplier's addition to total revenue

Final good assembled and sold to consumers

Solving the Model

- Each supplier i chooses $x(i)$, taking the organizational decisions of the firm and the upstream investment levels – i.e., $x(i')$ for all $i' < i$ – as given.
- At the start of the game, parent firm's decision problem is to decide on integration ($\beta(i) = \beta_V$) vs outsourcing ($\beta(i) = \beta_O$) for each stage i.

After some algebra:

$$\begin{array}{ll} \max\limits_{\beta(i)} & \pi_F = \Theta \int_0^1 \beta(i) \left(\frac{(1-\beta(i))\psi(i)}{c(i)} \right)^{\frac{\alpha}{1-\alpha}} \left[\int_0^i \left(\frac{(1-\beta(k))\psi(k)}{c(k)} \right)^{\frac{\alpha}{1-\alpha}} dk \right]^{\frac{\rho-\alpha}{\alpha(1-\rho)}} di \\ \text{s.t.} & \beta(i) \in \{\beta_V, \beta_O\}. \end{array}$$

- If $\psi(i) = c(i) = 1$ for all stages i, we are back to the maximization problem in Antràs and Chor (2013).

Relaxed Problem

Solution Method:

- Consider the relaxed problem where the firm chooses $\beta(i)$ flexibly, instead of constraining it to be a discrete choice between β_V and β_O.
- Assume $\beta(i)$ is piecewise continuous and differentiable. Euler-Lagrange condition of this calculus of variations problem yields:

$$\beta^*(i) = 1 - \alpha \left[\frac{\int_0^i (\psi(k)/c(k))^{\frac{\alpha}{1-\alpha}} dk}{\int_0^1 (\psi(k)/c(k))^{\frac{\alpha}{1-\alpha}} dk} \right]^{\frac{\alpha-\rho}{\alpha}} . \qquad (2)$$

- When $\rho > \alpha$: $\beta^*(i)$ is increasing in i.

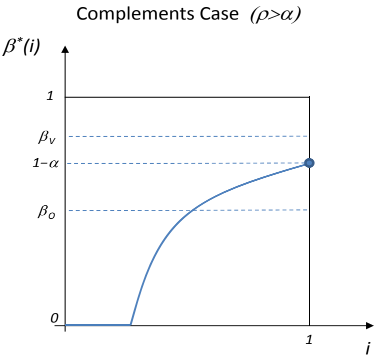
  When $\rho < \alpha$: $\beta^*(i)$ is decreasing in i.
- Slope of $\beta^*(i)$ depends on the *entire profile* of $\psi(k)/c(k)$.
- When no within-chain heterogeneity in marginal productivity or costs,

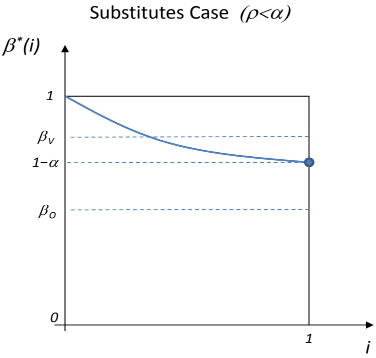
$$\beta^*(i) = 1 - \alpha i^{\frac{\alpha-\rho}{\alpha}} . \qquad (3)$$

Core Predictions

Core prediction of Antràs and Chor (2013) is preserved:

- Complements case ($\rho > \alpha$): Greater propensity to integrate *downstream*.
- Substitutes case ($\rho < \alpha$): Greater propensity to integrate *upstream*.



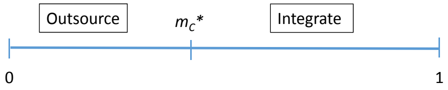


Integration and Upstreamness

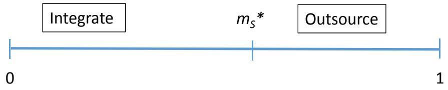
Proposition

There exist thresholds $m_C^* \in (0,1]$ *and* $m_S^* \in (0,1]$ *such that, in the complements case, all production stages* $m \in [0, m_C^*)$ *are outsourced and all stages* $m \in [m_C^*, 1]$ *are integrated, while in the substitutes case, all production stages* $m \in [0, m_S^*)$ *are integrated, while all stages* $m \in [m_S^*, 1]$ *are outsourced.*

Sequential complements: $\rho > \alpha$



Sequential substitutes: $\rho < \alpha$



Introducing Contractibility

Mapping $\psi(i)$ to the contractibility of inputs:

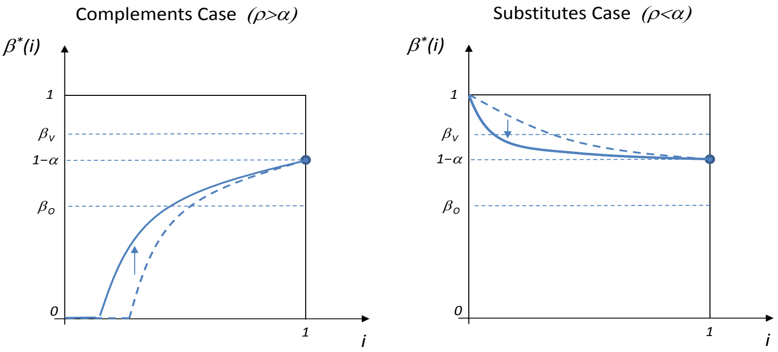
- Let $x(i)$ refer to the non-contractible investments embodied in input i (chosen by supplier i).
- Let $\psi(i)$ refer to contractible investments that can be specified in the initial contract (chosen by the firm at time t_0).
- Suppose that per unit contracting costs for specifying $\psi(i)$ are exogenously given by $\psi(i)^{\phi}/\mu(i)$

  $\phi > 1$: captures the idea that such contracting unit costs are plausibly convex.
- Then, the level of $\psi(i)$ specified in the initial contract will be inversely related to $1/\mu(i)$, so long as $\phi > \alpha/(1-\alpha)$.
- So we can interpret a high value of $\psi(i)$ as reflecting high contractibility of that stage input.

The Role of Contractibility

In industries that feature a higher level of **upstream** contractibility:

- Complements case: *Greater* propensity to integrate upstream relative to downstream.
- Substitutes case: *Lower* propensity to integrate upstream relative to downstream.



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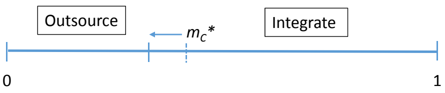

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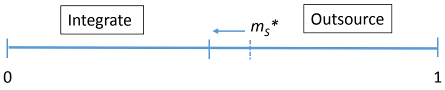

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Testing the Model: What Would an Ideal Dataset Look Like?

1. "Parent" firm's use of various inputs (regardless of whether they flow directly to the Parent)
2. Whether the suppliers of these inputs are integrated or not ($\beta(i) = \beta_V$ or $\beta(i) = \beta_O$)
3. Position or Upstreamness of those inputs in the value chain (index i, relative to the Parent)
4. Elasticity of demand faced by the parent (ρ)
5. Elasticity of substitution across inputs (α)
6. Degree of contractibility of each of the inputs (ψ_i)
7. Marginal cost of production for each input (c_i)

Testing the Model: Our Approach

1. "Parent" firm's use of various inputs: inferred from Input-Output Tables.
2. Whether the suppliers of these inputs are integrated or not ($\beta(i) = \beta_V$ or $\beta(i) = \beta_O$): use Dun & Bradstreet WorldBase dataset.
3. Position or Upstreamness of those inputs in the value chain (index i, relative to the Parent): inferred from I-O tables in the same spirit as Antràs et al. (2012).
4. Elasticity of demand faced by the parent (ρ): inferred from Parent SIC industry using Broda and Weinstein (2006).
5. Elasticity of substitution across inputs (α): unobserved.
6. Degree of contractibility of each of the inputs (ψ_i): inferred from I-O tables as in Nunn (2007).
7. Marginal cost of production for each input (c_i): unobserved.

Core Dataset: Dun & Bradstreet (D&B) WorldBase

- Comprehensive coverage of establishments in 120 countries (year: 2005)
- Compiled from different sources, including: registers, telephone directory records, websites, self-registration etc.
- Good information of a "business register" nature
  - Each observation has a unique identifier (DUNS number)
  - Name, Location, Global Parent (if any)
  - Up to six 4-digit SIC industry activities
- Extract 116,843 firms from 89 countries identified in D&B as "global ultimates" whose primary SIC activity is in manufacturing (*parents*)
- D&B enables us to link each of these to their subsidiaries, including information on country and SIC activities (90,159 *subsidiaries*)
- Average parent has 1.77 establishments; active in 1.14 countries and in 2.35 SIC activities. Details
- 6,983 of these parents are multinationals, i.e., ≥ 1 one foreign subsidiary

Merging D&B with Input-Output Data

- Some notation. Use:
  - p to index parent
  - j to index parent *output* industry (primary SIC)
  - i to index SIC *input* industry
  - For each j, use Input-Output Tables to deduce the set of inputs $S(j)$ that are used in the production of j.

    Specifically: $S(j)$ is the set of inputs i for which the total requirements coefficient, tr_{ij}, of the use of i in the production of j is positive.

- **Key idea:** View secondary SICs of parent p and all SICs of its subsidiaries as inputs that the parent could in principle obtain within firm boundaries.
  - Call the set of these integrated SICs: $I(p)$.
  - Call the set of non-integrated SICs: $NI(p)$.
  - Note: $I(p) \bigcup NI(p) = S(j)$ for a parent p whose output industry is j.
  - Relevance: 98.3% of the observed (i, j) pairs in the D&B data have $tr_{ij} > 0$.

More Details

Measuring Upstreamness

Turn to Input-Output Tables for measures of the production line position of each input i vis-à-vis output j.

- Fally (2012) and Antràs et al. (2012):
  - Develop a measure of the upstreamness between i and final use.
  - Can be obtained via different foundations.
- In this work:
  - Build an analogous measure of the upstreamness between input i and output j.
  - Similar in spirit to the concept of "average propagation lengths" in the Input-Output literature (Dietzenbacher et al. 2005)

Measuring Upstreamness (Cont.)

In an N-industry economy, accounting for the value of input i that goes into the production of \$1 of output j:

- d_{ij}: Value used directly (1 stage), aka direct requirements coefficient.
- $\sum_{k=1}^{N} d_{ik} d_{kj}$: Value used indirectly (2 stages).
- $\sum_{k=1}^{N} \sum_{l=1}^{N} d_{ik} d_{kl} d_{lj}$: Value used indirectly (3 stages), etc...

Motivates the following measure of input i's upstreamness in the production of j:

$$upst_{ij} = \frac{d_{ij} + 2\sum_{k=1}^{N} d_{ik} d_{kj} + 3\sum_{k=1}^{N}\sum_{l=1}^{N} d_{ik} d_{kl} d_{lj} + \dots}{d_{ij} + \sum_{k=1}^{N} d_{ik} d_{kj} + \sum_{k=1}^{N}\sum_{l=1}^{N} d_{ik} d_{kl} d_{lj} + \dots}$$

- A weighted-average measure of the number of production stages to get from i to j, with weights proportional to the value of input use that takes the said number of stages.
- Note: Denominator is tr_{ij}.

Measuring Upstreamness (Cont.)

$$upst_{ij} = \frac{d_{ij} + 2\sum_{k=1}^{N} d_{ik}d_{kj} + 3\sum_{k=1}^{N}\sum_{l=1}^{N} d_{ik}d_{kl}d_{lj} + \ldots}{d_{ij} + \sum_{k=1}^{N} d_{ik}d_{kj} + \sum_{k=1}^{N}\sum_{l=1}^{N} d_{ik}d_{kl}d_{lj} + \ldots}$$

Straightforward to show that:

- $upst_{ij} \geq 1$;
- Numerator of $upst_{ij}$ is the (i,j)-th entry of $[I - D]^{-2}D$; and
- Denominator of $upst_{ij}$ is the (i,j)-th entry of $[I - D]^{-1}D$;

where D is the matrix of direct requirements coefficient, and I is the identity matrix.

Use the above properties to compute both $upst_{ij}$ and tr_{ij} from the 1992 U.S. Benchmark Input-Output Tables.

▸ Practical Implementation Issues ▸ Summary Statistics

Cross-Firm Analysis: Specification

$$\log R_{jpc} = \beta_0 + \beta_1 \mathbf{1}(\rho_j > \rho_{med}) + \beta_X X_j + \beta_W W_p + D_c + \epsilon_{jpc}$$

R_{jpc} is a measure of j's propensity to integrate upstream vs downstream inputs:

$$R_{jp} \equiv \frac{\sum_{i \in I(p)} \theta^{I}_{ijp} upst_{ij}}{\sum_{i \in NI(p)} \theta^{NI}_{ijp} upst_{ij}}$$

where $\theta^{I}_{ijp} = tr_{ij} / \sum_{i \in I(p)} tr_{ij}$ and $\theta^{NI}_{ijp} = tr_{ij} / \sum_{i \in NI(p)} tr_{ij}$.

- "Ratio-upstreamness": Weighted-average upstreamness of integrated to non-integrated stages (for each p).
- Weights reflect the importance of each input (tr coefficients).
- R_{jp} increases in the propensity to integrate more upstream inputs.
- Consider several variants of R_{jp} (manuf. inputs only, drop parent SIC,...)

Cross-Firm Analysis: Other Variables

$$\log R_{jpc} = \beta_0 + \beta_1 \mathbf{1}(\rho_j > \rho_{med}) + \beta_X X_j + \beta_W W_p + D_c + \epsilon_{jpc}$$

- Focus on differences in demand elasticities to distinguish between complements and substitutes cases, following Antràs and Chor (2013)
  - Baseline: import demand elasticities from Broda and Weinstein (2006)
  - Robustness: only consumption and/or capital goods (UN BEC classification)
- Start with a median cutoff: $\beta_1 \mathbf{1}(\rho_j > \rho_{med})$. Theory suggests: $\beta_1 < 0$.
- Later use a set of quintile dummies: $\sum_{n=2}^{5} \beta_n \mathbf{1}(\rho_j \in Quint_n(\rho))$

Cross-Firm Analysis: Other Variables

$$\log R_{jpc} = \beta_0 + \beta_1 \mathbf{1}(\rho_j > \rho_{med}) + \beta_X X_j + \beta_W W_p + D_c + \epsilon_{jpc}$$

- X_j: Vector of industry controls ▸ Details
  - Log Nonproduction emp., Equipment capital, Plant capital, Materials (all in per worker terms) from NBER-CES
  - Log (0.001 + R&D expenditures/Sales) from Nunn and Trefler (2013)
- W_p: Vector of firm controls
  - Log number of subsidiaries, Indicator for MNC status, Year started
  - Log total employment, Log sales in USD
- D_c: Parent country fixed effects
- Cluster standard errors by output industry j
- Later introduce interactions with “Upstream Contractibility”

Within-Firm Analysis

$$D\_INT_{ijp} = \gamma_0 + \sum_{n=1}^{5} \gamma_n \mathbf{1}(\rho_j \in Quint_n(\rho)) \times upst_{ij} + \gamma_S \mathbf{1}(i = j) + D_i + D_p + \epsilon_{ijp}$$

- Focus on parent firms that have integrated at least one manufacturing SIC input $i \neq j$
- Expand the dataset to the parent firm by SIC input level
- For each p, include the top 100 manufacturing inputs i by tr value
  - This covers between 88-98% of the tr value of the output industry
- LHS: Indicator variable, D_INT_{ijp}, for whether parent firm p with output industry j has input i within firm boundaries
- Estimate as a linear probability model

Within-Firm Analysis

$$D\_INT_{ijp} = \gamma_0 + \sum_{n=1}^{5} \gamma_n \mathbf{1}(\rho_j \in Quint_n(\rho)) \times upst_{ij} + \gamma_S \mathbf{1}(i=j) + D_i + D_p + \epsilon_{ijp}$$

- Other controls:
  - $\mathbf{1}(i=j)$: Self-SIC dummy
  - D_p: Parent firm fixed effects
  - D_i: SIC input fixed effects
- Cluster standard errors by i-j pair
- Later introduce interactions with "Contractibility up to i in production of j"

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Median Cutoff: Negative Coefficient on $\mathbf{1}(\rho_j > \rho_{med})$

Table 3

Upstreamness of Integrated vs Non-Integrated Inputs: Median Elasticity Cutoff

Dependent variable:	Log Ratio-Upstreamnes				
	(1)	(2)	(3)	(4)	(5)
Ind.(Elas > Median)	-0.0417**	-0.0681***	-0.0677***	-0.0667***	-0.1096***
	[0.0207]	[0.0186]	[0.0181]	[0.0214]	[0.0248]
Log (Skilled Emp./Worker)		0.0004	0.0034	0.0000	-0.0310
		[0.0231]	[0.0224]	[0.0259]	[0.0322]
Log (Equip. Capital / Worker)		0.1094***	0.1067***	0.0798***	0.0846***
		[0.0219]	[0.0211]	[0.0226]	[0.0265]
Log (Plant Capital / Worker)		-0.0217	-0.0237	0.0026	-0.0038
		[0.0227]	[0.0223]	[0.0281]	[0.0328]
Log (Materials / Worker)		-0.0527**	-0.0487**	-0.0651**	-0.0471
		[0.0247]	[0.0228]	[0.0257]	[0.0325]
R&D intensity		0.0082	0.0059	0.0113	0.0067
		[0.0055]	[0.0053]	[0.0068]	[0.0076]
Value-added / Shipments		-0.1580	-0.1427	-0.1299	0.0673
		[0.1148]	[0.1108]	[0.1178]	[0.1527]
Elasticity based on:	All codes	All codes	All codes	BEC cons. & cap. goods	BEC cons. only
Parent country dummies?	Y	Y	Y	Y	Y
Firm controls?	Y	Y	Y	Y	Y
Observations	115,800	115,800	84,171	62,377	44,895
No. of industries	459	459	459	305	219
R^2	0.0671	0.1674	0.1896	0.2053	0.2393

Quintile Cutoff: Stronger Effect in Higher Quintiles of ρ_j

Table 4

Upstreamness of Integrated vs Non-Integrated Inputs: By Elasticity Quintiles

Dependent variable:	**Log Ratio-Upstreamness**				
	(1)	(2)	(3)	(4)	(5)
Ind.(Quintile 2 Elas)	-0.0205	-0.0304	-0.0313	-0.0629	-0.0805*
	[0.0307]	[0.0277]	[0.0282]	[0.0426]	[0.0453]
Ind.(Quintile 3 Elas)	-0.0677**	-0.0784***	-0.0797***	-0.0713*	-0.1026**
	[0.0308]	[0.0293]	[0.0295]	[0.0424]	[0.0415]
Ind.(Quintile 4 Elas)	-0.0334	-0.0832***	-0.0845***	-0.1035**	-0.1506***
	[0.0336]	[0.0312]	[0.0311]	[0.0432]	[0.0449]
Ind.(Quintile 5 Elas)	-0.0715*	-0.1021***	-0.1043***	-0.1287***	-0.1890***
	[0.0375]	[0.0315]	[0.0312]	[0.0418]	[0.0448]
Log (Skilled Emp./Worker)		0.0001	0.0022	-0.0042	-0.0370
		[0.0225]	[0.0219]	[0.0274]	[0.0335]
Log (Equip. Capital / Worker)		0.1084***	0.1058***	0.0750***	0.0800***
		[0.0207]	[0.0198]	[0.0199]	[0.0214]
Log (Plant Capital / Worker)		-0.0154	-0.0167	0.0134	0.0053
		[0.0211]	[0.0206]	[0.0235]	[0.0287]
Log (Materials / Worker)		-0.0561**	-0.0520**	-0.0707***	-0.0541*
		[0.0243]	[0.0223]	[0.0257]	[0.0314]
R&D intensity		0.0078	0.0058	0.0112*	0.0039
		[0.0053]	[0.0052]	[0.0063]	[0.0079]
Value-added / Shipments		-0.1732	-0.1572	-0.1454	0.0707
		[0.1159]	[0.1113]	[0.1188]	[0.1617]
Elasticity based on:	All codes	All codes	All codes	BEC cons. & cap. goods	BEC cons. only
Parent country dummies?	Y	Y	Y	Y	Y
Firm controls?	Y	Y	Y	Y	Y
Observations	115,800	115,800	84,171	62,377	44,895
No. of industries	459	459	459	305	219
R^2	0.0777	0.1773	0.2005	0.2300	0.2707

Baseline with Quintile Cutoff (cont.)

Remarks:

- Magnitude of effects larger as we refine the ρ proxy to include information only on final good demand elasticities (UN BEC)
- Coefficient of $\mathbf{1}(\rho_j \in Quint_5(\rho))$: Corresponds to a decrease in the propensity to integrate upstream vs downstream stages of about one standard deviation (Column 5), when moving from Q1 to Q5
- For the control variables:
  - Effect of equipment capital is positive, but that on materials intensity is negative.
  - Larger firms (in terms of number of subsidiaries, employment), younger firm, and multinationals more inclined to integrate upstream stages.

Effect of Upstream Contractibility: Empirical Specification

$$\log R_{jpc} = \beta_0 + \beta_k \sum_{k=2}^{5} \mathbf{1}(\rho_j \in Quint_k(\rho)) + \gamma_k \sum_{k=1}^{5} \mathbf{1}(\rho_j \in Quint_k(\rho)) \times \log UpstCont_j$$
$$+\beta_X X_j + \beta_W W_p + D_c + \epsilon_{jpc}$$

- Constructing $UpstCont_j$:
  - Contractibility follows Nunn (2007): Extent to which production involves the use of HS products classified as homogenous (Rauch 1999).
  - Look at all manufacturing inputs i:

    Let the set of inputs with above-median contractibility values be $\mathcal{H}$, and the set with below-median contractibility values be $\mathcal{L}$.
  - Take the (weighted-)average upstreamness of high- to low-contractibility inputs:

$$UpstCont_j \equiv \frac{\sum_{i \in \mathcal{H}} \theta_{ij}^H upst_{ij}}{\sum_{i \in \mathcal{L}} \theta_{ij}^L upst_{ij}}$$

where $\theta_{ij}^H = tr_{ij} / \sum_{i \in \mathcal{H}} tr_{ij}$ and $\theta_{ij}^L = tr_{ij} / \sum_{i \in \mathcal{L}} tr_{ij}$.

Effect of Upstream Contractibility

Dependent variable:	Log Ratio-Upstreamness		
	(1)	(2)	(3)
Ind.(Quintile 2 Elas)	-0.0290	-0.0441*	-0.0405
	[0.0186]	[0.0238]	[0.0286]
Ind.(Quintile 3 Elas)	-0.0639***	-0.0538**	-0.0617**
	[0.0205]	[0.0246]	[0.0251]
Ind.(Quintile 4 Elas)	-0.0617***	-0.0753***	-0.0914***
	[0.0223]	[0.0247]	[0.0278]
Ind.(Quintile 5 Elas)	-0.0835***	-0.1041***	-0.0876***
	[0.0207]	[0.0233]	[0.0292]
"Upstream Contractibility"			
X Ind.(Quintile 1 Elas)	-0.1685**	-0.2170***	-0.2270***
	[0.0684]	[0.0635]	[0.0640]
X Ind.(Quintile 2 Elas)	-0.0966**	-0.0673	-0.0834
	[0.0436]	[0.0721]	[0.0802]
X Ind.(Quintile 3 Elas)	0.0533	0.0616*	0.1049***
	[0.0443]	[0.0362]	[0.0382]
X Ind.(Quintile 4 Elas)	0.0476	0.1650***	0.1105***
	[0.0443]	[0.0398]	[0.0373]
X Ind.(Quintile 5 Elas)	0.1204***	0.1962***	0.2434***
	[0.0390]	[0.0352]	[0.0329]
p-value: Q5 at median Upst. Cont.	[0.0000]	[0.0001]	[0.0001]
Elasticity based on:	All codes	BEC cons. & cap. goods	BEC cons. only
Industry controls?	Y	Y	Y
Firm controls?	Y	Y	Y
Parent country fixed effects?	Y	Y	Y
Observations	84,171	62,377	44,895
No. of industries	459	305	219
R^2	0.2399	0.3174	0.3470

- Main effect of elasticity quintiles preserved
- Upstream contractibility:
  Raises propensity to integrate upstream in the complements case. . .

  but lowers it in the substitutes case!
- Similar results when using: (i) tercile cutoff to define $\mathcal{H}$ and $\mathcal{L}$; (ii) a tr-weighted covariance between $upst_{ij}$ and contractibility
  Details
- We perform several robustness tests (focus on large firms, MNCs, exclude own SIC,...)
  Details

Within-Firm Analysis: Empirical Specification

Remember baseline specification:

$$D\_INT_{ijp} = \gamma_0 + \sum_{n=1}^{5} \gamma_n \mathbf{1}(\rho_j \in Quint_n(\rho)) \times upst_{ij} + \gamma_S \mathbf{1}(i = j) + D_i + D_p + \epsilon_{ijp}$$

- $\mathbf{1}(i = j)$: Self-SIC dummy
- D_p: Parent firm fixed effects
- D_i: SIC input fixed effects

.

Within-Firm Analysis: Empirical Specification

Specification with Upstream Contractibility:

$$D\_INT_{ijp} = \gamma_0 + \sum_{n=1}^{5} \gamma_n \mathbf{1}(\rho_j \in Quint_n(\rho)) \times upst_{ij} + \sum_{n=1}^{5} \gamma_n \mathbf{1}(\rho_j \in Quint_n(\rho)) \times ContUpToi_{ij} + \gamma_S \mathbf{1}(i=j) + D_i + D_p + \epsilon_{ijp}$$

- Key RHS variable: "Contractibility up to i in the production of j"

$$ContUpToi_{ij} = \frac{\sum_{k \in S_i^m(j)} tr_{kj} cont_k}{\sum_{k \in S^m(j)} tr_{kj} cont_k}$$

where $S_i^m(j) = \{k : upst_{kj} \geq upst_{ij}\}$ is the set of manufacturing inputs used by j upstream of and including i.

($S^m(j)$ is the set of manufacturing inputs used by j, i.e., $tr_{ij} > 0$.)

Within-Firm Regression Results

Dependent variable:	Indicator variable: Input Integrated?			
	(1)	(2)	(3)	(4)
Upstreamness_ij				
X Ind.(Quintile 1 Elas_j)	-0.0068***	0.0016	0.0021	-0.0037*
	[0.0009]	[0.0017]	[0.0017]	[0.0019]
X Ind.(Quintile 2 Elas_j)	-0.0093***	-0.0000	0.0002	-0.0045
	[0.0020]	[0.0036]	[0.0036]	[0.0037]
X Ind.(Quintile 3 Elas_j)	-0.0123***	-0.0022	-0.0016	-0.0040
	[0.0018]	[0.0042]	[0.0042]	[0.0038]
X Ind.(Quintile 4 Elas_j)	-0.0107***	0.0080***	0.0076***	0.0015
	[0.0016]	[0.0021]	[0.0020]	[0.0017]
X Ind.(Quintile 5 Elas_j)	-0.0127***	0.0061*	0.0059*	0.0027
	[0.0022]	[0.0033]	[0.0032]	[0.0025]
"Contractibility up to i" (in prod. of j)				
X Ind.(Quintile 1 Elas_j)		0.0323***	0.0356***	0.0278***
X Ind.(Quintile 2 Elas_j)		0.0375***	0.0378***	0.0295***
X Ind.(Quintile 3 Elas_j)		0.0378***	0.0360***	0.0324***
X Ind.(Quintile 4 Elas_j)		0.0699***	0.0668***	0.0446***
X Ind.(Quintile 5 Elas_j)		0.0761***	0.0750***	0.0521***
Contractibility of input i				
X Ind.(Quintile 1 Elas_j)			-0.0190***	-0.0079
X Ind.(Quintile 2 Elas_j)			-0.0106***	0.0019
X Ind.(Quintile 3 Elas_j)			-0.0193***	-0.0040
X Ind.(Quintile 4 Elas_j)			-0.0123***	0.0039
X Ind.(Quintile 5 Elas_j)			-0.0098*	0.0068
Dummy: Self-SIC	0.9760***	0.9651***	0.9636***	0.9275***
	[0.0018]	[0.0029]	[0.0030]	[0.0074]
p-value: Quintile 5 - Quintile 1 effect of "Contractibility up to i"	---	[0.0087]	[0.0157]	[0.0671]
Observations	1,452,817	1,452,817	1,452,817	1,452,817
No. of parent firms	14,503	14,503	14,503	14,503
No. of i-j pairs	21,635	21,635	21,635	21,635
R^2	0.4990	0.5008	0.5015	0.5253

- Baseline: Propensity to integrate upstream falls as the elasticity increases
- *ContUpToi* matters:

(i) Raises propensity to integrate in the complements case

(ii) Also does in the substitutes case, but more weakly so

(p-value: reject equality of the Q1 and Q5 interaction coefficients)

Within-Firm Regressions (Cont.)

Similar results with more flexible quintile-by-quintile estimation.

- "Contractibility up to *i*" matters for integration decisions (particularly in Q5), even when controlling for $upst_{ij}$ at the same time.

Dependent variable:	**Indicator variable: Input Integrated?**				
BEC cons. Elas_j:	Quintile 1 (1)	Quintile 2 (2)	Quintile 3 (3)	Quintile 4 (4)	Quintile 5 (5)
Contractibility up to i (in prod. of j)	0.0338***	0.0264***	0.0321***	0.0312***	0.0532***
	[0.0063]	[0.0077]	[0.0094]	[0.0098]	[0.0150]
Upstreamness_ij	0.0001	-0.0072*	-0.0030	0.0008	0.0001
	[0.0018]	[0.0043]	[0.0044]	[0.0021]	[0.0031]
Dummy: Self-SIC	0.9217***	0.9247***	0.9401***	0.8226***	0.8767***
	[0.0128]	[0.0266]	[0.0135]	[0.0448]	[0.0378]
Firm fixed effects?	Y	Y	Y	Y	Y
Input industry (i) fixed effects?	Y	Y	Y	Y	Y
Observations	332,351	408,227	271,730	222,704	217,805
No. of parent firms	3317	4074	2710	2227	2175
No. of input-output (ij) industry pairs	4206	4411	4304	4401	4313
R^2	0.5158	0.5565	0.4957	0.5636	0.5661

Conclusion

- Production line position matters for firm organizational decisions.
- Available data on the production activities of firms operating in many countries and industries can be combined with information from I-O tables to study the organization of firms along global value chains.
- Evidence from Worldbase confirms that firms are less inclined to integrate upstream production stages as their revenue elasticity increases.
- Above patterns are moderated in industries that exhibit greater "upstream contractibility".
    - Importantly: Entire profile of upstream inputs matters, not just the contractibility of the input itself.
    - Greater upstream contractibility implies less need to rely on organizational mode to elicit desired effort levels from upstream suppliers to mediate downstream spillovers.

Back-Up Slides

Summary Statistics (Firm-level)

Return

Table 1
Summary Statistics: Global Parent Firms

	10th	Median	90th	Mean	Std Dev
A: <u>Global parent firm variables</u>					
All global parents:					
Number of Establishments (incl. self)	1	1	2	1.77	5.81
Number of countries (incl. self)	1	1	1	1.14	1.03
Number of integrated SIC codes	1	2	4	2.35	3.41
Year started	1948	1985	2000	1977	26.17
Log (Total employment), 107656 obs	1.099	3.219	5.704	3.322	1.856
Log (Sales in USD), 87675 obs	12.795	15.305	17.844	15.325	2.055
MNCs only, 6983 obs:					
Number of Establishments (incl. self)	2	3	15	8.05	22.32
Number of countries (incl. self)	2	2	6	3.36	3.51
Number of integrated SIC codes	2	4	16	7.73	11.45

Relevance

First-pass evidence that the information in D&B is relevant in terms of input-output linkages:

- 98.3% of the observed (i, j) pairs in the D&B data have $tr_{ij} > 0$.
- 82.8% of these pairs exceed the median positive tr_{ij} value.
- Similar summary statistics if:
  - restrict to distinct (i, j) pairs within each parent firm.
  - restrict to manufacturing inputs.
  - drop pairs where $i = j$.

Return

Measuring Upstreamness: Practical Implementation Issues ▸ Return

- Applying the open-economy and net-inventories correction to D; see Antràs et al. 2012.)
- Original industry categories: IO1992
- Compute $upst_{ij}$ and tr_{ij} first for IO1992 codes, and then map to SIC.
- For manufacturing: Each SIC is mapped into by a unique IO1992
- For non-manufacturing: Can have multiple IO1992's mapping to an SIC.
- We focus on global parents whose primary output j is in manufacturing, so the mapping issue matters for non-manufacturing inputs.

  Different treatments considered: (pairwise correlation > 0.98)

  (i) Simple average of $upst_{ij}$ over constituent IO1992 input categories
  (ii) Simple median
  (iii) Random pick
  (iv) tr_{ij} weighted-average

- Separate issue: If an IO1992 input maps into multiple SICs, divide up the tr_{ij} coefficient using a simple average.

Summary Statistics (Upstreamness Measures) ▸ Return

Table 2
Upstreamness: Summary Statistics and Some Examples

	10th	Median	90th	Mean	Std Dev
A: From Input-Output Tables (*i* =input; *j* =output) (for *j* in manufacturing only: 416,349 obs.)					
Total Requirements coefficient	0.000006	0.000163	0.002322	0.001311	0.008026
Baseline Upstreamness measure (mean)	1.838	3.094	4.285	3.097	0.955

B: Top ten most commonly observed SIC input-output pairs (in D&B)
(for *i and j* in manufacturing only)

SIC input, *i*	**SIC output, *j***	**No. such pairs**	**Upst_ij**
Cookies and Crackers (2052)	Bread, Cake and Related Products (2051)	497	3.135
Commercial Printing, Lithographic (2752)	Commercial Printing, n.e.c. (2759)	439	1.186
Periodicals (2721)	Newspapers (2711)	391	1.409
Commercial Printing, n.e.c. (2759)	Commercial Printing, Lithographic (2752)	319	1.186
Commercial Printing, Lithographic (2752)	Newspapers (2711)	299	1.348
Women's and Misses' Outerwear, n.e.c. (2339)	Men's and Boys' Clothing, n.e.c. (2329)	287	1.106
Typesetting (2791)	Commercial Printing, Lithographic (2752)	280	1.151
Bookbinding and Related Work (2789)	Commercial Printing, Lithographic (2752)	273	2.192
Sausages and Other Prepared Meats (2013)	Meat Packing Plants (2011)	272	1.329
Ready-Mixed Concrete (3273)	Concrete Products, n.e.c. (3272)	190	1.074

Ratio-Upstreamness Measures: Summary statistics

	10th	Median	90th	Mean	Std Dev
B: <u>Ratio-Upstreamness measures</u>					
Baseline (mean)	0.490	0.558	0.698	0.586	0.136
Baseline (random pick)	0.494	0.557	0.698	0.586	0.136
Manufacturing inputs only	0.547	0.620	0.779	0.645	0.161
Ever-integrated inputs only (mean)	0.564	0.659	0.821	0.693	0.178
Exclude parent sic (mean)	0.586	0.953	1.607	1.049	0.401
Exclude parent sic, manufacturing only	0.589	1.065	2.110	1.257	0.625

- R_{jp} values tend to be < 1, but this appears to be driven by the parent SIC.
- Correlation between variants is high (typically > 0.8).

  Key exception: When excluding parent SIC, correlation with baseline measures drops to about 0.15.

Return

Summary Statistics (Industry Controls) Return

Appendix Table 1
Summary Statistics: Industry Characteristics

	10th	Median	90th	Mean	Std Dev
SIC characteristics (459 industries)					
Import demand elasticity (all codes)	2.300	4.820	20.032	8.569	10.181
Import demand elasticity (BEC cons.+cap.)	1.983	4.500	20.289	8.819	11.722
Import demand elasticity (BEC cons. only)	2.000	4.639	15.992	8.366	11.881
Log (Skilled Emp./Worker)	-1.750	-1.363	-0.778	-1.308	0.377
Log (Capital/Worker)	3.493	4.428	5.591	4.495	0.794
Log (Equip. Capital / Worker)	2.869	4.043	5.163	4.039	0.867
Log (Plant Capital / Worker)	2.517	3.302	4.524	3.426	0.755
Log (Materials / Worker)	3.898	4.596	5.681	4.702	0.726
R&D intensity: Log (0.001+ R&D/Sales)	-6.908	-6.097	-3.426	-5.506	1.463
Value-added / Shipments	0.357	0.518	0.660	0.514	0.119
Contractibility (Rauch cons., homog. only)	0.091	0.362	0.816	0.410	0.265
Contractibility (Rauch cons., homog.+ref.priced)	0.006	0.021	0.183	0.073	0.132
Upst. contractibility (Rauch cons., homog. only)	0.549	0.914	1.438	0.966	0.352
Upst. contractibility (Rauch cons., homog.+ref.priced)	0.659	1.011	1.498	1.054	0.333

Alternative *UpstCont*$_j$ measure ▸ Return

Dependent variable:	Log Ratio-Upstreamness		
	(1)	(2)	(3)
Ind.(Quintile 2 Elas)	-0.0407	-0.0740**	-0.0572
	[0.0282]	[0.0337]	[0.0363]
Ind.(Quintile 3 Elas)	-0.1150***	-0.0871**	-0.0998***
	[0.0295]	[0.0362]	[0.0297]
Ind.(Quintile 4 Elas)	-0.1126***	-0.1576***	-0.1528***
	[0.0312]	[0.0271]	[0.0262]
Ind.(Quintile 5 Elas)	-0.1417***	-0.1748***	-0.1592***
	[0.0289]	[0.0275]	[0.0269]
"Upstream Contractibility"			
X Ind.(Quintile 1 Elas)	-1.2784***	-1.5249***	-1.8220***
	[0.4564]	[0.3683]	[0.3826]
X Ind.(Quintile 2 Elas)	-0.8160***	-0.3932	-0.6059
	[0.2640]	[0.4604]	[0.5864]
X Ind.(Quintile 3 Elas)	0.4082*	-0.0452	0.0563
	[0.2361]	[0.3314]	[0.3535]
X Ind.(Quintile 4 Elas)	0.3364	1.0129***	0.6766***
	[0.2762]	[0.2170]	[0.1989]
X Ind.(Quintile 5 Elas)	0.7606***	1.0618***	1.2564***
	[0.1941]	[0.1913]	[0.2188]
p-value: Q5 at median Upst. Cont.	[0.0000]	[0.0000]	[0.0000]
Elasticity based on:	All codes	BEC cons. & cap. goods	BEC cons. only
Industry controls?	Y	Y	Y
Firm controls?	Y	Y	Y
Parent country fixed effects?	Y	Y	Y
Observations	84,171	62,377	44,895
No. of industries	459	305	219
R^2	0.2568	0.3286	0.3531

Further Robustness Tests ▸ Return

1. Focusing on Larger Firms and MNCs. ▸ Details
2. For MNCs: Excluding purely horizontal affiliates.
3. Secondary manufacturing SIC codes: ▸ Details
   - Restrict to parents with a single SIC output industry
   - Alternatively: Construct R_{jpc} for each output industry j.

     Run a regression with two-way clustering of standard errors by parent firm and by output industry j (Cameron, Gelbach and Miller 2011).
4. Additional contractibility measures:
   - Contractibility of j
   - To confirm that it is variation in production line position matters: $\mathbf{1}(\rho_j \in Quint_k(\rho))$ interacted with a tr-weighted standard deviation of the contractibility of inputs used.
5. Alternative constructions of ratio-upstreamness ▸ Details

Robustness: Focusing on Larger Firms and MNCs ▸ Return

Dependent variable:	Log Ratio-Upstreamness Measure			
	Emp.>=20	Emp.>=20 & Subs.>=2	Emp.>=20 & MNC	Emp.>=20 & MNC & SICs>=2
	(1)	(2)	(3)	(4)
Ind.(Quintile 2 Elas)	-0.0450	-0.0467	-0.0516*	-0.0511*
	[0.0290]	[0.0304]	[0.0297]	[0.0298]
Ind.(Quintile 3 Elas)	-0.0603**	-0.0627**	-0.0468	-0.0455
	[0.0255]	[0.0280]	[0.0302]	[0.0304]
Ind.(Quintile 4 Elas)	-0.0931***	-0.0778***	-0.0616**	-0.0605**
	[0.0278]	[0.0295]	[0.0278]	[0.0282]
Ind.(Quintile 5 Elas)	-0.0987***	-0.0806**	-0.0667*	-0.0633*
	[0.0290]	[0.0323]	[0.0343]	[0.0353]
"Upstream Contractibility"				
X Ind.(Quintile 1 Elas)	-0.2208***	-0.2056***	-0.1858***	-0.1870***
	[0.0633]	[0.0652]	[0.0595]	[0.0604]
X Ind.(Quintile 2 Elas)	-0.0686	-0.0591	-0.0025	-0.0035
	[0.0803]	[0.0803]	[0.0576]	[0.0576]
X Ind.(Quintile 3 Elas)	0.0988**	0.1060*	0.0834	0.0853
	[0.0398]	[0.0568]	[0.0689]	[0.0693]
X Ind.(Quintile 4 Elas)	0.1173***	0.1052**	0.0854*	0.0832*
	[0.0393]	[0.0490]	[0.0435]	[0.0449]
X Ind.(Quintile 5 Elas)	0.2364***	0.2575***	0.2123***	0.2016***
	[0.0345]	[0.0369]	[0.0516]	[0.0531]
p-value: Q5 at median Upst. Cont.	[0.0000]	[0.0009]	[0.0631]	[0.0906]
Elasticity based on:	BEC cons.	BEC cons.	BEC cons.	BEC cons.
Industry controls?	Y	Y	Y	Y
Firm controls?	Y	Y	Y	Y
Parent country fixed effects?	Y	Y	Y	Y
Observations	26,151	7,805	2,490	2,419
No. of industries	219	216	199	197
R^2	0.3307	0.3086	0.2403	0.2292

Multi-industry Parents

Return

Dependent variable:	Log Ratio-Upstreamness Measure			
	Restrict to single SIC code parents		Parent firm by SIC output (two-way cluster)	
	(1)	(2)	(3)	(4)
Ind.(Quintile 2 Elas)	-0.0782	-0.0375	-0.0769*	-0.0379
	[0.0490]	[0.0301]	[0.0410]	[0.0280]
Ind.(Quintile 3 Elas)	-0.1140**	-0.0721***	-0.0901**	-0.0505*
	[0.0448]	[0.0261]	[0.0390]	[0.0263]
Ind.(Quintile 4 Elas)	-0.1489***	-0.0893***	-0.1504***	-0.0938***
	[0.0485]	[0.0297]	[0.0407]	[0.0269]
Ind.(Quintile 5 Elas)	-0.1886***	-0.0805***	-0.1871***	-0.0876***
	[0.0476]	[0.0305]	[0.0424]	[0.0297]
"Upstream Contractibility"				
X Ind.(Quintile 1 Elas)		-0.2353***		-0.2159***
		[0.0638]		[0.0612]
X Ind.(Quintile 2 Elas)		-0.0965		-0.0588
		[0.0857]		[0.0782]
X Ind.(Quintile 3 Elas)		0.1330***		0.0826*
		[0.0367]		[0.0429]
X Ind.(Quintile 4 Elas)		0.1063**		0.1058***
		[0.0413]		[0.0369]
X Ind.(Quintile 5 Elas)		0.2466***		0.2527***
		[0.0349]		[0.0370]
p-value: Q5 at median Upst. Cont.		[0.0004]		[0.0017]
Elasticity based on:	BEC cons. only	BEC cons. only	BEC cons. only	BEC cons. only
Industry controls?	Y	Y	Y	Y
Firm controls?	Y	Y	N	Y
Parent country fixed effects?	Y	Y	Y	Y
Observations	32,126	32,126	64,281	64,281
No. of industries	218	218	---	---
R^2	0.2764	0.3673	0.2633	0.3270

Robustness: More Contractibility Controls and Alternative R_{jpc}'s ▸ Return

Dependent variable:	Log Ratio-Upstreamness Measure				
	More cont. controls	Random pick	"Ever-Integrated" Inputs	Mfg. Inputs only	Mfg. Inputs and Drop parent SIC
	(1)	(2)	(3)	(4)	(5)
Ind.(Quintile 2 Elas)	-0.2932	-0.0396	-0.0494*	-0.0274	0.0237
	[0.2978]	[0.0285]	[0.0257]	[0.0318]	[0.0902]
Ind.(Quintile 3 Elas)	-1.0567***	-0.0633**	-0.0369	-0.0538*	-0.0915
	[0.3082]	[0.0253]	[0.0254]	[0.0293]	[0.0630]
Ind.(Quintile 4 Elas)	-0.7486**	-0.0886***	-0.0608**	-0.0884***	-0.1930**
	[0.3089]	[0.0278]	[0.0277]	[0.0307]	[0.0764]
Ind.(Quintile 5 Elas)	-0.6888**	-0.0819***	-0.0987***	-0.0923**	-0.2491**
	[0.2790]	[0.0295]	[0.0289]	[0.0359]	[0.0997]
"Upstream Contractibility"					
X Ind.(Quintile 1 Elas)	-0.1493	-0.2286***	-0.0705	-0.3133***	-0.2565***
	[0.1101]	[0.0635]	[0.0607]	[0.0695]	[0.0954]
X Ind.(Quintile 2 Elas)	-0.0862	-0.0807	-0.1097	-0.1058	0.1134
	[0.0838]	[0.0804]	[0.0943]	[0.0923]	[0.1278]
X Ind.(Quintile 3 Elas)	-0.1848*	0.1098***	0.1398***	0.1030	-0.2827
	[0.0972]	[0.0401]	[0.0534]	[0.0655]	[0.2202]
X Ind.(Quintile 4 Elas)	-0.0195	0.1044***	0.1246**	0.1204***	-0.3512**
	[0.0782]	[0.0388]	[0.0580]	[0.0396]	[0.1395]
X Ind.(Quintile 5 Elas)	0.1282**	0.2758***	0.2823***	0.1410**	-0.0239
	[0.0551]	[0.0410]	[0.0384]	[0.0582]	[0.2007]
p-value: Q5 at median Upst. Cont.	[0.0123]	[0.0002]	[0.0000]	[0.0026]	[0.0134]
Elasticity based on:	BEC cons.	BEC cons.	BEC cons.	BEC cons.	BEC cons.
Industry controls?	Y	Y	Y	Y	Y
Firm controls?	Y	Y	Y	Y	Y
Parent country fixed effects?	Y	Y	Y	Y	Y
Observations	44,895	44,895	44,895	44,780	14,503
No. of industries	219	219	219	218	216
R^2	0.3706	0.3558	0.2578	0.3339	0.1116