Determinants of Vertical Integration in Export Processing: Theory and Evidence from China

Ana Fernandes - University of Sussex

Heiwai Tang - Tufts University; LdA

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Make or Buy in International Trade

- Roughly one third of world trade is intrafirm trade.
- There is a large and growing theoretical literature that applies the theory of the firm to study the determinants of intrafirm trade (McLaren, 00; Grossman and Helpman, 02, 03, 04, 05; Antràs, 03, 05; Antràs and Helpman, 04, 08; Conconi, Legros and Newman, 08; Ornelas and Turner, 10)
- Empirical evidence is relatively scant and exclusively focuses on the developed world.

What we do

- This paper provides (product-level) evidence from export processing plants in China (who assemble imported intermediate inputs and export final products) to study the determinants of FDI versus outsourcing
- Property-Right Theory of the Firm – Grossman and Hart (86)
- Sectoral determinants: headquarter input intensities, productivity dispersion and contractibility of inputs (Antràs and Helpman, 04, 08)
- We extend Antràs and Helpman (2004) to consider investments in component purchases to guide empirical work on export processing.

Why China, why Export-processing?

- Export processing is regulated under two regulatory regimes, which designate by law the owner of the imported materials. A good case to study the theory of the firm.
- All existing empirical studies on intrafirm trade rely on evidence of the headquarter side in developed countries.
- The Chinese data allow us to study the determinants of vertical integration by using information on the side of the affiliates in developing countries.
- We consider exports from export assembly plants who produce exclusively for "headquarters" in developed countries.

Export Processing Regimes in China

Export processing plants in China have been governed under two regulatory regimes since the early 1980s

1. **Pure-assembly regime** - an assembly plant *receives* orders and all intermediate inputs from a foreign client.
   - The **foreign firm** retains control rights over the inputs.
2. **Import-and-assembly regime** - an assembly plant (bonded warehouse) receives order from a foreign client, imports intermediate inputs of its own accord, processes them and sells the finished goods to a foreign buyer.
   - The **assembly plant** retains control rights over the inputs.
   - Can use the same kind of imported inputs with multiple foreign firms (probably higher outside options).

Export Shares by Different Production Modes in China

	Total processing	Pure-assembly	Import-and-assembly
US $1 billion	416.48	83.97 (20.2%)	332.51 (79.8%)
Share of total exports	54.70%	11.00%	43.60%

		Who owns the plant?		
		Foreign (VI)	China (O)	
Who controls imported components?	Foreign (PA)	9.67%	12.22%	21.89%
	China (IA)	59.71%	18.40%	78.11%
		69.38%	30.62%	

Source: Chinese export data from the Customs General Administration of the People's Republic of China, 2005

Theoretical Results

- A variant of Antràs and Helpman (2004): North-South trade model with heterogeneous firms and different fixed costs for different production modes, Grossman-Hart-Moore property rights approach
- Basic insight: Imported input and asset ownership should be given to the party whose investments (assembly or headquarter services) are most important for production.
- In headquarter-intensive sectors, productivity pecking order: more productive firms choose pure assembly over import-and-assembly; integration over outsourcing.

Empirical Results

1. Under import-and-assembly (in which assembly plants own imported inputs), the share of integrated firms' exports is increasing in h-intensity of inputs (i.e., skill, capital-equipment and R &D intensities), and decreasing in the contractibility of inputs (consistent with existing theories on the determinants of intrafirm trade.)

2. However, no significant relationship is found under pure-assembly (in which the foreign buyer owns the intermediate inputs).

3. Under pure-assembly, a larger industry productivity dispersion is associated with a bigger share of integrated firm' exports;

    - This relationship between productivity dispersion and the share of vertically integrated plants' exports is higher in the more h-intensive sectors.

Brief Review of the Extensive Theoretical Literature

- Feenstra and Hanson (05) show theoretically and empirically the prominence of "split ownership" structure in China – prevalence of import-and-assembly exports, and the dominance of foreign ownership within this regime.
- Antràs (03, 05) and Antràs and Helpman (04, 08) use the property-rights theory of Grossman-Hart-Moore to model global outsourcing and intrafirm trade.
- Grossman and Helpman (02, 03, 05) show in a general equilibrium model how thicker factor markets are more conducive to outsourcing (transaction-cost approach)
- More recent work: Conconi, Lagros and Newman (08); Ornelas and Turner (10).

Related Empirical Work

- The existing empirical work (we are aware of) focus on property-right theory of the firm:

1. Sector-level evidence
   - Yeaple (06) - US
   - Nunn and Trefler (08a,b) - US
   - Bernard et al. (08) - US
2. Firm-level evidence
   - Defever and Toubal (07) - France
   - Corcos et al. (08) - France
   - Kohler and Smolka (09) - Spain

Model - Preferences

- The world is populated by a unit measure of consumers with identical preferences:

$$U = q_0 + \frac{1}{\mu}\sum_{j=1}^{J}\left[\int_{i\in\Omega_j} q_j\left(i\right)^{\alpha} di\right]^{\frac{\mu}{\alpha}}, \quad 0 < \mu < \alpha < 1;$$

- 1 homogeneous good (0), J industries (j), a brand (i) from Ω_j.
- Each firm produces a brand of a differentiated product, facing demand $q = Dp^{-\frac{1}{1-\alpha}}$, where D is a sector-level demand factor.

Model - Technology

- Final good q is produced using 3 inputs: activities to search for imported component (m); assembly activities (a); headquarter services (h)

$$q = \theta \left(\frac{m}{\eta^m}\right)^{\eta^m} \left(\frac{a}{\eta^a}\right)^{\eta^a} \left(\frac{h}{\eta^h}\right)^{\eta^h},$$

- θ is exogenous productivity, η^k captures intensity of factor k.
- Firm revenue:

$$R(m, a, h) = D^{1-\alpha}\theta^{\alpha} \left(\frac{m}{\eta^m}\right)^{\alpha\eta^m} \left(\frac{a}{\eta^a}\right)^{\alpha\eta^a} \left(\frac{h}{\eta^h}\right)^{\alpha\eta^h}.$$

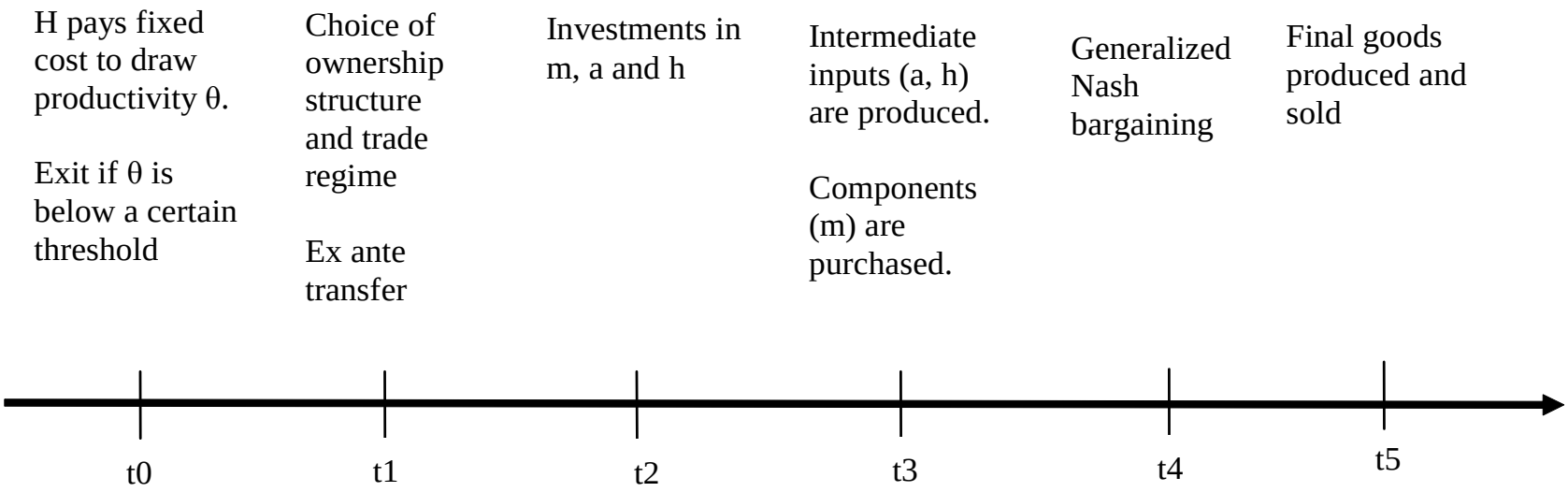
Production Modes

- Production always involves two parties, the final-good producer in the North (H) and the assembly plant in the South (A).
- H always invests in h, while A always invests in a.
- The trade regime stipulates who invests in purchasing imported component m.
- Pure-assembly (N): H has control rights and ownership over m;
- Import-and-assembly (S): A has control rights and ownership over m.

Incomplete Contracts

- No enforceable contracts can be signed ex ante. H and A bargain over the division of surplus from the relationship after investments.
- Primitive bargaining power: $\beta \in (0,1)$ for H $(1-\beta)$ for A.
- At the bargaining stage, the distribution of the ex post surplus is sensitive to the production mode.
- Asset ownership increases the owners' outside options.
- **In our model, control rights and ownership of components also increase the owners' outside options**.

Timing of Events



H's Ex post Revenue Share - Pure Assembly

- **Outsourcing** (arms-length relationship between H and A) **(NO)**
  - Outside options of both A and H are 0. Ex post surplus $= R$.
  - H's expected payoffs $= \beta_{NO} R$, where $\beta_{NO} = \beta$,
- **Vertical Integration** (H owns A's assets) **(NV)**
  - H can fire manager A, use A's assets to produce a fraction $\delta \in (0,1)$ of the original output, if bargaining fails.
  - With inputs tailored specifically to the relationship, A's outside option at the time of bargaining is 0.
  - Ex post surplus $= (1-\delta^{\alpha})\, R$.
  - H's expected payoffs $= \beta_{NV} R$, where $\beta_{NV} = \beta\,(1-\delta^{\alpha}) + \delta^{\alpha}$.

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H's Ex post Revenue Share - Import and Assembly

- **Outsourcing(SO)**
  - With component search experience, business network and ownership of components, A's outside option is γR (Feenstra and Hanson, 2005).
  - H's expected payoffs $= \beta_{SO} R$, where $\beta_{SO} = \beta(1-\gamma)$.
- **Vertical Integration (SV)**
  - Similar to pure-assembly, H can fire A and produce a fraction $\delta \in (0,1)$ of the original output, if bargaining fails.
  - Outside option of A is γR, that of H is 0.
  - Ex post surplus $= (1-\delta^{\alpha}-\gamma) R > 0$. $(\delta^{\alpha}+\gamma<1)$.
  - H's expected payoffs $= \beta_{SV} R$, where $\beta_{SV} = \beta(1-\delta^{\alpha}-\gamma)+\delta^{\alpha}$.

H's Ex post Revenue Share

H's Ex post Share of Surplus		Who owns the plant?	
		Foreign (V)	China (O)
Who controls	Foreign (N)	$\beta(1-\delta^{\alpha})+\delta^{\alpha}$	β
imported components?	China (S)	$\beta(1-\delta^{\alpha}-\gamma)+\delta^{\alpha}$	$\beta(1-\gamma)$

If γ is high and/or δ is low the final-good producer's effective bargaining power is weak. In this case,

$$\beta_{NV} > \beta_{NO} > \beta_{SV} > \beta_{SO}.$$

Choosing Optimal Production Mode

- H chooses the production mode (i.e. trade regime k and organizational form l) to maximize expected operating profits:

$$\pi^* \left(D, \eta^a, \eta^h \right) = \max_{k \in \{N,S\}, l \in \{V,O\}} D\Theta\psi_{kl} - w^N \phi_{kl}$$

- D = sector-level demand factor, Θ = firm-specific exogenous productivity term, Pareto distributed (Melitz, 03) $w^N \phi_{kl}$ = fixed cost of production for production mode kl.

- ψ_{kl} **is the multiplicative part of revenue that is sensitive to investment levels, which in turn depend the production mode.**

Choosing Optimal Production Mode

- **Rule of thumb**: the optimal production mode (SO, SV, NO, NV) gives most de facto bargaining power to the party whose investments are most important.
- In an **assembly-intensive** sector (high η^a and low η^h), integration is never an optimal organizational form.
- In a **headquarter-intensive** sector (high η^h)

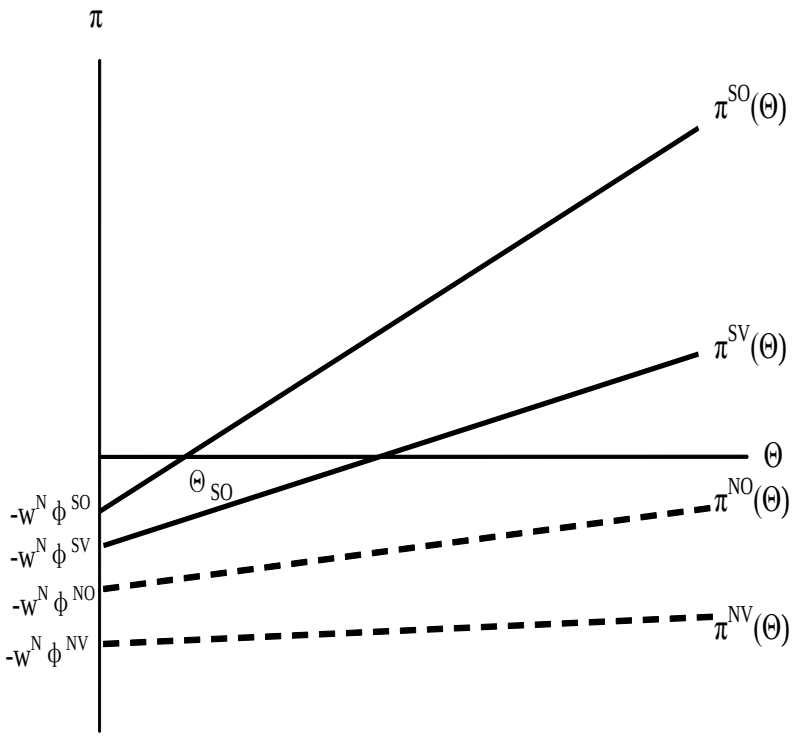
$$\psi_{NV} > \psi_{NO} > \psi_{SV} > \psi_{SO}.$$

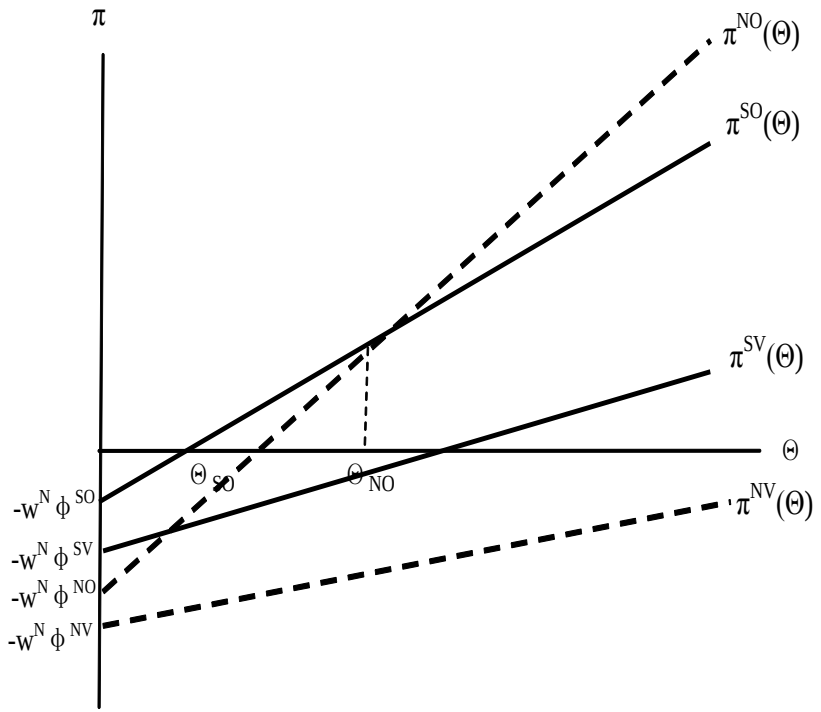
Choosing Optimal Production Mode

- Fixed costs for integration $>$ fixed costs for outsourcing (Antràs and Helpman, 2004).
- Fixed costs for pure-assembly $>$ fixed costs for import-and-assembly (e.g. transportation network to ship components).
- A natural ranking of fixed costs of production

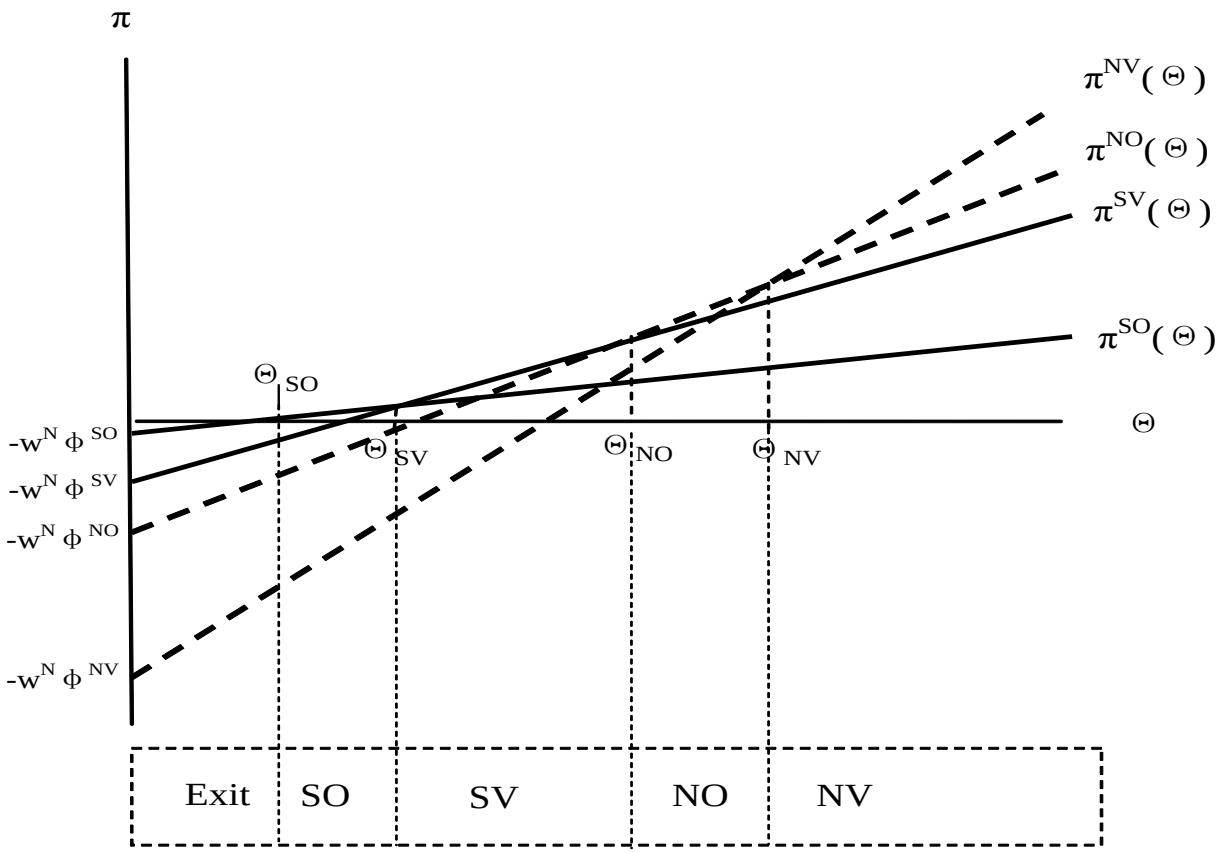
$$\phi_{NV} > \phi_{NO} > \phi_{SV} > \phi_{SO}.$$

Prevalence of Production Modes in Assembly-Intensive Sectors





Prevalence of Production Modes in Headquarter-Intensive Sectors



Impact of Higher η^h on Fractions of Production Modes

Export Share of Vertically Integrated Firms under **import-and-assembly:**

$$\frac{X_{SV}}{X_{SV}+X_{SO}} = \left[1+\frac{\psi_{SO}}{\psi_{SV}}\frac{1-\left(\frac{\Theta_{SV}}{\Theta_{SO}}\right)^{1-\kappa}}{\left[\left(\frac{\Theta_{SV}}{\Theta_{SO}}\right)^{1-\kappa}-\left(\frac{\Theta_{NO}}{\Theta_{SO}}\right)^{1-\kappa}\right]}\right]^{-1}.$$

- Θ_{SV}/Θ_{SO}, Θ_{NO}/Θ_{SO} and ψ_{SO}/ψ_{SV} all increase with η^h, so the share of integrated firms within the regime is higher in sectors with higher values of η^h.

Export Share of Vertically Integrated Firms under **pure-assembly**:

$$\frac{X_{NV}}{X_{NV}+X_{NO}} = \left[1+\frac{\psi_{NO}}{\psi_{NV}}\left[\left(\frac{\Theta_{NO}}{\Theta_{NV}}\right)^{1-\kappa}-1\right]\right]^{-1}.$$

Testable Hypotheses

Hypothesis – Headquarter Intensity

- The export share of vertically integrated plants is increasing in headquarter-service intensity under import-and-assembly;
- Ambiguous relationship under pure-assembly;
- No relationship in assembly-intensive sectors

Hypothesis – Productivity Dispersion

- In a headquarter-intensive sector, a higher sectoral productivity dispersion is associated with a larger export share of integrated plants' exports under pure-assembly;
- Ambiguous relationship under import-and-assembly;
- No relationship in assembly-intensive sectors

Data Sources

- Trade data: the Customs General Administration of the People's Republic of China for 2005. Data report values in US$ for imports and exports of over 5000 products in the HS 6-digit classification.
  - Men's or boys' nightshirts & pyjamas (excl knitted or crocheted), of cotton
  - Men's or boys' nightshirts & pyjamas (excl knitted or crocheted), of man-made fibres
- According to the Chinese law, a foreign partner has no less than 25% of ownership stake. We consider both wholly-owned and joint ventures as foreign owned.
- Industry level (SIC 4-digit) measures of capital, skill, material, capital-equipment, capital-structures-intensities: from NBER-CES for 2001-2005.
- Industry level (SIC 4-digit) measures of R & D intensity: from Orbis, 2006.

Data Sources (cont')

- Industry productivity dispersion: from Nunn and Trefler (2007) for 2005 (US exports based).
- We also use a Chinese exports-based measure, and a measure based on Chinese firms' sales from the Annual Survey of Industrial Production 1998-2005.
- Industry contractual intensity measure (increasing in the completeness of contracts): from Nunn (2007). Share of each industry's intermediate inputs that are not relationship-specific (1-fraction of inputs not sold on exchanges and not reference-priced).

Headquarter Intensity and Integrated Plants' Exports

$$\frac{X_{pjc}^{IV}}{X_{pjc}^{IV}+X_{pjc}^{IO}} = \alpha + \gamma_H \ln\left(\frac{H_j}{L_j}\right) + \gamma_K \ln\left(\frac{K_j}{L_j}\right) + \gamma_R \ln\left(\frac{RD_j}{PQ_j}\right) + \epsilon_{pjc}$$

- p = HS 6-digit product, j = sector, I = trade regime, c = destination country
- $\frac{X_{pjc}^{IV}}{X_{pjc}^{IV}+X_{pjc}^{IO}}$ is the share of exports in industry j that are from foreign invested firms (FIEs).
- H_j/L_j, K_j/L_j, RD_j/PQ_j are measures of skill, capital and R&D intensity of the industry (SIC 4-digit), respectively.
- We run regressions at the product-country level, and include country fixed effects.

Baseline Results

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

Trade Regime:	Import-and-assembly			
Skill Intensity, ln(H/L)	0.168***		0.191***	
	(4.914)		(5.310)	
Capital Intensity, ln(K/L)	-0.086**	-0.138***		
	(-2.048)	(-3.902)		
R&D Intensity, ln(RD/PQ)		0.101***		0.096***
		(2.907)		(2.656)
Material Intensity, ln(M/L)			-0.093**	-0.076
			(-2.357)	(-1.588)
Equipment Intensity, ln(E/L)			0.081**	-0.030
			(1.989)	(-0.657)
Plant Intensity, ln(P/L)			-0.118***	-0.071*
			(-3.076)	(-1.726)
Country fixed effects	yes	yes	yes	yes
N	72429	69669	72429	69669
No. clusters	348	317	348	317
R^2	.065	.051	.076	.055

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Baseline Results

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

Trade Regime:	Pure-assembly			
Skill Intensity, ln(H/L)	-0.090**		-0.119***	
	(-2.390)		(-3.367)	
Capital Intensity, ln(K/L)	0.031	0.071		
	(0.736)	(1.613)		
R&D Intensity, ln(RD/PQ)		-0.095***		-0.088***
		(-2.825)		(-2.665)
Material Intensity, ln(M/L)			-0.009	-0.020
			(-0.204)	(-0.463)
Equipment Intensity, ln(E/L)			-0.116**	-0.038
			(-2.340)	(-0.648)
Plant Intensity, ln(P/L)			0.161***	0.129***
			(3.546)	(2.605)
Country fixed effects	yes	yes	yes	yes
N	34877	32883	34877	32883
No. clusters	331	300	331	300
R^2	.081	.084	.095	.090

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Different Country Samples

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

	Import-and-assembly					
	(1)	(2)	(3)	(4)	(5)	(6)
Country Group:	LIC	HIC	US	Japan	Europe HIC	Exclude HK
Skill Intensity, ln(H/L)	0.222***	0.125***	0.144***	0.165***	0.155***	0.157***
	(5.480)	(2.941)	(3.547)	(4.419)	(3.184)	(3.267)
Material Intensity, ln(M/L)	-0.099*	-0.086*	-0.109**	-0.079*	-0.085*	-0.085
	(-1.936)	(-1.750)	(-2.247)	(-1.755)	(-1.687)	(-1.593)
Equipment Intensity, ln(E/L)	0.185**	0.056	0.115**	0.140***	0.067	0.103*
	(2.448)	(0.929)	(2.055)	(2.877)	(1.098)	(1.726)
Plant Intensity, ln(P/L)	-0.174***	-0.112**	-0.156***	-0.182***	-0.147***	-0.163***
	(-2.652)	(-2.298)	(-3.135)	(-4.382)	(-2.823)	(-3.084)
N	1368	3412	2314	2494	2413	3362
No. Clusters	273	344	315	326	318	346
No. Countries	47	59	1	1	38	233
R^2	.059	.037	.047	.047	.052	.050

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Different Country Samples

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

	Pure-assembly					
	(1)	(2)	(3)	(4)	(5)	(6)
Country Group:	LIC	HIC	US	Japan	Europe HIC	Exclude HK
Skill Intensity, ln(H/L)	-0.085	-0.083*	-0.099**	-0.175***	-0.122***	-0.117***
	(-1.328)	(-1.891)	(-2.313)	(-4.620)	(-2.781)	(-2.997)
Material Intensity, ln(M/L)	-0.031	0.030	0.036	0.048	0.029	0.023
	(-0.419)	(0.696)	(0.693)	(1.155)	(0.519)	(0.536)
Equipment Intensity, ln(E/L)	0.210**	-0.139**	-0.182***	-0.160**	-0.086	-0.074
	(2.418)	(-2.339)	(-3.110)	(-2.574)	(-1.407)	(-1.300)
Plant Intensity, ln(P/L)	-0.001	0.079	0.175***	0.087	0.147*	0.063
	(-0.008)	(1.223)	(2.689)	(1.441)	(1.864)	(1.001)
N	548	2708	1599	1755	1536	2495
No. Clusters	181	330	289	290	277	323
No. Countries	47	59	1	1	38	233
R^2	.058	.010	.025	.033	.026	.014

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Factor Intensities based on Chinese Data

Dependent Variable: China's foreign-affiliated plants' exports as a share of total

Trade Regime	Import-and-assembly		Pure-assembly	
Skill intensity	0.106***		-0.101**	
	(3.385)		(-2.251)	
Capital Intensity	-0.142***	-0.083**	-0.017	-0.080*
	(-3.697)	(-2.151)	(-0.293)	(-1.708)
RD+Advert intensity		0.102***		-0.079*
		(3.628)		(-1.771)
Country FE	yes	yes	yes	yes
N	72478	63733	34893	31282
No. Clusters	350	314	333	300
R^2	.047	.043	.082	.083

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01.

Productivity Dispersion and Integrated Firms' Exports

$$\frac{X_{pjc}^{IV}}{X_{pjc}^{IV}+X_{pjc}^{IO}} = d_c + \delta_\theta \sigma_j^\theta + \delta_{\theta\eta}\sigma_j^\theta \times \eta_j + \mathbf{S_j}\Gamma + \epsilon_{pjc},$$

- $\frac{X_{pjc}^{IV}}{X_{pjc}^{IV}+X_{pjc}^{IO}}$ is the share of exports of good j that are from FIEs.
- σ_j^θ is the measure of productivity dispersion in industry j.
- And η_j is a measure of headquarter intensity.
- And $\mathbf{S_j}$ is a full set of headquarter intensities.

Productivity Dispersion and Integrated Plants' Exports

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

Unit of Obs.	Product-Country			
	Import-and-assembly		Pure-assembly	
Headquarter intensity measure:	skill	equipment	skill	equipment
	(1)	(2)	(3)	(4)
Dispersion	0.050	0.071***	0.270***	0.033
	(0.921)	(3.049)	(2.946)	(1.367)
Dispersion interaction	0.063	-0.336***	0.409**	0.547***
	(0.486)	(-2.909)	(2.291)	(3.529)
Country fixed effects	yes	yes	yes	yes
Headquarter intensity controls	yes	yes	yes	yes
N	72365	72365	34867	34867
No. clusters	346	346	329	329
R^2	.076	.079	.100	.110

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Prod. Dispersion, Interacted with H-intensity Quintiles, Pure-Assembly

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

	Import-and-assembly		Pure-assembly	
	(1)	(2)	(3)	(4)
Dispersion interacted with:	skill	equipment	skill	equipment
Ii1	0.008	0.191***	0.163	0.007
	(0.072)	(2.911)	(1.299)	(0.088)
Ii2	0.118	0.108	0.003	0.013
	(1.126)	(1.192)	(0.032)	(0.146)
Ii3	0.088	0.074	-0.093	0.336
	(0.759)	(0.589)	(-0.658)	(1.576)
Ii4	-0.037	0.163	0.184*	0.430***
	(-0.265)	(1.478)	(1.712)	(2.821)
Ii5	0.067	-0.122	0.575***	0.410***
	(0.763)	(-1.148)	(3.181)	(3.512)
Country fixed effects	yes	yes	yes	yes
Quintile fixed effects	yes	yes	yes	yes
Headquarter intensity controls	yes	yes	yes	yes
N	72365	72365	34867	34867
No. Clusters	346	346	329	329
R^2	.079	.085	.110	.120

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Contractibility of Inputs and Integrated Plant's Trade

- Antràs and Helpman (2008) allow for varying degrees of contractibility across inputs and countries.
- An improvement in the contractibility of inputs implies that more tasks being contractible.
  - **(the "Standard Effect")** The hold-up problem is lessened.
  - **(the "Surprise Effect")** The headquarter is less concerned about the distortion of integration on the supplier's investment incentives.

Contractibility of Inputs and Integrated Plants' Exports

$$\frac{X_{pjc}^{IV}}{X_{pjc}^{IV} + X_{pjc}^{IO}} = d_c + \delta_Z Z_j + \delta_{Z\eta} Z_j \times \eta_j + \mathbf{S_j}\Gamma + \epsilon_{pjc}$$

- $\frac{X_{pjc}^{IV}}{X_{pjc}^{IV}+X_{pjc}^{IO}}$ is the share of exports of good j that are from FIEs.
- Z_j is a measure of contractibility of inputs in industry j.
- η_j is a measure of headquarter intensity.
- And $\mathbf{S_j}$ is a full set of headquarter intensities.

Contractibility of Inputs and Integrated Plants' Exports

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

Unit of Obs.	Product-Country			
	Import-and-assembly		Pure-assembly	
Headquarter intensity measure:	skill	equipment	skill	equipment
	(1)	(2)	(3)	(4)
Contractibility	-0.062	0.044	-0.056	-0.023
	(-0.561)	(1.053)	(-0.410)	(-0.416)
Contractibility interaction	0.009	-0.298***	-0.146	0.191
	(0.068)	(-3.167)	(-0.731)	(1.405)
Country fixed effects	yes	yes	yes	yes
Headquarter intensity controls	yes	yes	yes	yes
N	58967	58967	26416	26416
No. clusters	279	279	263	263
r2	.081	.088	.088	.090

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Contractibility Interacted with H-intensity Quintiles

Dependent Variable: China's foreign-affiliated plants' exports as a share of total exports.

	Import-and-assembly		Pure-assembly	
Headquarter intensity measure:	skill	equipment	skill	equipment
	(1)	(2)	(3)	(4)
Contractibility interacted with:				
Ii1	-0.147*	-0.001	0.214*	-0.018
	(-1.968)	(-0.013)	(1.899)	(-0.290)
Ii2	-0.043	0.138***	-0.024	-0.043
	(-0.704)	(2.862)	(-0.373)	(-0.828)
Ii3	0.077	-0.038	-0.070	0.139*
	(1.514)	(-0.760)	(-0.905)	(1.828)
Ii4	-0.087	-0.132**	0.094	-0.003
	(-0.921)	(-2.040)	(1.333)	(-0.052)
Ii5	-0.075	-0.230***	0.098	-0.071
	(-1.378)	(-2.843)	(1.015)	(-0.588)
Country fixed effects	yes	yes	yes	yes
Quintile fixed effects	yes	yes	yes	yes
Headquarter intensity controls	yes	yes	yes	yes
N	58967	58967	26416	26416
No. Clusters	279	279	263	263
R^2	.088	.095	.100	.110

An observation is a 6-digit HS product category. *p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01. All regressions include importing country fixed effects.

Summary of Results

1. **Headquarter Intensity** The export share of integrated plants is increasing in the intensity of headquarters inputs (skill, capital-equipment and R & D) under import-and-assembly. No significant results for pure-assembly.
2. **Productivity Dispersion** Larger productivity dispersion is associated with larger share of integrated plants' exports under pure-assembly, but not under import-and-assembly.
3. **Contractibility of Inputs** Some (not so strong) evidence that contractibility of inputs is negatively correlated with the share of integrated plants under import-and-assembly.

- These results are consistent with our model, which considers ownership of imported components as an alternative for alleviating the hold-up problem by the foreign assembly plant.