Export-Platform FDI: Cannibalization or Complementarity?

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Motivation

- Dominant branch of literature on MNEs treats their final-good production location choices as substitutes (Markusen, 1984, Brainard, 1997, Helpman et al, 2004, Tintelnot, 2017)

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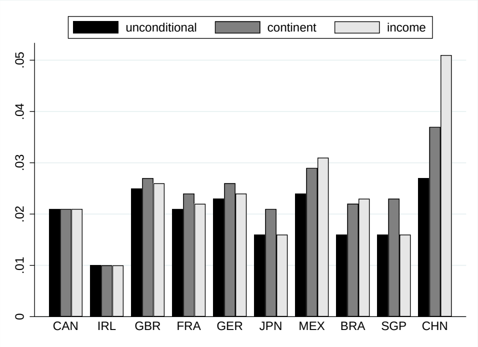
- In these settings, improvements in location-specific productivity generate cannibalization effects that reduce the profitability of operating affiliates in other countries
- Recent empirical work, however, suggests that MNEs' plant locations may not always be substitutes

Unconditional and conditional probability of **affiliate entry**

Figure 3: Unconditional and conditional probability of affiliate entry.



Note: Probabilities of affiliates' entry into the top-ten most popular destinations of US MNEs. Conditional probabilities refer to the probability of observing an MNE opening an affiliate in a country given that the parent already has an affiliate in another country in the same continent or in a country with similar income per capita. Similarity in terms of income per capita follows the group classification from the World Bank. The sample is restricted to parents with at least two affiliates worldwide.

Source: Garetto et al. (2023)

- Probability of affiliate entry **unaffected** by FDI in other countries in the same *region*

Probability that US manufacturing firms **export** by country in 2007

		Probability of Exporting		
		All	Firms with Regional	
Country	Region	Firms	Assembly	Importing
Canada	Northern America	0.19		
China	Eastern Asia	0.04		
Germany	Western Europe	0.05		
Great Britain	Northern Europe	0.06		
Taiwan	Eastern Asia	0.03		
Italy	Southern Europe	0.03		
Mexico	Latin America and Caribbean	0.06		
Japan	Eastern Asia	0.04		
Hong Kong	Eastern Asia	0.03		
Australia	Oceania	0.04		

Source: Antràs et al. (2023)

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Country	Region	Firms	Assembly	Importing
Canada	Northern America	0.19		
China	Eastern Asia	0.04	0.86	
Germany	Western Europe	0.05	0.73	
Great Britain	Northern Europe	0.06	0.79	
Taiwan	Eastern Asia	0.03	0.81	
Italy	Southern Europe	0.03	0.70	
Mexico	Latin America and Caribbean	0.06	D	
Japan	Eastern Asia	0.04	0.84	
Hong Kong	Eastern Asia	0.03	0.83	
Australia	Oceania	0.04	D	

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Germany	Western Europe	0.05	0.73	0.21
Great Britain	Northern Europe	0.06	0.79	0.25
Taiwan	Eastern Asia	0.03	0.81	0.11
Italy	Southern Europe	0.03	0.70	0.23
Mexico	Latin America and Caribbean	0.06	D	0.28
Japan	Eastern Asia	0.04	0.84	0.14
Hong Kong	Eastern Asia	0.03	0.83	0.15
Australia	Oceania	0.04	D	0.37

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Probability that US manufacturing firms **import** by country in 2007

		Probability of Importing
		All
Country	Region	Firms
Canada	Northern America	0.15
China	Eastern Asia	0.08
Germany	Western Europe	0.05
Great Britain	Northern Europe	0.04
Taiwan	Eastern Asia	0.04
Italy	Southern Europe	0.03
Mexico	Latin America and Caribbean	0.03
Japan	Eastern Asia	0.03
Hong Kong	Eastern Asia	0.02
Australia	Oceania	0.01

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Country	Region	Firms	Assembly
Canada	Northern America	0.15	
China	Eastern Asia	0.08	0.88
Germany	Western Europe	0.05	0.75
Great Britain	Northern Europe	0.04	0.72
Taiwan	Eastern Asia	0.04	0.77
Italy	Southern Europe	0.03	0.80
Mexico	Latin America and Caribbean	0.03	0.79
Japan	Eastern Asia	0.03	0.80
Hong Kong	Eastern Asia	0.02	0.56
Australia	Oceania	0.01	D

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Germany	Western Europe	0.05	0.75	0.15
Great Britain	Northern Europe	0.04	0.72	0.13
Taiwan	Eastern Asia	0.04	0.77	0.17
Italy	Southern Europe	0.03	0.80	0.14
Mexico	Latin America and Caribbean	0.03	0.79	0.06
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- Set of parameter values for which assembly decisions are complements expands with:
  - destination-specific fixed costs of exporting that are incurred at the firm level
  - input sourcing entailing country-specific fixed costs of sourcing incurred at the firm level

Baseline Model

Baseline Model: Preferences

- Individuals in J countries consume differentiated manufactured goods produced by heterogeneous firms
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- Preferences are

$$U_{Mi} = \left(\int_{\varphi \in \Omega_i} \boldsymbol{q}_i \left(\varphi\right)^{\frac{\sigma-1}{\sigma}} \mathrm{d}\varphi \right)^{\frac{\sigma}{\sigma-1}}$$

where Ω_i is the endogenous measure of firms selling differentiated goods in country i, and

$$\boldsymbol{q}_i \left(\varphi\right) = \left(\sum_{k \in \mathcal{K}(\varphi)} q_i \left(\varphi, k\right)^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

is a firm-specific composite

Baseline Model: Cannibalization versus Complementarity

- Consumer spending in country i on variety k (with price $p_i(\varphi, k)$)

$$S_{ki}(\varphi) = \left(\frac{p_i(\varphi, k)}{\boldsymbol{p}_i(\varphi)}\right)^{1-\varepsilon} \times \left(\frac{\boldsymbol{p}_i(\varphi)}{P_i}\right)^{1-\sigma} E_i$$

- $\boldsymbol{p}_i(\varphi)$ is price index for varieties sold by firm φ; P_i is economy-wide price index

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- Key feature: whether $S_{ki}(\varphi)$ increases or decreases with $\boldsymbol{p}_i(\varphi)$ depends on $\varepsilon \lesseqgtr \sigma$
- **Demand Cannibalization** when varieties are more substitutable within firms than across firms ($\varepsilon > \sigma$):

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- **Demand Complementarity** when varieties are more substitutable across firms than within firms ($\varepsilon < \sigma$)
  - Intuition: lower price of variety k' reduces $\boldsymbol{p}_i(\varphi)$ and shifts spending towards other φ varieties

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- In equilibrium, firms open a limited number of assembly plants (possibly a single one)
- **Global Assembly Strategy**: Optimal set $\mathcal{K}(\varphi) \subseteq J$ of countries $k \in J$ for which firm φ has paid the associated fixed costs of assembly

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- As in Antràs et al. (2023), we assume that total manufacturing spending E_i and wages w_i in all countries are independent of the equilibrium in the manufacturing sector

Interdependencies in the Intensive Margin

- Model delivers simple expression for sales of an assembly plant in k to each market i

$$S_{ki}(\varphi) = \kappa \varphi^{\sigma-1} \xi_k^a \left(\tau_{ki}^a\right)^{1-\varepsilon} \times \left(\Psi_i(\varphi)\right)^{\frac{\sigma-\varepsilon}{\varepsilon-1}} P_i^{\sigma-1} E_i$$

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with $\mathcal{I}_{k'}^a$ taking a value of 1 when $k' \in \mathcal{K}(\varphi)$, and a value of zero otherwise

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- Intensive-margin responses (holding $P_i^{\sigma-1} E_i$ and assembly strategy $\mathcal{K}$ constant):
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  1. An increase in assembly potential ξ_k^a increases sales $S_{ki}(\varphi)$ of plants based in k to all i
  2. An increase in ξ_k^a decreases $S_{k'i}(\varphi)$ for $k' \neq k$ when $\varepsilon > \sigma$, but increases $S_{k'i}(\varphi)$ when $\varepsilon < \sigma$

Interdependencies in the Extensive Margin

- Firm's global assembly strategy $\mathcal{K}(\varphi) \subseteq J$ seeks to maximize

$$\pi(\varphi) = \kappa_\pi \varphi^{\sigma-1} \sum_{i \in J} \left(\Psi_i(\varphi)\right)^{\frac{\sigma-1}{\varepsilon-1}} P_i^{\sigma-1} E_i - \sum_{k \in J} \mathcal{I}_k^a \cdot w_k f_k^a$$

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Proposition 1

Holding constant the market demand level $E_i P_i^{\sigma-1}$, an increase in the assembly potential of a given plant k from ξ_k^a to $\hat{\xi}_k^a > \xi_k^a$ leads to $\hat{\mathcal{I}}^a \geq \mathcal{I}^a$ whenever $\varepsilon \leq \sigma$, but it would not lead to $\hat{\mathcal{I}}_{-k}^a > \mathcal{I}_{-k}^a$ whenever $\varepsilon > \sigma$ and $\mathcal{I}^a$ is a unique solution.

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- Whenever $\varepsilon > \sigma$, this baseline model **cannot** possibly feature complementarities in the extensive margin of global assembly

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- A generalized version of preferences in Tintelnot (2017):

$$U_{Mi} = \left(\int_{\varphi \in \Omega_i} \left(\int_0^1 q_i\left(\varphi, \omega\right)^{(\sigma_\omega - 1)/\sigma_\omega} \mathrm{d}\omega \right)^{\frac{\sigma_\omega}{\sigma_\omega - 1} \frac{(\sigma - 1)}{\sigma}} \mathrm{d}\varphi \right)^{\sigma/(\sigma - 1)}, \quad \sigma_\omega, \sigma > 1.$$

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  - Within-firm substitutability governed by productivity dispersion, not demand substitutability
- Need to impose $\theta > \max(\sigma_\omega - 1, 1)$ for integrability, but value of σ_ω irrelevant otherwise

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- Note that θ governs the elasticity of substitution of factor (labor) demand across an MNE's plant locations
- In our baseline Armington model, this labor substitution elasticity is governed by $\varepsilon - 1$

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Export-Platform FDI Model with Firm-Level Export Costs

- We now assume that firms need to incur fixed marketing costs of f_i^x units of labor in country i to sell its varieties in country i
- We assume that these marketing costs are incurred at the firm- rather than the plant-level
  - this country-specific fixed cost allows firm to sell in country i **from all its assembly plants**
- **Global Marketing Strategy**: optimal set $\Upsilon(\varphi) \subseteq J$ of countries $i \in J$ for which a firm with productivity φ has paid the associated fixed cost of marketing
- Firm-level fixed export costs have no bearing on intensive margin of sales, conditional on extensive margin decisions $\mathcal{K}(\varphi)$ and $\Upsilon(\varphi)$
  - whether an increase in ξ_k^a of country k increases or decreases sales of plants based in $k' \neq k$ continues to depend only on the relative size of σ and ε

Export-Platform FDI Model with Firm-Level Export Costs: Main Result

- Profits net of entry costs are given by:

$$\pi\left(\varphi\right)=\kappa_{\pi}\varphi^{\sigma-1}\sum_{i\in J}\mathcal{I}_{i}^{x}\left(\Psi_{i}\left(\varphi\right)\right)^{\frac{\sigma-1}{\varepsilon-1}}P_{i}^{\sigma-1}E_{i}-\sum_{i\in J}\mathcal{I}_{i}^{x}\cdot w_{i}f_{i}^{x}-\sum_{k\in J}\mathcal{I}_{k}^{a}\cdot w_{k}f_{k}^{a}$$

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- Denoting by $\mathcal{I}^{x}$ and $\hat{\mathcal{I}}^{x}$ the optimal exporting decisions under ξ_{k}^{a} and $\hat{\xi}_{k}^{a}$, we have

Proposition 2

With firm-level fixed costs of exporting, holding constant the market demand level $E_{i}P_{i}^{\sigma-1}$, an increase in the assembly potential of a given plant k from ξ_{k}^{a} to $\hat{\xi}_{k}^{a}>\xi_{k}^{a}$ leads to $\hat{\mathcal{I}}^{a}\geq\mathcal{I}^{a}$ and $\hat{\mathcal{I}}^{x}\geq\mathcal{I}^{x}$ whenever $\varepsilon\leq\sigma$, and it may lead to $\hat{\mathcal{I}}_{-k}^{a}>\mathcal{I}_{-k}^{a}$ and $\hat{\mathcal{I}}^{x}>\mathcal{I}^{x}$ even when $\varepsilon>\sigma$.

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- Model generates complementarities across assembly locations for a wider range of parameter values than our baseline model without fixed costs of exporting

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- The fact that the fixed costs of exporting are incurred at the firm level is crucial: with plant-level fixed costs we revert to Proposition 1

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- **Global Sourcing Strategy**: Optimal set $\mathcal{J}(\varphi) \subseteq J$ of countries for which firm φ has paid the fixed costs of sourcing

Export-Platform FDI Model with Firm-Level Sourcing Costs

- Sales of an assembly plant in k to each market i are given by

$$S_{ki}(\varphi) = \kappa\varphi^{\sigma-1} (\xi_k^a)^{1-\alpha} (\tau_{ki}^a)^{1-\varepsilon} \times (\Theta_k(\varphi))^{\frac{\alpha(\varepsilon-1)}{\rho-1}} (\Lambda_i(\varphi))^{\frac{\sigma-\varepsilon}{\varepsilon-1}} E_i P_i^{\sigma-1}$$

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- Term $\Theta_k(\varphi)$ is plant k's **sourcing capability**, and is given by

$$\Theta_k(\varphi) \equiv \sum_{j \in J} \mathcal{I}_j^s \cdot \left(\tau_{jk}^s w_j / Z_j^s\right)^{1-\rho},$$

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- Cross-assembly plant intensive-margin interdepedencies governed by $\Lambda_i(\varphi)$:

$$\Lambda_i(\varphi) \equiv \sum_{k'\in J} \mathcal{I}_{k'}^a \cdot \left(\xi_{k'}^a\right)^{1-\alpha} \times \left(\tau_{k'i}^a\right)^{1-\varepsilon}\left(\Theta_{k'}(\varphi)\right)^{\frac{\alpha(\varepsilon-1)}{\rho-1}}.$$

- Cannibalization vs. complementarity continues to be shaped by relative size of σ and ε

Export-Platform FDI Model with Firm-Level Sourcing Costs: Main Result

- The empirical complementarities in global sourcing documented in Antràs et al. (2017) lead us to impose:

  Assumption 1: $\alpha(\varepsilon - 1) \geq \rho - 1$.

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- Intuition: An increase in ξ_k^a increases marginal benefit of investing in a larger sourcing capability $\Theta_k(\varphi)$ from which other assembly plants can benefit

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2. Alternative demand systems that generate lower demand elasticities (and thus larger markups) for large firms
3. Oligopolistic settings in which markups increase in a firm's market share