Contractual Frictions and Global Sourcing

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Introduction

- Insights from neoclassical trade theory and new trade theory have improved our understanding of the structure of foreign trade and investment.
- Recent developments in the world have called for new theoretical approaches:
  - growing role of multinational corporations in the global economy,
  - growing share of intermediate inputs in trade flows.
- There exists an important literature on trade in intermediate inputs and MNE formation but:
  - it largely ignores within-industry heterogeneity;
  - it does not satisfactorily address the control or internalization decision of firms.
- In Antràs and Helpman (2004) we developed a simple two-country Ricardian model of international trade in order to address some of these issues.
- We embraced the Coase-Williamson-Grossman-Hart view that incomplete contracting is a necessary feature to pin down (multinational) firm boundaries.
- Still, we did not explore the role of the size and type of contractual frictions in shaping global sourcing strategies.

Modelling Contractual Frictions

- Final-good producers and their suppliers undertake a continuum of relationship-specific activities aimed at producing intermediate inputs.
- A fraction of these activities is ex-ante contractible while the rest cannot be verified by a court of law and therefore are noncontractible.
  - Both parties are bound to perform their duties in the contractible activities,
  - but they are free to choose how much they invest in (and deliver of) the noncontractible activities.
- We allow the degree of contractibility to vary across inputs and countries.
- As in Antràs and Helpman (2004), we describe equilibria in which firms with different productivity levels choose different organizational modes.
  - We then study the effects of changes in the quality of contracting institutions on the relative prevalence of these organizational forms.
- A new interesting result is that the degree of contractibility of different inputs plays a central role in the integration decision.
  - These has interesting implications for choice between domestic and foreign offshoring,
  - but also for the choice between foreign outsourcing and vertical FDI.

The Model: Firm Behavior

- Consider a firm that produces a differentiated product with demand

$$q = Ap^{-1/(1-\alpha)}, \quad 0 < \alpha < 1.$$

- Output q is produced with two inputs, headquarter services X_h and an intermediate input X_m, according to

$$q = \theta \left(\frac{X_h}{\eta_h} \right)^{\eta_h} \left(\frac{X_m}{\eta_m} \right)^{\eta_m}, \quad 0 < \eta_h < 1, \quad \eta_m = 1 - \eta_h.$$

  - θ represents firm-specific productivity, η_h measures industry-specific headquarter intensity.

- Both inputs are brand-specific and useless to any producer.
- Each specialized input is produced with a set of input-specific activities $x_j(i)$

$$X_j = \exp \left[\int_0^1 \log x_j(i) \, di \right], \quad j = h, m.$$

- Agent H performs activities related to X_h (each at marginal cost c_h), but needs to contract with agent M to perform activities related to X_m (at marginal cost c_m).

The Model: Contracting

- Only activities related with input j in the range $\left[0, \mu_j\right]$, $0 \leq \mu_j \leq 1$, $j = h, m$, are contractible
  - in the sense that the characteristics of these activities can be fully specified in advance in an *enforceable* ex-ante contract.
- Initial contracts stipulates lump-sum transfer between agents, the organizational form, and the level of contractible activities.
- Organizational form does not affect the space of contracts available to agents.
- But it does affect ex-post bargaining over terms of trade
  - fraction $\beta_{hk} \in (0, 1)$ of revenue going to H is a function of ownership structure k.
- Organizational form may also affect fixed costs of production.
- Assume that H has full ex-ante bargaining power.
- For now we focus on the case in which H and F are located in the same country.

The Model: Timing of Events

1. H enters the industry and finds out her productivity level θ.

2. H chooses to leave the industry or stay and produce.

3. If she chooses to stay, H chooses an organizational form.

4. H commits to invest $\{x_{hc}(i)\}_{i=0}^{\mu_h}$ and offers potential suppliers a contract, which stipulates $\{x_{mc}(i)\}_{i=0}^{\mu_m}$ and an upfront payment of τ_m to M.

5. A large pool of potential M's is willing to accept H's contract if the payoff from supplying X_m is at least as large as w_m.

6. H and M choose $x_j(i) = x_{jc}(i)$ for $i \in \left[0, \mu_j\right]$, $j = h, m$, as specified in the ex-ante contract, and $x_{mj}(i)$, $i \in (\mu_m, 1]$, $j = h, m$, in the noncontractible activities.

7. Output is sold and the resulting revenue is distributed between F and M in proportions β_{hk} and $1 - \beta_{hk}$, respectively.

- We seek to characterize a symmetric subgame perfect equilibrium (SSPE) of this 7-stage game.

Equilibrium

- There will be symmetric investments x_{jn} in all noncontractible activities and x_{jc} in all contractible activities for $j = h, m$. And we can show $x_{jc} > x_{jn}$.
- Notice output is then

$$q = \theta \left(\frac{(x_{hc})^{\mu_h} (x_{hn})^{1-\mu_h}}{\eta_h} \right)^{\eta_h} \left(\frac{(x_{mc})^{\mu_m} (x_{mn})^{1-\mu_m}}{\eta_m} \right)^{\eta_m}.$$

- Intensity of noncontractible investments is $\omega_\ell = \eta_\ell (1 - \mu_\ell)$ for $\ell = h, m$.
- Solving the game, we find that H's profits are

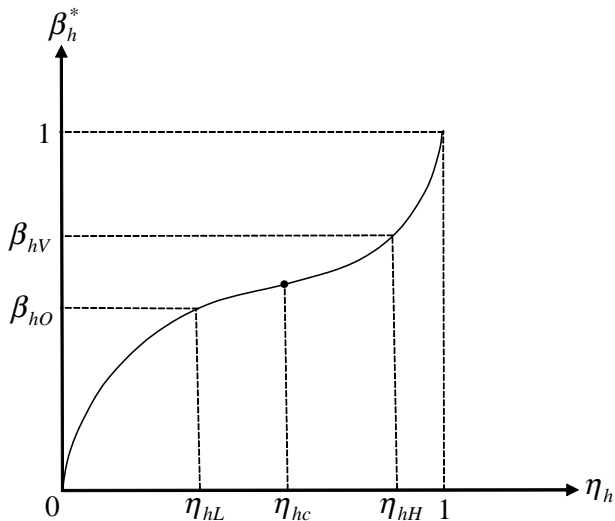$$\pi = Z \theta^{\alpha/(1-\alpha)} - w_m, \tag{1}$$

where

$$Z = (1 - \alpha) A \left[\alpha^\alpha c_h^{-\alpha \eta_h} c_m^{-\alpha \eta_m} \frac{\beta_m^{\alpha \omega_m} \beta_h^{\alpha \omega_h} \left(1 - \alpha \sum_{\ell=h,m} \beta_\ell \omega_\ell \right)^{1-\alpha\omega}}{(1 - \alpha\omega)^{1-\alpha\omega}} \right]^{\frac{1}{1-\alpha}} \tag{2}$$

and $\omega = \sum_{\ell=h,m} \omega_\ell$.

- Profits are increasing in the shares of contractible activities μ_j, $j = h, m$.

Effect of Bargaining Shares

- As in Antràs and Helpman (2004), there exists an optimal β_h :
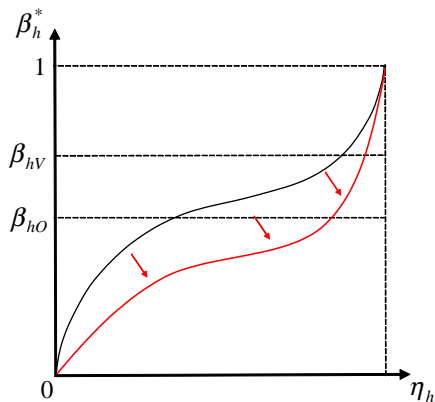
Effect of Headquarter Contractibility
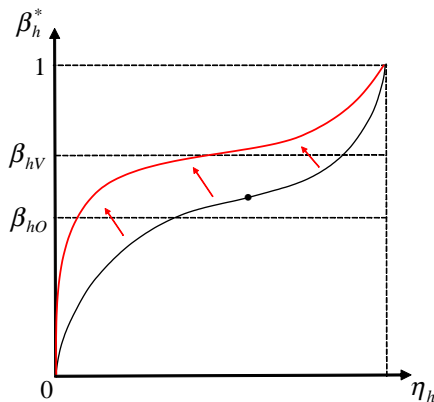

Figure: An increase in μ_h

Figure: An increase in μ_m

Choice of Ownership Structure

- The previous figures were illustrative, but revenue is not contractible, so H and M cannot choose optimal β_h^*. Instead the choice set for β is $\{\beta_V, \beta_O\}$ with $\beta_V > \beta_O$.

Proposition

Let fixed and variable costs be the same under integration and outsourcing. Then:
(i) There exists a unique headquarter-intensity cutoff $\eta_{hc} \in (0,1)$ such that profits are higher under outsourcing for $\eta_h < \eta_{hc}$ and higher under integration for $\eta_h > \eta_{hc}$.
(ii) The cutoff η_{hc} is higher the larger μ_h is and the smaller μ_m is.

Industry Equilibrium

- Now suppose that Θ is distributed Pareto with shape parameter κ.
- Assume also that there are fixed overhead costs and that $F_V > F_O$.
- In sectors with $\eta_h < \eta_{hc}$ integration will never be chosen:
    - firms with low productivity exit, and the rest outsource.

Proposition

Let variable costs be the same under integration and outsourcing and let fixed costs be higher under integration. Then in sectors with $\eta_h > \eta_{hc}$ in which $\Theta_O > \underline{\Theta}$ the share of outsourcing firms is increasing in μ_h and declining in μ_m.

- Key insight: contractual improvements per se do not bias the industrial structure toward outsourcing.
    - crucial is the differential impact of contractibility of two inputs.
- This result is independent of the ranking of fixed costs, though the sorting is obviously affected.
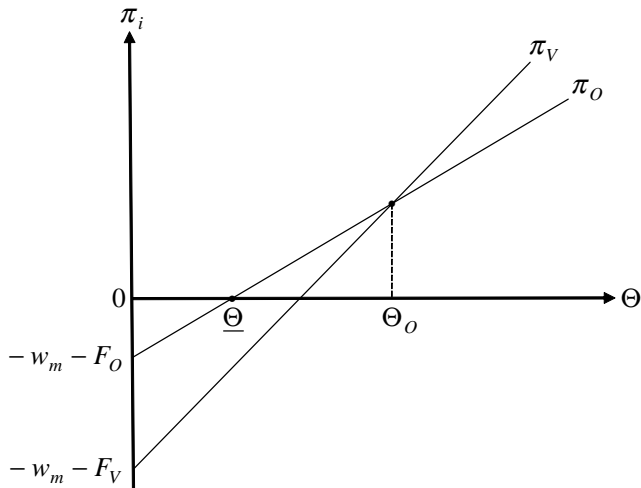
Industry Equilibrium

Figure: Profit function in a sector with $\eta_h > \eta_{hc}$

Foreign Sourcing

- H is located in North, which is a high-cost country, $c_j^N > c_j^S$ but has relatively better institutions $\mu_j^N > \mu_j^S$ (for $j = h, m$).
- H now chooses location of M, $\ell \in \{N, S\}$, and ownership $k \in \{V, O\}$.
- Even though X_h is always produced in North, we let μ_h be a function of the location of M, with $\mu_h^N > \mu_h^S$ (cf. Antràs, 2005).
- Assume that the revenue shares β_{hk}, $k = V, O$, are independent of ℓ.
- We now have two headquarter-intensity thresholds: η_{hc}^ℓ such that $Z_O^\ell = Z_V^\ell$.
- Provided that $\mu_h^N - \mu_h^S$ is sufficiently smaller than $\mu_m^N - \mu_m^S$, we have that $\eta_{hc}^S > \eta_{hc}^N$.
    - more sectors find outsourcing advantageous when they offshore than when they do not.
- Profits are then

$$\pi_i^\ell = Z_i^\ell \Theta - w_m^\ell - F_i^\ell, \quad i = O, V, \text{ and } \ell = N, S. \tag{3}$$

where we assume

$$F_V^S + w_m^S > F_O^S + w_m^S > F_V^N + w_m^N > F_O^N + w_m^N.$$
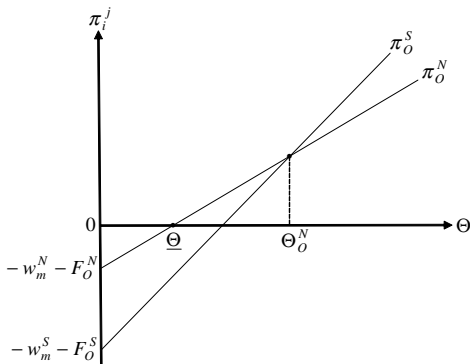
Low Headquarter Intensity Sector

Figure: Sorting when $\eta_h < \eta_{hc}^N$

- Result 1: Fraction of offshoring firms is larger, the larger is μ_j^S and the smaller is μ_j^N.

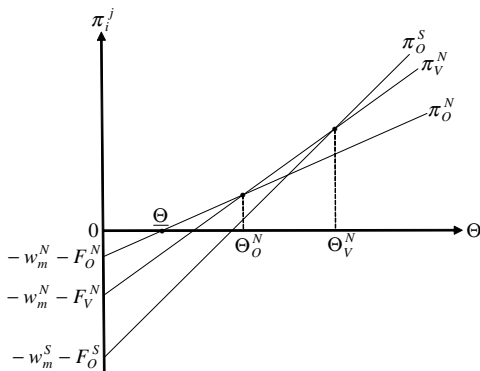# Medium Headquarter Intensity Sector

Figure: Sorting when $\eta_h \in \left(\eta_{hc}^N, \eta_{hc}^S\right)$

- Result 1 continues to apply. But now subtle effects on Northern composition:
  - increases in μ_j^S only reduce share of firms doing domestic integration
  - increases in μ_h^N (μ_m^N) may reduce share of domestic integrators (outsourcers).

High Headquarter Intensity Sector
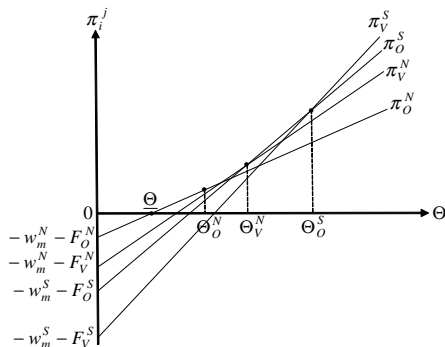

Figure: Sorting when $\eta_h > \eta_{hc}^S$

- Same results as above, but now subtle effects on Southern composition:
  - an increase in μ_h^N and μ_m^N or a reduction in μ_h^S reduces the share of outsourcers in total offshorers;
  - an increase in μ_m^S increases the prevalence of FDI but not necessarily relative to foreign outsourcing.

Conclusions

- Main Message: the relative prevalence of alternative organizational forms depends
  - not only on cross-country differences in contractibility,
  - but also on the degree to which contractual institutions are biased toward inputs controlled by final-good producers or by suppliers.
- This more general model provides rich predictions that may be tested in the data:
  - existing studies are generally supportive (Yeaple, 2006, Tomiura, 2006);
  - but role of contractibility has not been tested, or has it (ask Dan)?