A Simple Theory of Trade and Vertical Integration

Peter Arendorf Bache Anders Laugesen

Aarhus University

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Motivation

It is well known that trade liberalisation may spur a wave of M&As.

In its "Economic Evaluation of the Internal Market", the European Commission (1996) writes:

"Moreover, the restructuring appears to have taken place mostly through the capital market via mergers and acquisitions, with a more limited role for entry, exit and the internal growth or decline of existing firms."

Recent Evidence

 Breinlich (2008) shows that CUSFTA of 1989 led to a liberalisation of trade and a sizeable (70%) increase in domestic Canadian M&A activity.

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Existing Theory

 Horisontal M&As under Cournot competition: Long and Vousden (1995), Gaudet and Kanouni (2004), Bertrand and Zitouna (2006), Neary (2007), and Chalkey and Steward (2011).

... but M&As are often vertically related (Fan and Goyal, 2006)

- Breinlich (2008) observes that more than half of the M&As are between firms with primary activities in different two-digit SIC industries.
- At the end of this presentation, we will show how vertical M&As may appear in the wake of trade liberalisation.
- Our transmission mechanism based on vertical integration is new to the literature.
- Our results on M&As are consistent with the two most consistent features of M&A activity over the 20th century (Andrade et al., 2001): i) M&As appear in waves; ii) M&As strongly cluster by industry.
- Most of this presentation will however focus on complementarities between vertical integration, offshoring, and exporting.

Vertical Integration, Offshoring, and Exporting

- We build on Grossman and Hart's (1986) "Property Rights Theory" and in particular on Antràs and Helpman's (2004) "Global Sourcing" model with incomplete contracts and relationship specific investments.
- The modelling of exporting follows Melitz (2003).
- Our model is admittedly a simple extension of Antràs and Helpman (2004).
- We introduce: a continuum of industries; three countries; exporting; a clear-cut complementarity between integration, offshoring, and exporting; a discussion of M&As.

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Basic Setup

• A three-country heterogeneous-firms trade model with two symmetric northern countries (West and East) that interact through intra-industry trade in final goods.

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Basic Setup

- A three-country heterogeneous-firms trade model with two symmetric northern countries (West and East) that interact through intra-industry trade in final goods.
- The third country, South, is a low-wage production site that firms may use for offshoring.
- South does not demand or invent final goods but offers a perfectly elastic supply of labour at the wage $w_S < w_W = w_E$. Labour is the single factor of production.
- We use a homogeneous good, x_0 , to determine wages in all countries.

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Consumers

Cobb-Douglas preferences across industries and CES preferences across varieties within an industry. Demand for variety *i* in industry η:

$$q_{\eta}(i) = A_{\eta} p_{\eta}(i)^{-\sigma}, \qquad (1)$$

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where A_{η} is a demand shifter.

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Firm Entry and the Organisational Decision

- Prospective final-good firms in the North pay f_e units of local labour to draw a productivity, θ , from a known Pareto distribution, $G(\theta)$.
- After realising its θ, a final-good firm chooses its organisational form, klx, where k ∈ {O, V}, l ∈ {N, S}, and x ∈ {D, X}, in what we dub the organisational decision. The organisational decision comprises three subdecisions (in the language of yesterday: activities):

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- "k" and "l" respectively determines the ownership and the location of production of an intermediate manufacturing input, m.
- "x" determines determines final-good exporting.
- Overall, we hence have $2^3 = 8$ different organisational forms, klx.

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Production

In industry η , the production of final-good variety *i* is given by

$$q_{\eta}(i) = \theta(i)\zeta(\eta)h(i)^{\eta}m(i)^{1-\eta}, \qquad (2)$$

where $0 < \eta < 1$ and h and m denote relationship specific input investments.

- We dub final-good producers, *H*-firms, and intermediate manufacturing-good suppliers, *M*-firms.
- A unit continuum of industries differ by their headquarter intensity, η .
- We now focus on variety *i* in industry η .

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Costs of Production and Trade

- We assume that one unit of either input, h or m, is produced from one unit of local labour.
- Iceberg trade costs of final-good trade are $\tau > 1$.
- We include the intermediate-good iceberg trade costs, $\tau_l > 1$, in w_s such that $W_S = \tilde{W}_S \tau_I$.
- Only firms with sufficiently high productivities choose to be active as production implies fixed production costs, f_{klx} , where

$$f_{klx} = f_k + \mathbb{1}_S f_S + \mathbb{1}_X f_X$$
, and $f_O < f_V$; $f_S > 0$; $f_X > 0$. (3)

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The Organisational Decision

- The *H*-firms apply backwards induction in the following sequence of events:
- **1** Prospective *H*-firms make a productivity draw, θ , after paying f_e .
- 2 Choice of klx, signing of contract, and payment of f_{klx} .
- 3 Simultaneous production of the h and m inputs.
- 4 Nash bargaining over next subperiod's revenue.
- 5 Final-good production and revenue sharing.

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Profit Maximisation

• We show that the organisational decision boils down to a simple problem about profit maximisation. An H-firm simply chooses the organisational decision, kl_x , that maximises joint bilateral profits,

$$\pi_{klx}(\Theta,\eta) = A_{\eta}\Theta\psi_k(\eta)\gamma_l(\eta)(1+\tau^{1-\sigma})^{\mathbb{I}_X} - w_N f_{klx},\tag{4}$$

where $\Theta = \theta^{\sigma-1}$.

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Variable profits are increasing in: demand; productivity; offshoring because $\gamma_S(\eta) \ge \gamma_N(\eta)$; and exporting. What about integration? First define $\psi_k(\eta)$.

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- Lemma 1: $\exists \eta_1 \in (0, 1)$: $\psi_O(\eta_1) = \psi_V(\eta_1)$. Furthermore, $\eta > \eta_1$ $\Leftrightarrow \psi_V(\eta) > \psi_O(\eta)$ and $\eta < \eta_1 \Leftrightarrow \psi_V(\eta) < \psi_O(\eta)$.

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- Our assumption, $f_O < f_V$, thus implies that integration only occurs in the industries $\eta > \eta_1$ where furthermore, the most productive firms integrate.

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- Our assumption, $f_O < f_V$, thus implies that integration only occurs in the industries $\eta > \eta_1$ where furthermore, the most productive firms integrate.
- Lemma 2: If we define $\kappa(\eta) \equiv \frac{\gamma_S(\eta)}{\gamma_N(\eta)} = (\frac{w_N}{w_S})^{(1-\eta)(\sigma-1)} \ge 1$, then we have that $\kappa(\eta)$ is continuous and strictly decreasing in η for $\eta \in (0, 1)$. Further, $\kappa(1) = 1$.
- The most productive firms offshore (export) in all industries $\eta < 1$ (all industries).

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Complementary Activities

- All three subdecisions of the organisational decision are intimately related through a simple complementarity. Hence, all three subdecisions ought to be taken simultaneously. Why a complementarity?
- Variable profits:

$$A_{\eta}\Theta\psi_k(\eta)\gamma_l(\eta)(1+\tau^{1-\sigma})^{\mathbb{1}_X}.$$

- In the industries η > η₁, all three activities each increase variable profits at the cost of higher fixed costs.
- The absolute increases in variable profits from undertaking either integration, offshoring, or exporting are higher the more other activities (integration, offshoring, and exporting) are undertaken.
- Total fixed costs are linear in the activities.

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- The absolute increases in variable profits from undertaking either integration, offshoring, or exporting are higher the more other activities (integration, offshoring, and exporting) are undertaken.
- Total fixed costs are linear in the activities.
- What about the industries η < η₁? Only the activities offshoring and exporting are complementary here.
- By this observation and Lemma 1 and 2, it is clear that the complementarities between integration, offshoring, and exporting will vary across the continuum of industries.

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A Convenient Pattern of Firm Sorting

- Note that
 - i) Offshoring and exporting are always complementary with productivity.
 - ii) Integration and productivity are complementary in the industries $\eta > \eta_1$.
- By the insights of Mrazova and Neary (2011): if an industry equilibrium exhibits both firms that undertake an activity (integration, offshoring, or exporting) and firms that do not undertake that particular activity, then the former firms are more productive.
- Importantly, this convenient sorting pattern implies that even though $2^3 = 8$ possible organisational decisions are conceivable, at most four organisational decisions will be observed in industry equilibrium.
- This is reassuring since firms are only heterogeneous in one dimension.
- A larger number of organisational decisions might be observed across all industries as the sorting of firms into activities will vary across industries.

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The Sorting Pattern of Firms

- By the prevalence of an organisational decision we mean the share of active firms in a given industry which use that organisational decision.
- All graphs show a scaled productivity level, $\tilde{\Theta}$, as a function of headquarter intensity, η .
- We assume that the prevalence of exporting and offshoring are both less than one. Further, lets assume that exporting is relatively cheap compared to offshoring.



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Liberalisation of Final-Good Trade

- A liberalisation of final-good trade (or northern FTA) will not only imply an increased prevalence of exporting but will also:
 - Weakly increase the prevalence of integration across industries (strict increases when the marginal integrator exports ex post). M&As?
 - Strictly increase the prevalence of offshoring across industries as the marginal offshorer always exports in the figure above.
 - Strictly increase the prevalence of vertical FDI when $\eta > \eta_1$. Cross-border M&As?

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Liberalisation of Intermediate-Input Trade

- A symmetric North-South trade liberalisation (a fall in *w_S*) will not only imply that the prevalence of offshoring strictly increases across all industries but also:
 - Weakly increase the prevalence of integration across industries (strict increases when the marginal integrator offshores ex post).
 - Weakly increase the prevalence of exporting across industries.
 - Strictly increase the prevalence of vertical FDI when $\eta > \eta_1$. Cross-border M&As?

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Trade and Vertical Integration

- We know from our paper entitled "Complementary Activities, Heterogeneous Firms, and Industry Structure":
 - Improving an activity (integration, offshoring, or exporting) weakly increases the prevalence of all activities, in all industries, given that the activity improved is not undertaken by all firms upon its improvement.
- Hence, the prevalence of integration (weakly) increases, in all industries, after one kind of trade liberalisation.
- Interestingly enough, our results hold even in industries where trade liberalisation is found to spur a wave of outsourcing at the firm level - as we will show below.
- Most other studies find a positive relationship between globalisation and outsourcing (e.g. McLaren, 2000; Alfaro et al. 2011). Ambiguities are however found in Aghion et al. (2006) and Ornelas and Turner (2008).

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Mergers and Acquisitions

Let us shot down the opportunity for offshoring.



Figure : Sorting of firms in different industries

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Lemma

The productivity cutoffs, Θ^{VX}_{OX}(η) and Θ^{VX}_{OD}(η), are both strictly decreasing when trade is liberalised. On the other hand, the productivity cutoff, Θ^{VD}_{OD}(η), is strictly increasing when trade is liberalised.

Implications for the industries $\eta \in (\eta_1, \eta_3)$

- Firms with productivities between the old and the new cutoff for integration choose to outsource ex ante and integrate ex post.
- If we go beyond the one-shot nature of the model, we would see that some firms actually change ownership structure from outsourcing to integration.
- This step necessitates firm-level adjustment through vertical M&A activity.

Implications for the industries $\eta \in (\eta_3, \eta_4)$

- Some firms, which ex ante would have chosen integration, now choose outsourcing.
- Going beyond the one-shot nature of the model would imply divestitures by these firms. A wave of outsourcing. This is intuitive as the marginal integrating firm does not export.

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Conclusion

- A first step towards combining models of the Antràs and Helpman (2004) family with the influential literature on firm decisions to serve foreign markets.
- Trade liberalisation weakly increases the prevalence of vertical integration even in industries where a wave of outsourcing is observed.
- Post trade liberalisation vertical M&As.
- New guidance for empirical testing of Antràs and Helpman (2004).
- Thank you for your attention.
- alaugesen@econ.au.dk

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