Cross-Border Mergers and Vertical Integration***

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October 2010

*** PRELIMINARY DRAFT: Please do not quote without the permission of the authors.

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Cross-Border Mergers and Vertical Integration

We present a theoretical model to capture the role of the vertical structure, of an oligopolistic industry, in the incentives for and implications of cross-border horizontal mergers. Absent any merger incentives in an autarkic equilibrium, we demonstrate that vertical integration can raise the incentives for diversification in production and add to the gains from cross-border horizontal mergers. Any additional gain from cross-border horizontal mergers, due to the existence of a vertically integrated production structure, is shown to be sensitive to the relative market concentration across countries. We have also demonstrated how market concentration interacts with costs in the decision of a relatively efficient foreign firm located in one country (source) to merge with a disintegrated or an integrated firm in another country (target) when the industry is vertically related. A wave of cross-border mergers will be triggered by a relatively cost-efficient source taking over a disintegrated target when pre-merger competition among the disintegrated firms is relatively intense but, otherwise, the initial target will be a vertically integrated firm. The impact of a merger, on the extensive margins of trade, will be magnified when the merger takes place between two disintegrated firms across borders compared to a merger between a disintegrated firm in one country and a vertically integrated firm in another.

JEL Classification Code: F10, F12, L13

Keywords: Multinational Corporations, Merger, Cross-border merger, Vertical integration, Oligopoly, GOLE, Comparative Advantage.

“Cross-border mergers are an increasingly important phenomenon in the world economy. … Yet the theoretical literature on cross-border mergers is tiny …” J. Peter Neary (2007)

1. Introduction

Over the last couple of decades, cross-border mergers have continued to intensify significantly as capital reallocation between firms has increasingly been facilitated through interactions between financial liberalization policies and regional agreements. This millennium’s wave of cross-border mergers was preceded by five successive waves in close proximity — one appearing at the dawn of the 20th century which was followed by four dominant waves at the ends of the 1920s, 1960s, 1980s and 1990s.1 During the widely celebrated merger boom witnessed during this millennium, the value of worldwide mergers reached an all-time record nearly half of which was due to cross-border mergers². The steady growth³ of cross-border mergers pulled up the value of cross-border mergers to a record $1,637 billion in 2007 spanning a total number of
10,145 such transactions.⁴ There is a growing consensus⁵ that, notwithstanding the low tides due to the global crises, “a new wave” of cross-border mergers will be triggered by the imminent exit of public funds from ailing industries in the immediate aftermath of the crises. With this backdrop, it is not at all surprising that mergers across borders continue to draw increasing attention⁶ since they not only yield cost-reducing efficiencies but, at the same time, present new opportunities for firms to intensify market power with international reach.

![Figure 1: Cross Border Mergers (1988 – 2007)](image)

While nearly three quarters of all cross-border mergers have been classified as horizontal, it is no less important to assess the role played by the vertical structure of these industries in which cross-border mergers have been initiated. In particular, the significance of the vertical dimension of horizontally merging firms is evident from the initiatives taken by suppliers (of large retail chains) seeking to control the costs of purchasing and carrying inventories by cutting down on the number of vendors.⁷ A cross-border horizontal merger involves firms producing substitutes in two distinct⁸ countries with the consequence that such a merger will remove direct competitive pressures absent
other constraining factors or offsetting efficiencies\textsuperscript{9}. When cross-border horizontal mergers take place in industries that are vertically related, they present a greater challenge for competition authorities since the vertical structure itself affects the intensity of competition. In this paper, we analyze cross-border horizontal mergers in a vertically related oligopolistic industry capturing the incentives for and implications of the waves of cross-border mergers apparent in international data.

The rest of the paper is organized as follows. The next section places our model in context. Section 3 provides a brief review of the literature on cross-border mergers. Section 4 sets up a partial equilibrium exposition of our model and propositions the implications of which, under conditions general equilibrium, are presented in Section 5. In the final section, we draw our conclusions.

2. **Context**

In a vertically related industry, firms are located at different stages of production or distribution, with some firms supplying inputs used by others. Mergers in such industries have been drawing increasing attention of regulators, anti-trust authorities as well as those in the media and academics. Conventional concerns with the vertical structure of an industry focused on the potential for a monopolist upstream to leverage its market power downstream through integration. Antitrust decisions hostile towards vertical mergers in the US during the 1950s and 1960s were based on the idea that vertical integration can harm competition by removing resources from the input market, thereby leveraging monopoly power from one market to another. This line of argument has usually faced sharp criticism primarily due to a conspicuous lack of a rigorous foundation.\textsuperscript{10} By the late 1970’s and early 1980’s, the legal hostility towards vertical mergers had withered partly
due to the wisdom trickling from the Chicago school that concerns regarding monopoly leverage were likely misplaced. Instead, a vertical merger came to be viewed as efficiency enhancing and beneficial for consumers because it internalized a vertical pricing externality: there was only a single monopoly profit and that could be extracted by appropriate pricing upstream. It is well-known, by now, that the models following the trails of the Chicago School were based on restrictive assumptions and that if these assumptions do not hold then a vertical merger could be motivated by its potential to enhance or exercise market power. Interests in vertical merger activities have been renewed by re-assessments, of the competitive impact of such a merger, made by post-Chicago theories cast in a framework that does not assume monopoly upstream and either perfect competition or monopoly downstream.

We draw on the key elements from this rich body of knowledge\textsuperscript{11} with the understanding that while it is widely recognized that merger activities in vertically related industries are relatively complex, cross-border mergers of firms in such industries pose even more challenges for competition policy: they affect several countries and are, hence, subject to review by different national authorities who may come to conflicting conclusions, especially if some countries bear more of the costs, while others receive more of the benefits of the merger. A prominent recent example was the attempted $42 billion merger between General Electric (GE) and Honeywell that was approved by the US authorities but not by the European Commission.\textsuperscript{12} While the horizontal overlap in large regional and medium corporate jet engine markets and power systems was apparent in the debates surrounding this proposed merger, the relevance of the vertical structure of the market did not go unnoticed: Honeywell is a leading supplier of an intermediate input
(namely, engine starters) for GE as well as its major competitors in the market for large jet engines. Some other prominent examples of horizontal mergers approved across borders, where the vertical structure of an industry led to concerns, include i) the 2001 merger between the US-based eBay Inc., the world’s largest online trading community with local sites in 60 markets worldwide, and Internet Auction Co. Ltd., Korea’s largest auction-style web site ii) the 2002 merger between Telia, the Swedish fixed operator also active in cable and mobile services, and Sonera, a Finnish provider of local, national and international long distance services as well as mobile and cable services; iii) the 2005 merger between Telfonica (Spanish) and Cesky Telecom (Czech) where both fixed operators were also active in a range of other services including mobile services; iv) the 2007 merger between Swisscom fixed operator and Fastweb (Italian) broadband and cable television company and v) the 2007 merger between Vodafone (British) and Tele2 Italy and Tele2 Spain providing fixed and broadband services.

3. Landmarks


Long andVousden (1995) analyzed the effects of tariff reductions on horizontal mergers in a Cournot oligopoly. They showed that unilateral tariff reductions encourage cross-border mergers which concentrate market power at the expense of mergers which
reduce cost, while bilateral tariff reductions have the opposite effect, encouraging mergers which significantly reduce cost. Head and Ries (1997) investigated the welfare consequences of horizontal mergers between firms based in different nations. They demonstrated that when mergers do not generate cost savings, it will be in the national interest for existing competition agencies to block most world welfare-reducing combinations. When mergers generate cost savings, national welfare-maximizing regulators cannot be relied upon to prevent mergers that lower world welfare. Falvey (1998) showed how the rules for approving an international merger should be adapted to account for the fact that the regulator is only concerned with domestic welfare i.e. ignores the effect of the merger on foreign firms and consumers. Horn and Levinsohn (2001) looked at the interactions between trade policy and merger policy. In particular, they investigated how an optimum merger policy is affected by restrictions on the use of tariffs and export subsidies. Horn and Persson (2001) presented international mergers as the outcome of a cooperative game. They highlighted how the international pattern of ownership of productive assets may depend on features of trade and production costs and show how private and social incentives for mergers may differ for weak merger synergies but converge when synergies are stronger. Marin and Verdier (2002) used a principal-agent framework to show that a rise in the intensity of competition can induce a merger wave. They predicted that merger waves would occur when countries become more integrated in the global economy as the corporate sector reorganizes in response to an increase in international competition. Jovanovic and Rousseau (2003) constructed an endogenous growth model in which mergers are driven by the diffusion of new technologies. They argued that exits should lead mergers as mergers spread new
technology in a way that is similar to that of entry and exit of firms. Reuer et al. (2004) have analyzed the role of sector-specific contractual heterogeneity of cross-border mergers in mitigating the problem of adverse selection. They pointed out that, in the case of international mergers, a key contractual variable is whether the parties agree to a performance-contingent payout structure which can mitigate the risk of adverse selection. Barba-Navaretti et al. (2004) showed how two firms in monopolistic competition have an incentive to merge across borders. Bertrand and Zitouna (2006) examined policy designs for international mergers. They showed that the effect of trade liberalization on merger incentives depends on the technological gap: for low and high (medium) gap, there is an inverted U- (W-) shaped relation between trade costs and incentives to merge. Nocke and Yeaple (2007) have modeled cross-border mergers as international purchases and sales of country-specific firm capabilities. They demonstrated that the degree to which firms differ in their mobile and non-mobile capabilities plays a crucial role for the international organization of production: depending on whether firms differ in their mobile or immobile capabilities, cross-border mergers may involve the most or the least efficient active firms. Neary (2007) constructed the first analytically tractable general equilibrium model of cross-border mergers where he showed how trade liberalization can trigger international merger waves through bilateral mergers in which it is profitable for low-cost firms to buy out higher-cost foreign rivals. As such, international differences in access to technology can generate incentives for bilateral mergers in which low-cost firms located in one country acquire high-cost firms located in another. In consequence, cross-border mergers facilitate specialization in the direction of a nation’s comparative advantage. Fumagalli and Vasconcelos (2009) have demonstrated how cross-border mergers occur in
waves when trade policy influences firms' choice between intra-national and cross-border mergers in a sequential game of international Cournot oligopoly.

4. Partial Equilibrium

Consider a vertically related industry\textsuperscript{15} with 2 upstream firms \((M_i : i = 1,2)\) supplying a homogeneous intermediate input to \(n\) downstream firms \((R_j : j = 1,2, ..., n)\) located at home and 2 upstream firms \((M'_i : i = 1,2)\) supplying the same intermediate input to \(n^*\) downstream firms \((R'_j : j = 1,2, ..., n^*)\) located in a foreign country.

We assume perfect Bertrand competition between the upstream firms. This implies that the lowest of the upstream prices, within each country, constitutes the price that each non-integrated downstream firm pays and that the upstream firms must meet demand at the announced price but the cost of acquiring the intermediate input may differ when there is vertical integration. We assume away any fixed cost which, otherwise, would provide a trivial rationale for mergers.\textsuperscript{16} The unit cost of producing the homogeneous intermediate input is identical (which, for simplicity, is normalized to zero) irrespective of location. Each downstream firm, engaged in Cournot competition with its rivals within and across borders, pays a linear cost to acquire the intermediate input from an upstream firm in the same location. The downstream firm then transforms the intermediate input, on a one-to-one basis (at a unit cost of \(c\) at home and \(c^*\) in the foreign country), into a homogeneous final good the world demand \((x)\) for which is linear\textsuperscript{17} in its price \((p)\):

\[ p = a' - b'x \]

4.1 Pre-Merger Equilibrium

4.1.1 Disintegration
Absent any possibility of vertical integration, competition (‘a la Bertrand) implies that the Nash equilibrium price charged by each upstream firm will be equal to its (zero) marginal cost. Each domestic downstream firm will

\[
\text{Maximize: } \Pi_i = \left( a' - b' \left[ \sum_{i=1}^{n} y_i + \sum_{i=1}^{n} y_i^* \right] - c \right) y_i
\]

Each foreign downstream firm will

\[
\text{Maximize: } \Pi_i^* = \left( a' - b' \left[ \sum_{i=1}^{n} y_i + \sum_{i=1}^{n} y_i^* \right] - c^* \right) y_i^*
\]

![Figure 2: Disintegrated Vertical Structure](image)

The best-response functions of the \((n + n^*)\) downstream firms can be written as

\[
y_j(n, n^*) = \frac{1}{2b'} \left( a' - b' \left[ \sum_{i=1}^{n} y_i + \sum_{i=1}^{n} y_i^* \right] - c \right) \quad \forall \quad j = 1, 2, ..., n
\]

\[
y_j^*(n, n^*) = \frac{1}{2b'} \left( a' - b' \left[ \sum_{i=1}^{n} y_i + \sum_{i=1}^{n} y_i^* \right] - c^* \right) \quad \forall \quad j = 1, 2, ..., n^*
\]

In equilibrium, each downstream firm produces
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(3) \[ y_i(n, n^*) \big|_{D} = \left( \frac{a^*(n + 1)c + n^*c^*}{b'(n + n^* + 1)} \right) \]
\[ \forall \ i = 1,2,...,n \]

(4) \[ y_i^*(n, n^*) \big|_{D} = \left( \frac{a^*-1(n + 1)c^* + nc}{b'(n + n^* + 1)} \right) \]
\[ \forall \ i = 1,2,...,n^* \]

It will be profitable for a domestic firm to produce iff its unit cost does not exceed a weighted average of the demand intercept and the unit cost of foreign firms, where the weight attached to the former is decreasing in the number of foreign firms:

(5) \[ c \leq \xi_0 a' + (1 - \xi_0) c^* \]
where \( \xi_0 = \left( \frac{1}{n^* + 1} \right) \in (0,1) \).

Analogously, it will be profitable for a foreign firm to produce iff its unit cost does not exceed to a weighted average of the demand intercept and the unit cost of domestic firms, where the weight attached to the former is decreasing in the number of foreign firms:

(6) \[ c^* \leq \xi_0^* a' + (1 - \xi_0^*) c \]
where \( \xi_0^* = \left( \frac{1}{n + 1} \right) \in (0,1) \).

The industry output and price are

(7) \[ \tilde{y}(n, n^*) \big|_{D} = \left( \frac{n(a^*-c) + n^*(a^*-c^*)}{b'(n + n^* + 1)} \right) \]

(8) \[ p(n, n^*) \big|_{D} = \left( \frac{a^*+nc + n^*c^*}{n + n^* + 1} \right) \]

In the pre-merger disintegrated equilibrium, the profit each downstream firm earns is

(9) \[ \Pi_i(n, n^*) \big|_{D} = b' \left( y_i(n, n^*) \big|_{D} \right)^2 \]
\[ \forall \ i = 1,2,...,n \]
4.1.2 Vertical Integration

Suppose now, at home, that one of the upstream firms (say, \(M_1\)) becomes integrated with one of the downstream firms (say, \(R_1\)). Consequently, to maximize the joint profit of the vertically integrated \(M_1 - R_1\), \(M_1\) will supply the intermediate input internally at (zero) marginal cost to its downstream segment \(R_1\) and will withdraw\(^{18}\) from competing in the input market in order to increase its profit by raising the cost of its downstream rivals at home as \(M_2\) will then charge a price \(\left(\frac{a'-(n^* + 1)c + n^* c^*}{2(n^* + 2)}\right)\) for supplying the intermediate input to any disintegrated downstream firm at home.

\[
\Pi_i^* (n, n^*)^{19} = b' \left( y_i^* (n, n^*)^{20} \right) \quad \forall \quad i = 1, 2, \ldots, n^*
\]

In the pre-merger equilibrium, the vertically integrated home firm \((M_1 - R_1)\) produces

\[
y_1(n, n^*) = y_1(n, n^*)^{21} + \frac{1}{2} \left( \frac{(n - l)(a'-(n^* + 1)c + n^* c^*)}{(2+n^*)(n+n^*+1)b'} \right)
\]

Each disintegrated downstream firm at home produces

\[
y_i(n, n^*) = \frac{1}{2} y_i(n, n^*)^{22} \quad \forall \quad i = 2, \ldots, n
\]

Each disintegrated foreign downstream firm produces

---

\(^{18}\)Withdraw from competing in the input market.

\(^{19}\)Joint profit function.

\(^{20}\)Marginal cost of intermediate input.

\(^{21}\)Joint profit in pre-merger equilibrium.

\(^{22}\)Joint profit in post-merger equilibrium.
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(13) \( y_i^*(n^*,n^*) \bigg|_D = y_i^*(n^*,n^*) \bigg|_D + \frac{1}{2} \left( \frac{(n-1)(a^-(n^*+1)c + n^*c^*)}{(2+n^*)(n^*+1)b} \right) \quad \forall \quad i = 1, 2, ..., n^* \)

It will be profitable for a domestic firm, notwithstanding its vertical structure, to produce iff

(14) \( c \leq \xi_0a^* + (1 - \xi_0)c^* \)

It will be profitable for a foreign firm to produce iff

(15) \( c^* \leq \xi_0^*a'^* + (1 - \xi_0^*)c^* \)

where \( \xi_0^* = \left( \frac{3 + 2n^* + n}{4n + 4 + mn^* + 3n^*} \right) \in (\xi_0, 1) \)

Figure 4: Production Pattern with and without Vertical Integration at Home
Vertical integration, at home, makes foreign downstream firms more competitive and the disintegrated domestic downstream firms less competitive in the international market. Figure 4 above presents a comparison between the production patterns with and without a vertically integrated firm at home. When the cost of every firm exceeds $a'$, in region $O$, then the good is not produced at all. In region $H$ only the home can compete and in region $F$ only the foreign firms can compete. Region $HF$ is a cone of diversification where both home and foreign firms can coexist. When an upstream home firm becomes integrated with a downstream home firm, region $H$ (where exclusively home firms can compete) shrinks and the cone of diversification $HF$ (where both home and foreign firms can co-exist) expands.

The industry output and price are

\[
\bar{y}(n,n^*)|_I = \bar{y}(n,n^*)|_D - \frac{1}{2}\left(\frac{(n-1)\left(a^*-(n^*+1)c + n^* c^*\right)}{(2+n^*)(n+n^*+1)b'}\right)
\]

\[
p(n,n^*)|_I = p(n,n^*)|_D + \frac{1}{2}\left(\frac{(n-1)\left(a^*-(n^*+1)c + n^* c^*\right)}{(2+n^*)(n+n^*+1)}\right)
\]

In the pre-merger equilibrium, with a vertically integrated firm at home, the profits of the downstream firms are

\[
\Pi_i(n,n^*)|_I = b^l\left(y_i(n,n^*)|_I\right)^2 = \left(1 + \frac{(n-1)}{2(2+n^*)}\right)^2 \Pi_i(n,n^*)|_D
\]

\[
\Pi_i(n,n^*)|_I = b^l\left(y_i(n,n^*)|_I\right)^2 = \frac{1}{4} \Pi_i(n,n^*)|_D \quad \forall \ i = 2,..,n
\]

\[
\Pi_i'(n,n^*)|_I = b^l\left(y_i'(n,n^*)|_I\right)^2 = \left(1 + \frac{(n-1)\left(a^*-(n^*+1)c + n^* c^*\right)}{2(2+n^*)(a^*-(n^*+1)c^* + nc)}\right)^2 \Pi_i'(n,n^*)|_D
\]

\[
\forall \ i = 1,2,..,n^*
\]
4.2 Mergers

Let us now consider the possibility of mergers. A merger, absent any tariff or transportation cost, effectively implies that one of the participating firms is closed down since there is no incentive for a firm to operate more than one plant19.

**Lemma 1.** Absent vertical integration, closing down \( (n - \tilde{n}) \) home firms increases the output of all remaining firms (home as well as foreign) by

\[
y_i(\tilde{n}, n^*)D - y_i(n, n^*)D = y_j(\tilde{n}, n^*)D - y_j(n, n^*)D = \left(\frac{n - \tilde{n}}{\tilde{n} + n + 1}\right)y_i(n, n^*)D
\]

\[\forall i = 1, 2, \ldots, \tilde{n}; j = 1, 2, \ldots n^*.
\]

**Proof:** Follows directly from (3) and (4).

**Lemma 2.** Absent vertical integration, closing down \( (n^* - \tilde{n}^*) \) foreign firms increases the output of all remaining firms (home as well as foreign) by

\[
y_i(n, \tilde{n}^*)D - y_i(n, n^*)D = y_j(n, \tilde{n}^*)D - y_j(n, n^*)D = \left(\frac{n^* - \tilde{n}^*}{\tilde{n}^* + n + 1}\right)y_j(n, n^*)D
\]

\[\forall i = 1, 2, \ldots, \tilde{n}; j = 1, 2, \ldots n^*.
\]

**Proof:** Follows directly from (3) and (4).

**Lemma 3.** When an upstream firm is integrated with a downstream firm (say, \( R_k \)) at home, closing down \( (n - \tilde{n}) \) disintegrated home firms increases the output of all remaining firms (home as well as foreign) by

\[
y_i(\tilde{n}, n^*)I - y_i(n, n^*)I = y_k(\tilde{n}, n^*)I - y_k(n, n^*)I = \left(\frac{n - \tilde{n}}{\tilde{n} + n + 1}\right)y_i(n, n^*)I
\]

\[\forall i, k = 1, 2, \ldots, \tilde{n}; i \neq k; j = 1, 2, \ldots n^*.
\]

**Proof:** Follows directly from (11), (12), and (13).
**Lemma 4.** When an upstream firm is integrated with a downstream firm (say, \(R_k\)) at home, closing down \((n^* - \tilde{n}^*)\) disintegrated foreign firms increases the output of

a) the disintegrated home firms by

\[
y_i(n, \tilde{n}^*)_f - y_i(n, n^*)_f = \frac{1}{2} \left( \frac{n^* - \tilde{n}^*}{n + \tilde{n}^* + 1} \right) \left( a + nc - (n+1)c^* \right) \frac{b(n + n^* + 1)}{b(n + n^* + 1)} \quad \forall i, k = 1, 2, \ldots, n; i \neq k
\]

and

b) the integrated home firm and the remaining disintegrated foreign firms by

\[
y_k(n, \tilde{n}^*)_f - y_k(n, n^*)_f = y_j(n, \tilde{n}^*)_f - y_j(n, n^*)_f = \left( \frac{n^* - \tilde{n}^*}{(n + \tilde{n}^* + 1)(2 + \tilde{n}^*)} \right) \left( \frac{\lambda_i a + \lambda_2 c - \lambda_3 c^*}{b(n + n^* + 1)(2 + n^*)} \right) \quad \forall j = 1, 2, \ldots \tilde{n}^*
\]

where

\[
\lambda_i = (n+1)^2 + n^* + (n + \tilde{n}^* + 3) + \tilde{n}^* + 3(n + n^* + 3) + 4
\]

\[
\lambda_2 = (n+1)^2 + (n+1)n^* + 3(n^* + \tilde{n}^* + 1)n + n + n^* + \tilde{n}^*
\]

\[
\lambda_3 = 2[(n+1)^2 + (n+1)(4 + n^* + \tilde{n}^*) + n^* + \tilde{n}^* + 2(nn^* + n^* + \tilde{n}^* + \tilde{n}^*)]
\]

**Proof:** Follows directly from (11), (12), and (13).

Absent vertical integration, the net gain from a takeover of a disintegrated home firm by another disintegrated home firm is

\[
G_{HH-D} = b' \left( y_i(n, n^*)_D \right)^2 \left[ \left( 1 + \frac{1}{n + n^*} \right)^2 - 2 \right] < 0 \quad \text{if} \quad (n + n^*) > 2 \quad (i = 1, 2, \ldots n)
\]

Analogously, absent vertical integration, the net gain from a takeover of a disintegrated foreign firm by another disintegrated foreign firm is

\[
G_{FF-D} = b' \left( y_i^*(n, n^*)_D \right)^2 \left[ \left( 1 + \frac{1}{n + n^*} \right)^2 - 2 \right] < 0 \quad \text{if} \quad (n + n^*) > 2 \quad (i = 1, 2, \ldots n)
\]

When an upstream firm is integrated with a downstream firm at home (say, \(R_k\)), the net gain from a takeover of a disintegrated home firm by another disintegrated home firm is
When an upstream firm is integrated with a downstream firm at home (say, $R_k$), the net gain from a takeover of a disintegrated home firm by the integrated home firm is

\begin{equation}
G_{HH-I}^{D-D} = b' \left( y_i(n,n^*) \right) \left[ \left( 1 + \frac{1}{n+n^*} \right)^2 - 2 \right] < 0 \quad \text{if} \quad (n+n^*) > 2 \quad (i = 1,\ldots,n; \quad i \neq k)
\end{equation}

When an upstream firm is integrated with a downstream firm at home (say, $R_k$), the net gain from a takeover of a disintegrated foreign firm by another disintegrated foreign firm is

\begin{equation}
G_{HH-I}^{I-D} = -b' \left( y_i(n,n^*) \right) \left[ \frac{(n+n^* - 2)^2 + (n^* - 1)(n+n^* - 1)^2 + 1}{2(n+n^*)(2+n^*)} \right] < 0 \quad (i = 1,\ldots,n)
\end{equation}

When an upstream firm is integrated with a downstream firm at home (say, $R_k$), the net gain from a takeover of a disintegrated foreign firm by another disintegrated foreign firm is

\begin{equation}
G_{HH-I}^{D'-D'} = b' A_i \left[ \left( 1 + \frac{1}{n+n^*} \right)^2 - 2 \right] < 0 \quad \text{if} \quad (n+n^*) > 2 \quad (i = 1,\ldots,n)
\end{equation}

where

\begin{equation}
A_i = \left( \frac{a'(n + 2n^* + 3) + c(3n + n^* + nn^* + 1) - c^* (4n + 3n^* + nn^* + 4)}{2(2+n^*)(n+n^*+1)} \right)
\end{equation}

Our first proposition follows from (21) through (25).

**Proposition 1.** Notwithstanding the vertical structure of an industry, $(n+n^*) > 2$ imposes a condition sufficient for removing any incentive for a merger between two firms within the same country.

Thus, there is no incentive for autarkic firms to merge within border but for the trivial case of a duopoly when a merger to a monopoly is always profitable. Starting from the equilibrium industrial structure in autarky, with $n$ firms at home and $n^*$ firms in the foreign country, let us now turn to the incentives for mergers across countries (when free trade is opened up). For ease of exposition, without loss of any generality, we assume hereinafter that foreign firms are relatively cost-efficient i.e. $c > c^*$. 


Absent vertical integration, the net gain from a takeover of a home firm by a foreign firm is

\[ G_{FH-D} = \frac{2n(n+n^*)+(n^*-1)(n+n^*)^2-1}{(n+n^*)^3(n+n^*+1)} \left[ y_i(v(n,n^*),\xi_i^*,\xi_i) - (1-\xi_i)c^* \right] \quad (i = 1, 2, \ldots n) \]

where \( 0 < \xi_1 = \frac{(n+n^*)^2-2(n+n^*)-1}{2n(n+n^*)+(n^*-1)(n+n^*)^2-1} < \xi_0. \)

Our next proposition follows from (26).

**Proposition II.** Absent vertical integration, a takeover of a home firm by a foreign firm will be profitable iff \( c > \xi_1 a^* + (1-\xi_1)c^*. \)

When an upstream firm is integrated with a downstream firm at home (say, \( R_k \)), the net gain from a takeover of the integrated home firm by a foreign firm is

\[ G_{FH-I}^D = N_0 \left( 2(c-c^*) y_i(v(n,n^*),\xi_i^*) + b(v_i(v(n,n^*),\xi_i^*)) \right) \left[ N_0 - (n+n^*-2) \right] \]

where

\[ N_0 = \left( \frac{(n+n^*)^2+n^*(n^*+4)+n+2}{(n+n^*)(1+n^*)(n+2n^*+3)} \right) \]

When an upstream firm is integrated with a downstream firm at home (say, \( R_k \)), the net gain from a takeover of a disintegrated home firm by a foreign firm is

\[ G_{FH-I}^D = \frac{\left[ y_i(v(n,n^*),\xi_i^*) \right]}{b'(n^*+2)(n+n^*+1)(n+n^*)^2 N_2} \left[ c - \xi_2 a^* - (1-\xi_2)c^* \right] \quad (i = 2, \ldots n) \]

where\%

\[ 0 < \xi_0 < \xi_2 = \left( 1 - \frac{N_1}{N_2} \right) < 1 \]

\[ N_1 = n + 4n^2n^* + 5n^{*2} + 8n^2 + 2nn^* + 6nn^* + 6n^* + n^{*4} + 2n^{*3} + 14nn^* + n^2n^{*2} \]

\[ N_2 = 2nn^* + n^2n^{*2} + 2(4n^2-1) + 8nn^* + 5n^2n^* + 3n^{*2} + (n^{*4} - n^*) + 3n^3 + 12nn^* + 2n \]
The difference between a foreign firm’s gain from taking over a disintegrated home firm and a foreign firm’s gain from taking over the integrated home firm is

\[
G_{FH-I}^{D^*-D} - G_{FH-I}^{D^*-I} = \frac{y_i(n, n^*)}{2b'(n^* + 2)^2(n + 1)^2(n + n^*)N_3} \left[ c - \xi_3 \alpha' - (1 - \xi_3)c^* \right]
\]

where

\[
0 < \xi_0 < \xi_2 < \xi_3 = \left(1 - \frac{N_3}{N_4}\right) < 1
\]

\[
N_3 = 8n(n+1) + n^*(3n^* + 11n^* + 16n^* + 12n^* + 4 + mn^*(4n^* + nn^* + 15n^* + 4nn^* + 10n + 28n^* + 26)
\]

\[
N_4 = (n^* + 1)[n^*(3n^* + 11n^* + 12n^*) + 6(n^* + n - 1) + mn^*(4n^* + mn^* + 4n + 15n^* + 20) + 2]
\]

Figure 5: Cross-Border Merger Incentives with Vertical Integration at Home when \( c > c^* \)

Our final propositions follow from (26) through (29).

**Proposition III.** Vertical integration at home increases the gains from cross-border mergers \( \text{iff} \ n > N_0^* \) where

\[
N_0^* = \frac{(n^* + 1)(n^* + 2 + 4n^* + 6)}{(n^* + 6n^* + 6)}
\]
Proposition IV. When an upstream firm is integrated with a downstream firm at home, a relatively efficient foreign firm will have an incentive to acquire a) a disintegrated home firm \(\text{iff } c \in \left(\xi_2 a' - (1 - \xi_2)c^*, \xi_3 a' - (1 - \xi_3)c^* \right)\) and b) the integrated home firm \(\text{iff } c > \xi_3 a' - (1 - \xi_3)c^*\).

Intuitively, our propositions hinge on an interaction between efficiency and concentration as a merger between a high-cost and a low-cost firm increases efficiency by eliminating the high-cost firm and raises price by increasing concentration. The profits of a low-cost foreign firm must increase significantly to justify its taking over a high-cost home firm when the cost differential is large. When this cost differential is sufficiently large, the foreign firm has a greater incentive to merge with the integrated home firm than to merge with a disintegrated home firm. A vertical merger can affect the incentives for competition in the input market. More specifically, the withdrawal of a vertically integrated firm from the input market weakens upstream competition. This raises the input price which, in turn, leads to a higher cost for the non-integrated downstream firms. The profits of the downstream unit of the integrated firm rise with a rise in its rivals’ costs and the integrated firm is better off withdrawing from the input market. As such, a vertical integration at home changes the strategic advantages for foreign firms. With the vertically integrated home-firm operating at a lower cost relative to the disintegrated home firms, the increase in the profits of a foreign firm from a merger with an integrated home firm exceeds the increase in its profits from a merger with a disintegrated home firm when there are fewer disintegrated firms at home in the pre-merger equilibrium. This, indeed, is of practical relevance since merger initiatives will not be attracted to relatively small gains. In particular, a wave of cross-border mergers will be triggered by a
relatively cost-efficient disintegrated firm located in one country (source) taking over a disintegrated firm located in another country (target) when pre-merger competition among the disintegrated firms is relatively intense but, otherwise, the initial target will be a vertically integrated firm.

5. **General Equilibrium Implications**

In this section, we discuss the implications of our findings for the effects of cross-border mergers on a nation’s comparative advantage in the setting of a general oligopolistic equilibrium (GOLE), à la Neary (2002), over a continuum of goods indexed by $z \in [0, 1]$. The supply side is analogous to the Dornbusch-Fischer-Samuelson (DFS) exposition of the Ricardian theory where countries differ in their access to technology reflected in unit labor requirements denoted by $\alpha(z)$ and $\alpha^*(z)$ with wages $w$ and $w^*$ at home and abroad respectively. For expositional convenience, we assume that $\alpha(z)$ is increasing and $\alpha^*(z)$ is decreasing in $z$ which can then be interpreted as an index of foreign comparative advantage with home’s relative productivity $\frac{\alpha^*(z)}{\alpha(z)}$ decreasing as $z$ increases.

To close the model, let the demand side be characterized by an additive utility function of the form

$$U[x(z)] = \int_0^1 \left[ ax(z) - \frac{1}{2} bx(z)^2 \right] dz$$

(30)

There is a single representative consumer, in each country, who maximizes (30) subject to the budget constraint.
where $I$ is aggregate income. This yields, for each country, an inverse demand function for each good which is linear in its own price conditional on the marginal utility of income ($\lambda$)

$$p(z) = \frac{1}{\lambda} [a - bx(z)]$$

where $\lambda = \frac{a\mu_1^p - bI}{\mu_2^p}$. The effects of prices on $\lambda$ are summarized by the first and second moments of the distribution of prices

$$\mu_1^p = \int_0^1 p(z)dz$$

$$\mu_2^p = \int_0^1 p(z)^2dz$$

It follows that, under free trade, the world inverse demand curve for each good is

$$p(z) = a^{'} - b^{'} \bar{x}(z)$$

where $a^{'} = \frac{\bar{a}}{\bar{\lambda}} = \frac{a + a^{'}}{\lambda + \lambda^{'}}$ and $b^{'} = \frac{b}{\bar{\lambda}}$ with $a$ and $a^{'}, b$ the common slope for home demand ($x(z)$) and foreign demand ($x^*(z)$) respectively. $\bar{\lambda}$ is the world marginal utility of income which we choose as the numeraire.

We will, hereinafter, normalize the wages to $W = \bar{\lambda}w$ and $W^* = \bar{\lambda}w^*$. The threshold sectors pinning down the extensive margins of trade, denoted $\bar{z}$ and $\bar{z}^*$ at home and abroad respectively, can be determined (conditional on wages) by
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(35A) \[ W \alpha(\tilde{z}) - \tilde{\alpha}(\tilde{z}) a' - (1 - \tilde{\xi}(\tilde{z})) W^* \alpha^*(\tilde{z}^*) = 0 \]

(35B) \[ W^* \alpha^*(\tilde{z}^*) - \tilde{\xi}^*(\tilde{z}^*) a' - (1 - \tilde{\xi}^*(\tilde{z}^*)) W \alpha(\tilde{z}) = 0 \]

This is depicted by ZZ in figures 6 through 8 below where, given wages, the home country specializes in \( z \in [0, \tilde{z}^*] \), the foreign country specializes in \( z \in (\tilde{z}, 1] \), and production is diversified in \( z \in [\tilde{z}, \tilde{z}^*] \).

Wages are determined by the full employment conditions

(36A) \[ L = \int_0^{\tilde{z}} \alpha(z) n \tilde{y}(W, z, n) dz + \int_{\tilde{z}}^{\tilde{z}^*} \alpha(z) n \tilde{y}(W, W^* z, n, n^*) dz \]

(36B) \[ L' = \int_{\tilde{z}}^{1} \alpha^*(z) n^* \tilde{y}^*(W^*, z, n^*) dz + \int_{\tilde{z}}^{\tilde{z}^*} \alpha^*(z) n^* \tilde{y}^*(W, W^* z, n, n^*) dz \]

Figure 6: Pre-Merger Trading Equilibrium with and without Vertical Integration at Home
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Figure 7: Post-Merger Trading Equilibrium with Vertical Integration at Home
(Foreign Acquisition of a Disintegrated Home Firm)

Figure 8: Post-Merger Trading Equilibrium with Vertical Integration at Home
(Foreign Acquisition of an Integrated Home Firm)
In the pre-merger trading equilibrium, as seen in figure 6, the extensive margin of trade shrinks on the face of vertical integration. Cross-border mergers induce expansion and contraction of sectors as high-cost firms in one country are bought out by low-cost foreign rivals in another. At any given wages, expanding firms will a) increase their output by only a fraction of the output of the firms which are taken over and b) have lower labor requirements per unit output than the contracting ones. Consequently, the total demand for labor will fall pressing wages down to restore equilibrium in the labor market which, in turn, encourages hiring of labor at the intensive margin. The lower wages raise the profitability of high-cost firms, at the margin, placing them outside the reach of takeovers thereby dampening the initial wave of mergers. This is captured in figures 7 and 8 where a merger-induced fall in wages causes the ZZ locus to shifts toward the origin which expands the range of sectors that remain in the HF region. In particular, while a cross-border merger will mitigate the effect of vertical integration on the extensive margins of trade by facilitating specialization toward the direction of comparative advantage (i.e. moving production and trade patterns closer to what would prevail in a competitive Ricardian world), the impact of such a merger on the extensive margins of trade will be larger when a foreign firm acquires a disintegrated home firm compared to the impact when a foreign firm acquires a vertically integrated home firm.

6. Conclusion

Cross-border mergers have increasingly evolved into an effective strategy used by a large number of companies with global presence. Notwithstanding the fact that a third of worldwide mergers involve firms from different countries, the vast majority of the academic literature on mergers has been primarily limited to intra-national mergers. We
hope to have taken a step forward along the path of continued efforts to capture the incentives for and implications of cross-border mergers. We have shown how vertical integration can extend the diversification of production. Our model captures the possibility of augmenting the gains from cross-border horizontal mergers when a vertically integrated production structure exists. Gains from cross-border mergers, attributed to the vertical structure of an industry, can vary with the relative market concentration between countries. Such gains rise if competition in the completely disintegrated market declines. We have derived explicit conditions under which a target of cross-border merger, in a vertically related industry, is identified through an interaction between relative market concentration and relative cost efficiency. We have also shown that, in the presence of a vertically integrated production structure, the impact of a merger on the extensive margins of trade will be magnified when the merger takes place between two disintegrated firms across borders compared to a merger between a disintegrated firm in one country and a vertically integrated firm in another. A couple of interesting extensions, we are currently working on, include integrating our model with a) Nocke and White (2007) to assess the role that vertical structures play in firms' dynamic incentives to merge horizontally across borders and b) Beladi et al. (2008, 2010a) to analyze the role that cross-border mergers play in a nation’s comparative advantage, under conditions of spatial price discrimination within an industry where a retailer cannot deliver all the varieties that the market demands.
References


Endnotes

1 While much of the earlier merger activity was confined to North America and Great Britain, the most recent wave has engulfed all of the major industrial countries of the world. See Gugler et al. (2003).

2 Cross-border mergers and acquisitions account for a significant and growing share of global FDI flows. Between 1996 and 2005, the annual average value of cross-border mergers and acquisitions worldwide was $533 billion, or about 70% of annual world FDI flows (source: UNCTAD, 2006).

3 The volume of cross-border mergers has been growing worldwide, from 30 percent of the total merger volume in 1998 to 45 percent in 2007. See Erel et al. (2009).


6 There are at least three reasons why it is interesting to examine mergers and acquisitions from an international perspective. First, cross-border mergers and acquisitions have fueled the growth in international production for more than a decade. Specifically, most foreign direct investment is carried out through the acquisition of foreign firms’ assets rather than the creation of new firms, also known as greenfield investment. Second, there is evidence that economic integration affects mergers and acquisitions activity by increasing the incentives to undertake cross-border mergers and acquisitions, and by forcing industries to restructure. This restructuring is often accomplished through mergers and acquisitions. Third, both cross-border mergers and mergers between domestic firms engaged in international trade pose challenges for competition policy. See Raff et al. (2006).

7 See Lipton (2006).

8 Even mergers of companies with headquarters in the same country, though do not fit into the strict definition of cross-border mergers, are often transnational in nature. For instance, when Boeing acquired McDonnell Douglas, the two American companies had to integrate operations in dozens of countries around the world. This was just as true for other supposedly single-country mergers, such as the $27 billion dollar merger of Swiss drug makers Sandoz and Ciba-Geigy (now Novartis). See Finkelstein (1999).

9 See Perry and Porter (1985) and Farrell and Shapiro (1990) on cost synergies in horizontal mergers.

10 See Rey and Tirole (2005).

11 See Lafontaine and Slade (2007) for a recent insightful review.

12 This was the first case in which a proposed merger between two U.S. companies that had been approved by Washington was blocked by European regulators. The decision has since been subject to criticism due to the alleged lack of sound analytical models to support.


15 In our exposition, for ease of comparison, we preserve Neary’s (2007) notations to the fullest extent possible.

16 It may be noted that sunk costs have no effect on merger decisions as they cannot be recouped.

17 As in Neary (2007), the demand function is highly non-linear in general equilibrium though it is linear from the perspective of firms.

18 See Ordover et al. (1990) for the original exposition of the integrated firm’s foreclosure strategy to raise rivals’ costs. It may be noted that any incentive for the vertically integrated firm to deviate ex post from its decision to withdraw, from upstream competition, can be removed by simple trigger strategies in repeated interaction.

19 In other words, à la Neary (2007), the terms “merger” and “takeover” are used interchangeably in our model.
Neary (2007) had shown that a merger between two firms with the same unit cost (whether two home or two foreign firms) is never profitable provided \((u\cdot n^*) > 2\). This result is more general than Salant et al. (1983) to the extent that it allows the unit costs of firms within a merger to differ from the unit costs of firms outside the merger. Our first proposition generalizes this further to a vertically related industrial structure.

This replicates Neary’s (2007) myopic criterion for a takeover of a home firm by a foreign firm in a vertically related industry. The same logic can be applied, \textit{mutatis mutandis}, to a takeover of a foreign firm by a home firm which will be profitable \(iff\ c^* > \xi d^* + (1 - \xi^*) c\).

\(W\) and \(W^*\) can be interpreted as \textit{marginal} real wages since they equal nominal wages deflated by the \textit{marginal} cost of utility. For homothetic preferences, \(W\) and \(W^*\) would measure the real wages.

See Erel et al. (2009).

Nocke and White (2007) are among the first to have investigated the impact of vertical mergers in a dynamic game of repeated interaction between upstream and downstream firms.

Beladi et al. (2008) studied the relationship between a company’s vertical structure and its choice of location under conditions of spatial price discrimination in an industry where none of the downstream firms produce all varieties demanded by consumers. This was extended to a sequential game in Beladi et al. (2010a) and to cross-border mergers in Beladi et al. (2010b).