Cross-Border Mergers and Market Segmentation (Replaces CentER DP 2010-096)

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Publication date:
2011

Discussion paper

CROSS-BORDER MERGERS AND MARKET SEGMENTATION

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October 2011

Tilec Discussion Paper
No. 2011-047

CentER Discussion Paper
No. 2011-112

This is a revision of
TILEC Discussion paper No 2010-035

and

CentER Discussion Paper No. 2010-96

ISSN 1572-4042
http://ssrn.com/abstract=1095672

Cross-border mergers and market segmentation

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Abstract

This paper shows that cross-border mergers are more likely to occur in industries which serve multiple segmented markets rather than a single integrated market, given that cost functions are strictly convex. The product price rises in the market where an acquisition is made but falls in the other, decreasing the acquisition price of other firms (in contrast to the results in the existing merger literature on integrated markets). Although the sum of consumer surplus across the countries may rise in response to a given acquisition, one of the countries gains at the expense of the other.

JEL classifications: L12, L40, L41, F15, F23

Keywords: cross-border mergers, endogenous mergers, competition policy, Cournot competition, economic integration

1 Introduction

Mergers and acquisitions have played an important role in the evolution of industry structure worldwide. According to Gaughan (2002), the first merger wave in the early 1900's transformed the US economy from one with many small firms to one with larger dominant firms. In 1911, for example, Standard Oil was found guilty of monopolizing the industry through acquisitions. More recent evidence (1970 - 2000) is provided by Andrade, Mitchell and Stafford (2001) who illustrate that mergers occur in waves and that within a wave, mergers strongly cluster by industry.

Over the decades, due to globalization, merger[1] waves have taken on an increasingly international dimension. The volume of cross-border mergers has grown over time such that, in 2000, the ratio of the value of global cross-border mergers to the value of global foreign direct investment (FDI) was about 80% (UNCTAD (2000)).[2] There is considerable evidence that cross-border mergers tend to occur in waves (see, for example, Gaughan (2002), Gugler et al (2003) and UNCTAD's World Investment Report (2004)). This paper illuminates one channel through which these "waves" are generated.

The key result of this paper is that the greater the degree of market segmentation across the markets served by a given industry and the more convex the cost function faced by firms in the industry, the more likely that multiple acquisitions across several countries are realized either simultaneously or in close succession. Such a merger wave would be less likely to occur in an integrated market where, after an acquisition in one country, the market price of the product would rise in all countries, making it more expensive to acquire other firms (see, for example, Gaudet and Salant (1992), Kamien and Zang (1990, 1991, 1993)[3] and Salant, Switzer and Reynolds (1983)).

This result gains further importance in light of the overwhelming empirical evidence in support of the existence of market segmentation across countries (see, for example, Atkeson and Burstein (2008) and Knetter (1989, 1993) for evidence of price discrimination by exporting firms across

[1] For the purposes of this paper, the terms "mergers" and "acquisitions" are used interchangeably.

[2] Gugler et al (2003) also find an upward trend in the percentage of mergers that are cross-border, a trend that was particularly pronounced for EU countries in the 1990s. The percentage of all mergers in Continental Europe that were cross-border rose from 24.2% in 1991-92 to 39.8% in 1997-98.

[3] Kamien and Zang (1990) show that there are limitations to the possibility of the endogenous monopolization of a homogenous good Cournot oligopoly through one firm's acquisitions of the others. Whilst Kamien and Zang (1990) assume identical constant marginal costs of production, Kamien and Zang (1991) extends the above result to an industry with a strictly convex cost function. Kamien and Zang (1993) further extend this result to the case of a noncooperative game in which the Kamien and Zang (1990) game is repeated in order to allow for sequential acquisitions.

different destination countries).[4]

Moreover, the main result of this paper is supported by the following empirical observation. According to UNCTAD's World Investment Reports (WIR) (2006-2010), during the last two decades, each year about 60% of all cross-border mergers worldwide have been realized within service industries such as financial services. This is in line with Norbäck and Persson (2008b) which provides further details regarding cross-border mergers in service industries. The standard example in most IO texts of an industry where market segmentation and price discrimination prevail is service industries since the nature of these industries does not allow consumers to resell the service in order to gain from arbitrage. Furthermore, these industries typically have lower fixed costs than manufacturing industries, which is another condition under which the result of this paper is more likely to be realized.[5] Thus, this paper provides a possible explanation for the dominance of the service sector in the total value/volume of cross-border mergers worldwide.

The set of conditions identified in this paper that induce cross-border merger waves includes not only market segmentation but also convexity of cost functions, which is a standard assumption in many IO models. If costs were linear and markets segmented, an acquisition in one market would have no impact on the other market.[6] It is established in the seminal work of Perry and Porter (1985) that a given merger is more profitable in industries facing convex costs. However, Perry and Porter (1985) does not investigate the impact of one merger on the profitability of subsequent mergers in the industry. Kamien and Zang (1991) show that despite the existence of

[4] Atkeson and Burstein (2008) use aggregate price data from exporting manufacturing firms in the US, the UK, Japan, Germany, France, Italy and Canada for the period 1985-2006. Knetter (1989, 1993) uses the annual value and quantity of exports to selected destination countries for a number of seven-digit industries in four source countries: the US, the UK, Japan, and Germany, for the period 1975-1987. The industries in his data set include durables, nondurables and intermediate goods.

[5] The WIR 2010 summarizes the sectoral distribution of cross-border mergers, by industry of seller, for the period 1990–2009, where the sectors are categorized as primary, manufacturing and services. They note that during the period 1990-1995, the share of service sector in the total value of cross-border merger worldwide was about 50%. This percentage rose to more than 60% during 1995-2000 and remained so during 2000-2005. Annual data thereafter (inclusive of 2009) shows that this figure has remained consistently close to 60% except in 2008 (during the financial crisis) when it fell to 40%. Moreover, during all these periods, these figures have been higher by about 10 percentage points in developing countries as compared to developed countries. For further details please refer to Figure I.9 in UNCTAD's World Investment Report 2010. Similar shares apply when we focus on the number of cross-border mergers rather than value. For example, according to WIR 2010, in 2007 the service sector share of the total number of cross-border mergers worldwide was 65%, in 2008 it was 62%, and in 2009 it was 63%.

According to WIR 2010, during the financial crisis in 2008 when the value of cross-border merger transactions fell in most sectors, the fall in the manufacturing sector (77%) was greater than the services sector (57%) overall. An exception was the financial services sector (87%).

[6] See Nguyen and Schaur (2010) for empirical evidence supporting the theory that markets are linked through convex costs.

convex cost functions, within a context of Cournot oligopolists serving a single integrated market, an acquisition raises the market price of the product, making it more expensive to acquire other firms in the industry. This paper provides an instance where Kamien and Zang's result is reversed, that is, one set of acquisitions actually lowers the market price in one of the markets, making it cheaper to acquire local firms. In this paper, this reversal is only possible when, along with convex costs, the oligopolists operate across segmented markets allowing them to engage in third degree price discrimination.

Given the empirical relevance of cross-border mergers, the theoretical literature on cross-border mergers remains small relative to that on greenfield FDI (Barba-Navaretti and Venables (2004), Caves (1996), Helpman (1984), Klimenko and Saggi (2007), Markusen (2002), Mattoo, Olarreaga and Saggi (2004), Helpman, Melitz and Yeaple (2004), Nocke and Yeaple (2007, 2008)).[7]

Existing papers that model cross-border mergers are mostly built around some exogenously given asymmetry between domestic and foreign firms such as differences in production costs (e.g. Bertrand and Zitouna (2006), Long and Vousden (1995), Neary (2007)) and access to information (e.g. Das and Sengupta (2001), Qiu and Zhou (2006)).[8] In contrast, this paper shows that even when countries are identical and all firms have access to the same technology and information, a wave of cross-border mergers may be triggered by trade liberalization and sustained purely by the strategic interaction of firms. This paper abstracts away from the possibility of greenfield FDI in order to focus on the process by which multinational firms acquire local firms and to isolate a set of conditions that facilitate the realization of cross-border mergers.

This paper is most closely related to the literature on the determinants and welfare effects of endogenous cross-border mergers. In this literature, most papers use a combination of market power and synergies or trade cost savings to explain equilibrium cross-border mergers (Bjorvatn (2004), Fumagalli and Vasconcelos (2006), Horn and Persson (2001), Norbäck and Persson (2008a)). Some

[7] Some of these papers do include the possibility of cross-border mergers. The focus, however, is on determining the conditions under which cross-border mergers are the prefered mode of entry to greenfield FDI. For example, Barba-Navaretti and Venables (2004) show how firms in monopolistic competition have an incentive to merge, but do not explore the implications of a first merger for subsequent ones. Nocke and Yeaple (2007) show how interfirm differences in country-specific firm capabilities affect the choice between greenfield and acquisition FDI. However, they assume that the market for capabilities is perfectly competitive. Nocke and Yeaple (2008) use a more general setting and show that firms engaging in greenfield entry are systematically more efficient than those engaging in cross-border mergers.

[8] An alternative approach taken by Horn and Persson (2001) and Fumagalli and Vasconcelos (2006) is to explore international mergers as the outcome of a cooperative game.

other papers use labour market effects (Lommerud, Straume, Sorgard (2006) and Straume (2003)), and tax advantages arising from cross-border mergers (Norbäck and Persson (2009)) to explain equilibrium cross-border mergers. This paper adds to this literature by showing that a combination of access to multi-plant activities and cost reallocation for multinational enterprise (MNEs) could explain equilibrium cross-border mergers when the industry is spread across multiple segmented markets.

More specifically, this paper considers a two-country model with a MNE that sells its product in both markets. The markets are segmented. Each country is also served by local firms. According to Bernard et al (2007), of the 5.5 million firms operating in the United States in 2000, just 4 percent were exporters.[9] The firms compete in quantities in the product market and sell a homogeneous good. Within this context, I study the incentives of the MNE to acquire the local firms. Empirical evidence shows that a large proportion of cross-border acquisitions are indeed undertaken by MNEs as a means of entering a new market (Nocke and Yeaple (2007, 2008)).

The acquisition game presented here consists of the MNE announcing bids for each of the local firms, which the local firms may accept or reject. It is assumed, as is common to much of the merger literature, that due to barriers to entry, firms cannot enter this industry.

Given the convex cost structure faced by firms, after an acquisition, the owner of the merged entity minimizes cost by equating marginal cost across all firms he owns. This leads to price discrimination, as shown in the paper.[10] If a multinational firm acquires a local firm in one of the markets, the price of the product in that market is shown to rise and the price in the other market is shown to fall. This decreases the profit that each local firm would obtain if it unilaterally remained outside a merger to monopoly. Consequently, local firms become cheaper to acquire.

This paper also distinguishes between "closer economic integration" and "trade liberalization" in the form of tariff cuts in the following sense. Henceforth, the first term refers to the reduction of frictions across markets, at any given tariff level, which allows consumers to profit from arbitrage opportunities across markets, such that price discrimination becomes ineffective. Also, the term

[9] In order to explain why, in reality, some firms do not export whilst others do, a number of studies have shown that setting up export activities is costly and requires an initial investment (e.g. Melitz (2003), Roberts and Tybout (1997)). This is because, as the management strategy literature posits, some capabilities, such as marketing, distribution, and country-specific institutional competency are imperfectly mobile across countries (Anand and Delios (2002)). This paper abstracts away from these features for ease of exposition.

[10] This finding is in line with Bulow et al (1985) who show that a firm's actions in one market can change competitors' strategies in another market by affecting its own marginal cost in the second market.

"trade liberalization" refers to the reduction of tariffs, given that the markets continue to be segmented, due to some source of friction other than tariffs, such that it is costly for consumers to engage in arbitrage across markets. The paper shows that the impact of these two phenomena on merger waves may be very different.

This has an important implication for empirical work. The general conclusion in existing empirical studies that "trade liberalization" and "economic integration" play a similar role in driving cross-border merger waves[11] needs to be re-examined in light of this paper's findings. This paper shows that "trade liberalization" may trigger the mechanism by which cross-border mergers occur, as outlined in this paper. On the other hand, this mechanism is unambiguously thwarted by "economic integration". Thus, this paper illustrates the need to include a measure of the degree to which markets are segmented, at any given tariff level, across different industries and countries in future empirical analyses to identify the different roles of "trade liberalization" and "economic integration". This can be expected to generate new policy implications. For example, in the case of the EU, the cross-border merger wave of the 1990's is often attributed to closer "economic integration" in the form of the EU Single Market Treaty. However, despite the announcement of the extension of the EU Single Market Treaty, there prevailed market segmentation and price discrimination across the EU Member States in the 1990's (see Crucini et al (2005), Goldberg and Verboven (2001) and Fabiani et al (2005)). As per the insight provided by this paper, it may indeed be the persistence of market segmentation together with "trade liberalization", rather than "closer economic integration", that was responsible for the EU merger wave. This provides a new rationale in favour of the European Commission's policy to actively achieve integration of national markets.[12]

This paper also contributes to the literature on the welfare effects of mergers.[13] The paper shows that the same merger can decrease consumer surplus in one market and simultaneously increase

[11] See Brakman et al (2006), Chudnovsky (2000) and European Commission (1996). An exception is Breinlich (2008) which is not able to establish a robust link between tariff reductions and cross-border mergers between US and Canada.

[12] In order to facilitate integration of the national markets within the EU, the European Commission has actively encouraged (within limits) arbitrage, harmonized taxes and other national regulations, increased transparency, monitored cross-country price differences and created the European Monetary Union to reduce exchange rate volatility (Goldberg and Verboven (2005)).

[13] A related topic that has been addressed in the literature is the determination of conditions under which it is beneficial to set up a supra-national antitrust authority (e.g. Falvey (1998), Head and Ries (1997)). Another set of papers study the interaction between trade and competition policies (e.g. Francois and Horn (1998), Horn and Levinsohn (2001), Saggi and Yildiz (2006)). Norbäck and Persson (2007) compares liberalization programs which allow greenfield investments but not cross-border mergers and those that allow both.

consumer surplus in another. This has policy implications for international antitrust authorities such as the European Commision (EC).[14] If an international antitrust authority disallows all mergers that are not Pareto improving across countries (using the consumer surplus standard), then it may not maximize aggregate consumer surplus of all countries under its jurisdiction.[15] These policy implications also hold for national antitrust authorities of large countries such as the US where the domestic market for a good may consist of several segmented markets.

On the one hand, the above result suggests that the antitrust authority can be more relaxed when reviewing a given merger in isolation. On the other hand, this paper also shows that, if the firms serve multiple segmented markets, allowing one merger may lead to a spate of cross-border mergers, which might ultimately lower consumer surplus in all countries involved. This warrants greater caution on the part of antitrust authorities in an increasingly globalized world. This result is of particular concern because it has been observed that MNEs are increasingly acquiring firms in emerging and developing economies[16] which may be unable to prevent the acquisitions undertaken by MNEs due to non-existent, weak or corrupt institutions including antitrust authorities.[17] Indeed, the interaction of MNEs and local firms that this paper models, is particularly relevant to many developing countries and emerging markets.

The paper proceeds as follows. Section 2 presents the model. Section 3 compares the likelihood of the monopolization of the industry under segmented markets and integrated markets. Section 4 discusses the policy implications within this setting. Section 5 discusses the effect of trade liberalization on the process of monopolization and on welfare. Section 6 concludes.

[14] In Europe, the EC Merger Regulation distinguishes between mergers that have and mergers that do not have a "Community dimension". The latter involve large firms that operate in several Member states and must be notified to the EC in advance. Mergers that do not have a Community dimension are examined by the relevant Member State's antitrust authority.

[15] Indeed, the current policy of the EC is to reject mergers that harm any of its Member States, for example, in the Scania-Volvo merger case, more details of which are provided in footnote 21.

[16] Cross-border mergers and acquisitions in emerging markets have been rising since the 1990s. During 1991-2000 cross-border M&As accounted for 61% of foreign direct investment in Latin America and 48% in East Asia, as compared to 10% and 4% in the 1980s (see Chari, Ouimet and Tesar (2004) for further details).

According to WIR 2010, over two thirds of cross-border M&A transactions still involve developed countries, but the share of developing and transition economies as hosts to those transactions has risen from 26 per cent in 2007 to 31 per cent in 2009.

[17] For example, in India, trade liberalization and liberalization of restrictions on foreign ownership of assets were implemented widely starting in 1991. However, the Indian Competition Act only came into force in 2002, the Competition Comission of India was set up only in 2003 and the Central government has only made the latter functional since 2009.

2 The Model

Consider an industry consisting of n firms and $m \leq n$ owners of firms. Each firm is owned in its entirety by a single owner. Please note that the terms "firm" and "plant" are equivalent within the context of this paper. Each firm produces a homogenous product and has a cost function, given by $C(q)$.

ASSUMPTION 1: *The cost function, $C(q)$, is increasing, $C'(q) > 0$, and twice continuously differentiable, has no fixed cost, $C(0) = 0$, and is strictly convex, implying that $C''(q) > 0$ for all $q > 0$, where q denotes the total output of each firm.* [18]

The model consists of two periods. In the first period, owner 1 acquires firms owned by other owners. The acquisition process is detailed below. In the second period, all the remaining owners act as Cournot oligopolists. At the beginning of the first period, owner 1 owns n_1 firms. The rest of the $(m-1)$ owners own n_j firms each, for $j \in [2, ..., m]$. Although not necessary for deriving the results in this paper, it is useful to think of n_j as being strictly less than n_1 for $j \in [2, ..., m]$. That is, owner 1 initially owns more firms than any of the others. Given strictly convex costs, the greater the number of firms owned by an owner, the lower his cost of production of a given amount of the output, as formally stated in Lemma 1 below. Although not modeled explicitly, the lower cost of owner 1 provides a justification for the assumption in this paper that owner 1 is able to serve both markets and to acquire firms as opposed to the other owners. This also reflects the reality that multinational firms often own more firms and have lower costs than do local firms and is in line with the emprical evidence provided by Breinlich (2008) which concludes that "acquirers tend to be bigger, more profitable and more productive". In Section 3 we discuss how the main results of this paper may also carry over to the case where there exist multiple acquirers.

Consider two countries denoted by A and B. Within this context, we consider the following two scenarios.

1. Segmented markets

The two markets, A and B, are segmented. Owner 1 sells the joint output of its n_1 firms in both countries. Owner j for $j \in [2, ..., m]$, where $m_A < m - 1$, sells the joint output of its n_j firms

[18] This is identical to the cost specification used in Kamien and Zang (1991).

in country A only. That is, m_A number of owners own "local" firms that sell their output in A only. Owner j for $j \in [m_A + 1, ..., m]$, sells the joint output of its n_j firms in country B only. Let $m_B \equiv m - 1 - m_A$. That is, m_B number of owners own "local" firms that sell their output in B only. In Section 3, we discuss how the main result may carry over to the situation where all firms sell their output in both markets. The inverse demand in country i is given by $P_i(Q_i)$ where Q_i denotes the total volume sold in country i. It is assumed that the following properties hold for $i = A, B$:

Assumption 2:

1. *$P_i(Q_i)$ is twice continuously differentiable, $P_i(0)$ and $P_i'(0)$ are finite, $P_i'(Q_i) < 0$ for all $Q_i \geq 0$ and $P_i(0) > C'(0)$.*

2. *The second derivative of the industry total revenue function in each country, $Q_i P_i(Q_i)$, is negative, i.e. $(Q_i P_i(Q_i))'' < 0$ for all $Q_i \geq 0$. Note that this assumption implies strict concavity of the industry total revenue function in each country.*

2. Integrated markets

In this scenario, the markets of A and B, are integrated. Let Q represent the total volume sold in the single market. The inverse demand is given by $P(Q)$. It is assumed that the following conditions, as per Assumption 2', are satisfied.

Assumption 2':

1. *$P(Q)$ is twice continuously differentiable, $P(0)$ and $P'(0)$ are finite, $P'(Q) < 0$ for all $Q \geq 0$ and $P(0) > C'(0)$.*

2. *The industry total revenue function $QP(Q)$ possesses a negative second derivative, i.e. $(QP(Q))'' < 0$ for all $Q \geq 0$.*

The focus of this paper is on the scenario with segmented markets. The scenario with integrated markets is introduced as a benchmark against which to compare the effects of market segmentation.

2.1 The Acquisition Game

The acquisition process consists of two stages.

Stage 1:

Each firm is initially owned and operated by one of the m owners. If a firm is sold during Stage 1, it becomes operated by its buyer. For clarity, it is assumed that only owner 1 is allowed to buy other firms.

Owner 1 makes offers to each of the other owners. An offer to owner i, for $i \in [2, ..., m]$, consists of the number of firms that owner 1 wishes to buy from owner i and a bid for the entirety of each of these firms. Owner i, for $i \in [2, ..., m]$, decides whether to accept or reject the offer made by owner 1. At the end of Stage 1, owner 1 buys all the firms whose owners accept the offers they received and does not buy the other firms in the industry. Let L represent the set of firms owned by owner 1 at the end of Stage 1. Let K represent the set of owners that remain active at the end of period 1, that is, those owners who have not sold all their firms to owner 1 during period 1.

In addition to paying the bids that are accepted, owner 1 pays a negotiation fee of $\phi \geq 0$ in Stage 1.

Stage 2:

Given the pattern of acquisitions that is realized in Stage 1, each owner independently and simultaneously chooses the production levels at each of his firms in order to maximize the joint profit of all firms he owns. The analysis in Stage 2 depends on whether markets are segmented or integrated and on whether any acquisitions were realized in Stage 1. The following is a description of Stage 2 under both scenarios.

Stage 2 under segmented markets:

Owner 1 chooses (q_{1Aj}, q_{1Bj}) for each firm j that he owns, where q_{1Aj} (q_{1Bj}) represents the output produced in firm j and sold in country A (B) by owner 1. Let $q_{1i} \equiv \sum_{j \in L} q_{1ij}$, $i = A, B$ denote the total sales of owner 1 in market i. Similarly, each of the other owners chooses the output level at each firm that he owns. Let q_{iA} denote the total sales of owner i in market A for $i \in K \cap \{2, ..., m_A\}$ and q_{iB} denote the total sales of owner i in market B for $i \in K \cap \{m_A + 1, ..., m\}$. Note that while the number of owners may decline after Stage 1, the number of firms does not.

Owner 1's Stage 2 profit is given by:

$$\pi_1 = P_A(Q_A)\, q_{1A} + P_B(Q_B)\, q_{1B} - \sum_{j \in L} C_j(q_{1Aj} + q_{1Bj}) \tag{1}$$

The Stage 2 profit of each of the owners of the local firms in A who remains active is given by:

$$\pi_k = P_A(Q_A)\, q_{kA} - \sum_{j \in n_k} C_j(q_{kAj}), \text{ if } k \in K \cap \{2, ..., m_A\} \tag{2}$$

The Stage 2 profit of each of the owners of the local firms in B who remains active is given by:

$$\pi_k = P_B(Q_B)\, q_{kB} - \sum_{j \in n_k} C_j(q_{kBj}), \text{ if } k \in K \cap \{m_A + 1, ..., m\}$$

Assumption 3: *Each active owner's reaction curve slopes downward in each market. Equivalently, an increase in rivals' output in each market lowers owner k's marginal revenue, for $i = A, B$. That is,*

$$P_i'(Q_i) + P_i''(Q_i)\, q_{ki} < 0, \text{ for } i = A, B; k \in K \tag{3}$$

Stage 2 under integrated markets:[19]

Each active owner chooses q_k, and his Stage 2 profits are given by:

$$\pi_k = P(Q)\, q_k - \sum_{j \in n_k} n_k C_j(q_{kj}), \ k \in K$$

Assumption 3': *The following holds:*

$$P'(Q) + P''(Q)\, q_k < 0, \text{ for } k \in K$$

Under both scenarios (segmented and integrated markets), each player's payoff is the sum of the Stage 2 operating profits of all the firms he owns plus the net trade cash flow from Stage 1.

Lemma 1: *Under both segmented and integrated markets, for every possible ownership configuration, a pure strategy Stage 2 Cournot equilibrium of the acquisition game exists. In this equilibrium, all*

[19] Stage 2 under integrated markets is identical to Kamien and Zang (1991).

firms are operated, and every owner possessing at least one firm produces the same quantity in each.
PROOF: For integrated markets, see Proposition 1 in Kamien and Zang (1991). The proof for segmented markets is a straightforward extension of Proposition 1 in Kamien and Zang (1991) and is available upon request.

The intuition behind Lemma 1 is straightforward. An owner of multiple firms minimizes total cost of production by equating the marginal cost across all his firms. Given identical and strictly convex cost functions at each firm, this is achieved by equally splitting production across all the firms that the owner owns.

Before proceeding to analyze the equilibria of this game, let us first consider the effect of an exogenously given acquisition by owner 1 on prices and quantities in Stage 2 for both scenarios. The following lemma facilitates our analysis of a merged equilibrium, analyzed in the next section. Without loss of generality, let us consider the case where owner 1 acquires M of the local firms in country A.

Henceforth, all variables corresponding to outcomes subsequent to the acquisition of the M local firms in A by owner 1, are denoted by the subscript "M". Also, all variables corresponding to outcomes subsequent to the acquisition of all firms in both countries by owner 1, are denoted by the subscript "mon".

LEMMA 2: *Subsequent to the acquisition of M firms in A by owner 1, it follows that*
(i) *under segmented markets, a rise in price in A (that is, $P_A(Q_A) < P_A(Q_{MA})$) and a fall in price in B (that is, $P_B(Q_B) > P_B(Q_{MB})$).*
(ii) *under integrated markets, a rise in price (that is, $P(Q) < P(Q_M)$).*
PROOF**:** See appendix.

The result for the single integrated market, Lemma 2(ii), follows directly from Proposition 3 in Kamien and Zang (1991). Interestingly, this result does not carry over to Scenario 1, where the markets are segmented, as shown by Lemma 2(i). The acquisition causes the price level to simultaneously rise in one country and fall in the other, that is, price discrimination across the two countries is intensified.

The key intuition driving the results in this paper, as embodied by Lemma 2, is as follows.

Subsequent to the acquisition of the M firms in A, owner 1 faces the following tradeoff in market A. The first effect is that, due to increased market power, owner 1 has an incentive to decrease the quantity sold in A. The second effect is that the acquisition allows owner 1 to split his total output equally across all firms (by Lemma 1), thereby reducing his marginal cost at the pre-merger output level. Thus, by the second effect, owner 1 has an incentive to increase his total output. Lemma 2 shows that the former effect dominates in market A, thereby raising the price level in A. In contrast to A, owner 1 faces no tradeoff in B, since his market power remains unchanged. The only effect faced by owner 1 in B of the acquisition in A is the second effect, which explains the decrease in the price level in B.

This generates new insights regarding the incentives of multinational firms to monopolize an industry and the welfare effects of such acquisitions.

3 Effect of market segmentation on cross-border merger waves

This section focuses on the firms' incentives to merge in the absence of an antitrust authority. The role of the antitrust authority will be examined in the following section.

For ease of exposition, I begin by presenting the main result using the case where $m = 3$. I then show that the main result may be generalized to cases with $m > 3$. Let $n_A(n_B)$ be the number of local firms in $A(B)$.

Scenario 1: *Consider three owners where owner 1 owns n_1 firms, owner 2 owns local firms in A only and owner 3 owns local firms in B only.* A and B are identical countries such that $n_A = n_B$ and $P_A(.) = P_B(.)$.

Given Scenario 1, consider the possibility of a merged equilibrium to the game in which owner 1 possesses all firms. Let π_{mon} denote owner 1's Stage 2 monopoly profits and let $\hat{\pi}_1$ be his Stage 2 profits if he does not acquire any firms. Certainly, owner 1 is unwilling to pay more than $\pi_{mon} - \hat{\pi}_1 > 0$ for the other firms altogether, as $\hat{\pi}_1$ is his opportunity cost. Now consider each of the sellers, owners 2 and 3. Let $\hat{\pi}$ be the Stage 2 profits of owner i for $i = 2, 3$ if he unilaterally rejects owner 1's bid whilst the other owner does not. It follows that owner 1 has to pay at least $2\hat{\pi}$ in order to induce owners 2 and 3 to accept the offer. Thus, a merger wave that results in complete

monopolization is an equilibrium as long as the following holds:

$$\pi_{mon} - \hat{\pi}_1 \geq 2\hat{\pi} + \phi \tag{4}$$

Given that (4) holds, owner 1 will pay the least possible amount to owners 2 and 3 which still induces them to sell. That is, owner 1 will pay $2\hat{\pi} + \phi$ at the equilibrium. Let owner 1's gain from the merger wave, as compared to not acquiring any firms, be denoted by:

$$G \equiv \pi_{mon} - (2\hat{\pi} + \phi) - \hat{\pi}_1$$

It follows that $G \geq 0$ if and only if

$$\phi \leq \hat{\phi} \equiv \pi_{mon} - 2\hat{\pi} - \hat{\pi}_1 \tag{5}$$

Whilst comparing the scenarios, we say that the merger wave is more likely to occur if G is non-negative for a greater range of negotiation costs, ϕ. In other words, the merger wave is more likely to occur the greater is $\hat{\phi}$.

PROPOSITION 1: *Given Scenario 1, a merger wave is more likely to occur under segmented markets than under integrated markets.*

PROOF: For notational convenience, let subscripts S and I denote segmented markets and integrated markets respectively. It follows that

$$\pi_{mon}|_S = \pi_{mon}|_I \tag{6}$$

$$\hat{\pi}_1|_S = \hat{\pi}_1|_I \tag{7}$$

and

$$\hat{\pi}|_S < \hat{\pi}|_I \tag{8}$$

In (6) and (7) , the equality holds because, for identical countries, the monopoly and Cournot oligopoly equilibrium outcomes with segmented markets are identical to those with integrated markets, that is, with and without price discrimination across the countries.

The inequality in (8) follows from Lemma 2 and Assumptions 3 and 3'. Lemma 2 shows that by unilaterally refusing to sell his firm, an owner faces a lower market price under segmented markets than under integrated markets. This is because owner 1, under segmented markets, subsequent to the acquisition in market i increases the quantity sold in market j, as shown in the proof of Lemma 2 (see appendix), whereas under integrated markets, he lowers quantity sold in both countries. This, together with Assumptions 3 and 3', imply that the output of the outsider to the merger falls (rises) under segmented (integrated) markets due to the merger of the other two firms. Therefore, an owner, by unilaterally refusing to sell his firm, earns less under segmented markets than under integrated markets.

From (6) , (7) and (8) , it follows that

$$\hat{\phi}|_S > \hat{\phi}|_I \tag{9}$$

Proposition 1 follows directly from (9) . ■

Proposition 1 states that a merger wave will occur for a larger range of negotiation costs, ϕ, under segmented markets than under integrated markets. That is, when markets are segmented, acquisitions by the MNE are more likely to occur than when the markets are integrated. This is because the cost of acquiring each firm is lower due to Lemma 2 under segmented markets than under integrated markets.

In Proposition 1, I have assumed that owner 1 simultaneously bids for all local firms. Would $\hat{\pi}$ be any different if owner 1 moved sequentially, that is, acquiring owner i's firms only after owner j's firms had been acquired and Stage 2 profits realized? Let π_2 be the duopoly profits from market A that owner 2 would obtain by refusing to sell when owner 1 bids for owner 2's firms only. That is, π_2 is owner 2's opportunity cost of selling out. Owner 3's opportunity cost, once owner 2's firms have been acquired is given by $\hat{\pi}$, as in the simultaneous move game. That $\pi_2 > \hat{\pi}$ follows directly from Lemma 2. In this case, both owners 2 and 3 compete to be the first to sell out. This process reduces each of their reservation prices to $\hat{\pi}$. Thus, the sequential move acquisition game has the same outcome as the simultaneous move game described in this paper.

Proposition 1 focuses on the case with three owners in order to present the main message of the paper as clearly as possible. Next, I turn to the more general case where there exist multiple

owners of local firms in each country. Proposition 2 extends the main result stated by Proposition 1 to the case where owner 1 wishes to acquire firms from a single owner in each country, even though there may exist more owners of local firms in each country.

PROPOSITION 2: *For $n_A = n_B$ and $P_A(.) = P_B(.)$, simultaneous acquisitions by owner 1 from a single owner in each market, are more likely to occur under segmented markets than under integrated markets.*

PROOF: The proof of Proposition 2 is a straightforward extension of that of Proposition 1 and is available in the appendix.

Proposition 2 focuses on the case where owner 1 wishes to acquire firms owned by a single owner in A and by a single owner in B, even though there may exist other owners in these countries. The following proposition allows for the possibility that owner 1 acquires firms from multiple owners in either one or both countries and that the countries are non-identical. Consider two cost functions, $C_1(.)$ and $C_2(.)$ with $C_1''(.) < C_2''(.)$. The cost function $C_2(.)$ is said to be "more convex" than $C_1(.)$.

PROPOSITION 3: *The more convex the cost function, the more likely that simultaneous acquisitions across both markets of a given number of firms occur under segmented markets relative to integrated markets.*

Under segmented markets, there are two counteractive effects of simultaneous acquisitions of firms in both countries on the equilibrium price in each country. Effect 1: The acquisition of the firms in j decreases the price level in i, as per Lemma 2. Effect 2: The acquisition of firms in i increases the price level in i, also as per Lemma 2. The magnitude of Effect 1 (Effect 2) is increasing (decreasing) in the degree of convexity of the cost function. This is because, the greater the convexity of the cost function, the lower the post-acquisition marginal cost of owner 1 and therefore, the greater the post-acquisition output of owner 1. By a similar argument as in the proofs of Propositions 1-2, it follows that Effect 1 (2) reduces (increases) the price that owner 1 needs to pay to acquire each firm. Ceteris paribus, the more convex the cost function, the greater is Effect 1 relative to Effect 2. If the cost function is sufficiently convex, Effect 1 dominates Effect 2. That is, each owner, if he unilaterally refuses to sell out, faces a negative externality from the

acquisition of the other firms. On the other hand, under integrated markets, from Lemma 2 (ii), only Effect 2 exists, although the magnitude of Effect 2 is smaller the more convex the cost function. That is, each owner, if he unilaterally refuses to sell out, always faces a positive externality from the acquisition of the other firms under integrated markets.

Therefore, if the degree of convexity of the cost function is beyond a given threshold, owner 1 needs to pay a lower price to acquire each firm under segmented markets than under integrated markets. Proposition 3 follows.

Although for ease of exposition, Propositions 1-2 have been derived under the assumption of identical countries, the main intuition carries through to cases where the two countries have different demand functions, as illustrated in the following section. This is because Lemma 2, which drives the result, holds for countries with asymmetric demand functions. Proposition 3 states that the main result (that cross-border merger waves are more likely to occur when markets are segmented rather than integrated) is more likely to hold the more convex the cost function faced by the firms in the industry, regardless of asymmetries across countries in terms of demand conditions and number of firms.

It is also straightforward to extend Lemma 2 to the case where more than two countries are being served by owner 1, where an acquisition in one of the countries would increase the quantity sold by owner 1 in all other markets.

Although for ease of exposition, all owners apart from 1 are assumed to possess purely local firms before they are acquired, it is straightforward to show that Lemma 2 extends to cases where these firms do export but each of their export volumes before they are acquired is sufficiently lower than that of the n_1 firms originally owned by owner 1 due to factors exogenous to the model. Thus, Propositions 1-3 may hold in these alternative settings.

In the presence of multiple acquirers, the acquirers may compete with each other to acquire the local firms, bidding up their price and countering the effect of Lemma 2 on the price that local owners are willing to accept to sell out (see, for example, Toxvaerd (2008) for a model of endogenous acquisitions with multiple acquirers). However, such competition amongst acquirers would occur under both segmented as well as integrated markets, such that when the two scenarios are compared, similar results hold as per Propositions 1-3.

4 Implications for merger policy

This section discusses the policy implications and the role of antitrust authorities within the context of this model . First, let us consider the effects of a given acquisition of M firms in A by owner 1.

COROLLARY 1: *Following the acquisition of M firms in A by owner 1,*
(i) *under segmented markets, consumer surplus in country A (B) falls (rises).*
(ii) *under integrated markets, consumer surplus in both countries fall.*
PROOF: This follows directly from Lemma 2. ■

Let us suppose that, in line with the recent trend both in the US and in the EU, the antitrust authorities use the consumer surplus standard (Whinston (2006)). If the acquisition of M firms by owner 1 is being reviewed by a national antitrust authority (that of country A), then, as per Corollary 1, it will be rejected. An interesting case arises if the merger is being reviewed by an international antitrust authority such as the European Commission (EC). Suppose that both A and B are EU Member States. If the EC's policy is to only approve mergers that are Pareto improving, then again, this merger will be rejected.

However, if the EC aims to maximize aggregate consumer surplus across all member states, then this merger might be approved. Next, I provide an example that illustrates this result.

Example 1 *Consider three owners. Owner 1 owns firm 1 that sells its product in both A and B. Owner 2 (3) owns a local firm in A (B) denoted by firm 2 (3). Let inverse demand in each country be given by:*

$$P_i(Q_i) = \begin{cases} a - Q_i \text{ for } i = A \\ b - Q_i \text{ for } i = B \end{cases}$$

Let the cost function of each firm be given by:

$$C(q_i) = \frac{1}{2}(q_i)^2 \text{ for } i = 1, 2, 3$$

where q_i is the total output of firm i. If no acquisitions occur, owner 1's profit maximization problem

is given by:

$$\max_{q_{1A},q_{1B}} \left(a - \left(q_{1A} + q_{2A}\right)\right) q_{1A} + \left(b - \left(q_{1B} + q_{3B}\right)\right) q_{1B} - \frac{1}{2}\left(q_{1A} + q_{1B}\right)^2$$

Owner 2's profit maximization problem is given by:

$$\max_{q_{2A}} \left(a - \left(q_{1A} + q_{2A}\right)\right) q_{2A} - \frac{1}{2}\left(q_{2A}\right)^2$$

Owner 3's profit maximization problem is given by:

$$\max_{q_{3B}} \left(b - \left(q_{1B} + q_{3B}\right)\right) q_{3B} - \frac{1}{2}\left(q_{3B}\right)^2$$

Subsequent to the acquisition of firm 2 by owner 1, owner 1's profit maximization problem is given by:

$$\max_{q_{1MA},q_{1MB}} \left(a - q_{1MA}\right) q_{1MA} + \left(b - q_{1MB} - q_{3MB}\right) q_{1MB} - \left(\frac{1}{2}\left(q_{1MA} + q_{1MB}\right)\right)^2$$

Owner 3's profit maximization problem is given by:

$$\max_{q_{3MB}} \left(b - \left(q_{1MB} + q_{3MB}\right)\right) q_{3MB} - \frac{1}{2}\left(q_{3MB}\right)^2$$

It can be shown that all pre- and post-acquisition equilibrium quantities are strictly positive if and only if $a \in (\underline{a}, \bar{a})$ *with* $\underline{a} \equiv 0.375b$ *and* $\bar{a} \equiv 2.666\,7b$. *Moreover, the change in the quantity sold in A due the acquisition of firm 2 by owner 1,* $Q_A - Q_{MA}$, *is strictly positive for all a such that* $a \in (\underline{a}, \bar{a})$. *That is, the quantity in A falls due to the merger for all* $a \in (\underline{a}, \bar{a})$, *implying that the price in A rises due to the merger. The change in the quantity sold in B due to the acquisition of firm 2 by owner 1,* $Q_B - Q_{MB} < 0$ *for all* $a, b > 0$, *implying that the price in B falls due to the merger. Thus, this example is in line with Lemma 2. Moreover, it can be shown that the sum of the changes in consumer surplus across both countries due to the acquisition of firm 2 by owner 1,* $\sum_{i=A,B}\left(CS_i - CS_{Mi}\right)$, *is strictly negative for all a, b such that* $a \in (\underline{a}, \hat{a})$ *where* $\hat{a} \equiv 0.62b$. ■

Example 1 illustrates the following.

RESULT 1: *If the country where the acquisition is realized is sufficiently small relative to the other,*

under segmented markets, the aggregate consumer surplus across both countries increases due to a single acquisition.

One of the main justifications behind establishing an international antitrust authority, such as the EC, is that it has the ability to maximize joint welfare across all countries under its jurisdiction, an objective that cannot be reached with national antitrust authorities which behave non-cooperatively. However, it has been observed that the EC uses a Pareto improving standard when taking its decisions.[20] The policy implication of Result 1 is that if an international antitrust authority disallows all mergers that are not Pareto improving across countries (using the consumer surplus standard), then it will not maximize aggregate consumer surplus of all countries under its jurisdiction, given that some countries have considerably larger markets than others. This is because the magnitude of the unrealized gain in consumer surplus in countries other than the one where the acquisition occurs may outweigh any losses of consumer surplus within that country.

Moreover, within the context of this model, the antitrust authority would choose to approve the merger in the smaller of the two countries only. Such a policy may not be politically feasible to implement since smaller countries systematically lose at the expense of larger ones, unless some mechanism for redistributing the gains of the larger county is designed to work alongside the merger policy.

Now, let us consider the welfare implication of complete monopolization. It is straightforward to show the following in Example 1.

RESULT 2: *Regardless of segmented or integrated markets, complete monopolization results in lower consumer surplus for each country compared to the equilibrium with no acquisitions.*

Results 1 and 2, together, imply that the antitrust authority may be faced with an interesting dilemma when the cost function of the merger participants is convex. In isolation, one or both of the acquisitions (owner 1 buying firms 2 and 3) increase aggregate consumer surplus. However, taken

[20] For example, in 2000, the EC blocked Volvo's proposal to acquire Scania AB (Volvo's largest Swedish competitor in the market for trucks and buses) on the basis that Volvo/Scania would obtain too large a market share in its home market (EC decision 15/03/2000: Case No/ COMP/M.1672 –Volvo/Scania). More specifically the investigation was limited to the five countries (Sweden, Norway, Finland, Denmark and Ireland) where the creation of a dominant position was found (see Ivaldi and Verboven (2005)). This decision faced criticism from multiple sources. E.g. Volvo claimed that Sweden only takes up about 5% of its business and that the merger might have led to lower prices for consumers in other Member States with larger markets (Hemmingsson (2002)).

together, the two acquisitions result in complete monopolization of the industry, reducing consumer surplus to a level below that attained if none of the acquisitions are allowed. Provided that the antitrust authority wishes to maximize aggregate consumer surplus, it would like to approve one of the mergers but not both. This may be particularly difficult for developing countries to achieve since they may lack strong institutions such as antitrust authorities.

5 Trade liberalization

Thus far, the paper has focused on the free trade equilibria under two different scenarios, segmented and integrated markets. Now consider the case under segmented markets where there exists a per unit tariff, t, to be paid by the exporter to either country A or B. The effect of trade liberalization[21], that is, reducing t, depends on the location of firm 1 (whether in A, B or in a third country), due to the tariff jumping effect. Depending on firm 1's location, it may not be profit maximizing for owner 1, in Stage 2, to equally split output across all the firms that belong to him for any $t > 0$. Moreover, the effect of trade liberalization depends on the functional forms of demand and cost. Next, I provide an example where trade liberalization triggers a cross-border merger wave.

Example 2 *Let there be three owners. Owner 1 owns a single firm located in A and serving both markets. Owner 2 owns a single local firm in A. Owner 3 owns two local firms in B. Let inverse demand in each country be given by:*

$$P_i(Q_i) = d - Q_i \text{ for } i = A, B$$

Let the cost function of each firm be given by:

$$C(q_i) = \frac{1}{2}(q_i)^2 \text{ for } i = 1, ..., 4$$

where q_i is the total output of firm i. Additionally, owner 1 pays a tariff, t, per unit exported from one country to another. Let owner 1 move sequentially. First firm 2 in A is acquired, then Stage 2 profits are realized, and finally firms 3 and 4 in B are simultaneously acquired by owner 1. In this

[21] Note that "trade liberalization" in this context refers to a reduction in t and is not equivalent to closer "economic integration". That is, this section focuses on the case where, even as t is reduced, the markets remain segmented such that price discrimination across A and B continues to be possible.

case, since firm 1 is located in A, in line with our previous analysis, it is indeed profit maximizing for owner 1, in Stage 2, to equally split output across the two firms that belong to him subsequent to the acquisition of firm 2, despite the presence of the tariff. Also, once complete monopolization occurs, the two countries are identical such that owner 1 does not have any incentive to export to either country. Within this example, it is straightforward to show that all quantities (pre- and post-acquisition) are strictly positive for $t < t_{\max} \equiv 0.35d$ *and that the gain to owner 1 from monopolization is given by:*

$$G = \pi_{mon} - \pi_2 - \pi_3 - \phi - \pi_1$$

where π_1 *is owner 1's profit if it does not acquire any firms, and* $\pi_2(\pi_3)$ *is the opportunity cost of owners 2 (3) of selling out to owner 1. It is straightforward to show that* $\frac{\partial G}{\partial t} = \left(-\frac{1}{396\,050}\right)(257\,105t - 23\,882d)$. *Thus, for all* $t \in [0.093d, t_{\max}]$, *we have that* $\frac{\partial G}{\partial t} < 0$.■

Example 2 illustrates the following.

RESULT 3: *In Example 2, trade liberalization, in the presence of market segmentation, renders a merger wave more likely given that the pre-liberalization tariff level is sufficiently high, that is,* $t \in [0.093d, t_{\max}]$.

Thus trade liberalization in the form of tariff cuts may trigger merger waves, provided that markets remain segmented. In this case, the benefits of trade liberalization would be reduced and could even be overturned, in the absence of intervention by an antitrust authority. The policy implication of the above is that it may be necessary to ensure that trade liberalization, in the form of tariff reductions, is accompanied by closer economic integration in order to avoid anticompetitive effects arising from acquisitions. This is a more pressing concern for developing countries or emerging markets which may lack effective merger policies, given that MNEs are increasingly acquiring firms in such economies. Moreover, in such cases, "trade liberalization" has the opposite effect as that of "economic integration" since as per Propositions 1-3, the latter hinders the realization of cross-border merger waves. This dichotomy between the roles played by "trade liberalization" and "economic integration" has not been accounted for in the existing empirical literature on cross-border merger waves.

6 Conclusion

By introducing market segmentation, this paper reverses a key result well established in the existing merger literature which has mainly focused on the scenario where the industry in question serves a single integrated market.

The paper shows that under segmented markets, a merger may inflict a negative externality on the non-merging firms. This contradicts the classic intuition derived in Stigler (1950) and the ensuing IO literature built around this seminal work (such as Salant, Switzer and Reynolds (1983) and Kamien and Zang (1990). The new insight generated by this reversal of the existing intuition is that acquisitions undertaken by a multinational firm are more likely to occur in industries where firms face strictly convex cost functions and serve segmented markets rather than a single integrated market. In this case, within a two-country model, the paper shows that when a multinational firm acquires a local firm in one of the markets, the price in that market rises but the price in the other falls. This decreases the profit that the local firm in the other market would obtain if it remained outside the merger, making it cheaper to acquire. This mechanism does not function if the industry serves a single integrated market, revealing a new rationale for reducing frictions between markets in order to create a single integrated market (as, for example, per the goals of the EU).

Developing countries and emerging markets should be most cautious when dealing with industries possessing these characteristics (segmented markets and convex costs), since they may lack the necessary institutions to contain monopolization of these industries by MNEs.

When markets are segmented, this paper shows that, since a merger intensifies price discrimination across the different markets, there will be some winners and some losers (in terms of consumers located in different markets) from the same merger such that the approval of a merger may need to be accompanied by some form of redistribution of the gains. Moreover, if antitrust authorities aim to maximize consumer surplus across multiple segmented markets, the paper shows that they should not restrict their approvals to only those mergers which are Pareto improving. This is because, as long the markets are sufficiently asymmetric with regard to their demand conditions, aggregate consumer surplus across markets increases due to an acquisition.

Moreover, these results gain importance in light of two pieces of well documented empirical evidence. First, market segmentation across countries appears to be prevelant due to the observed

price discrimination across different destinations by exporting firms from different source countries including the US, UK, Japan, Germany, France and Italy. Second, cross-border mergers are observed to occur more frequently in service industries (which is a prime example of an industry where markets are naturally segmented) than in manufacturing and primary industries, in line with the merger process outlined in this paper.

Appendix:

Proof of Lemma 2

Proof of Part (i)

If no acquisitions occur, the profit of owner i in period 2, π_i, is given by the following:

$$\begin{aligned}
\pi_1 &= P_A(Q_A)\, q_{1A} + P_B(Q_B)\, q_{1B} - n_1 C\left(\frac{1}{n_1}(q_{1A} + q_{1B})\right) \\
\pi_i &= P_A(Q_A)\, q_{iA} - n_i C_i\left(\frac{1}{n_i} q_{iA}\right) \quad \text{for } i \in [2, ..., m_A] \\
\pi_i &= P_B(Q_B)\, q_{iB} - n_i C_i\left(\frac{1}{n_i} q_{iB}\right) \quad \text{for } i \in [m_{A+1}, ..., m]
\end{aligned}$$

Subsequent to the acquisition of M by owner 1, the profit of owner i in period 2, π_{Mi}, is given by the following:

$$\begin{aligned}
\pi_{M1} &= P_A(Q_{MA})\, q_{M1A} + P_B(Q_{MB})\, q_{M1B} - (n_1 + M) C\left(\frac{1}{n_1 + M}(q_{1A} + q_{1B})\right) \\
\pi_{Mi} &= P_A(Q_{MA})\, q_{MiA} - n_{Mi} C_i\left(\frac{1}{n_{Mi}} q_{MiA}\right) \quad \text{for } i \in K \cap \{2, ..., m_A\} \\
\pi_{Mi} &= P_B(Q_{MB})\, q_{MiB} - n_{Mi} C_i\left(\frac{1}{n_{Mi}} q_{MiB}\right) \quad \text{for } i \in K \cap \{m_A + 1, ..., m\}
\end{aligned}$$

The proof consists of two steps. Step 1 shows that holding total output sold in A constant at the pre-merger output level, Q_A, the post-merger quantity sold by owner 1 in B rises due to the merger. Step 2 shows that given a rise in the quantity sold by owner 1 in B, the total quantity sold in A must fall below the pre-merger level.

Step 1:

Suppose that the output produced at each firm owned by owner 1, subsequent to the merger, is held constant at the pre-merger output levels. If no acquisitions occur, the marginal cost is given by:

$$C'\left(\frac{1}{n_1}\left(q_{1A}+q_{1B}\right)\right) \tag{10}$$

If owner 1 acquires M firms, by Lemma 1, the marginal cost is given by:

$$C'\left(\frac{1}{n_1+M}\left(q_{1A}+q_{1B}\right)\right) \tag{11}$$

From Assumption 1, it follows that

$$C'\left(\frac{1}{n_1}\left(q_{1A}+q_{1B}\right)\right) > C'\left(\frac{1}{n_1+M}\left(q_{1A}+q_{1B}\right)\right)$$

Now consider the first order necessary condition of owner 1 with respect to the output sold in B. In (12), q_{1A}, q_{1B} and Q_B denote that values that satisfy owner 1's first order necessary condition if there are no acquisitions by owner 1.

$$P_B\left(Q_B\right)+q_{1B}P'_B\left(Q_B\right)-C'\left(.\right)=0 \tag{12}$$

By Lemma 1, $C'\left(.\right)$ falls from (10) to (11) due to the acquisition of the M firms by owner 1. Therefore, Lemma 1, together with Assumption 2, implies that, subsequent to the acquisitions, holding constant the output sold in A by all firms at their pre-merger levels, owner 1's post-acquisition first order necessary condition is only satisfied if the output sold by owner 1 in B rises to a level above q_{1B}.

Step 2:

Suppose that the post-acquisition first order necessary condition of owner 1 with respect to q_{1A} is satisfied at the pre-acquisition output levels, q_{1A} and q_{1B}, such that we have

$$P_A\left(Q_A\right)+q_{1A}P'_A\left(Q_A\right)-C'\left(\frac{1}{n_1+M}\left(q_{1A}+q_{1B}\right)\right)=0 \tag{13}$$

This contradicts Step 1, since Step 1 shows that if total output sold in A is held constant at the pre-merger output level, Q_A, then post-merger output sold by owner 1 in B, $\hat{q}_{1B}$, must exceed q_{1B}. Replacing q_{1B} with $\hat{q}_{1B}$ in (13) , it follows from Assumption 2 that (13) is only satisfied if the output sold by owner 1 in A falls to a level below q_{1A}.

Steps 1-2 together show that, starting with the pre-acquisition output levels at each firm, post-acquisition, owner 1 has an incentive to decrease its sales in A and increase its sales in B. Let q_{M1A} and q_{M1B} be the post-merger equilibrium quantities sold by owner 1. Steps 1-2 imply that

$$q_{M1A} < q_{1A} \tag{14}$$

and

$$q_{M1B} > q_{1B} \tag{15}$$

Farrell and Shapiro (1990) consider an exogenous change in the output of firm i in an N firm Cournot oligopoly. If the other firms' outputs adjust to re-establish a Cournot equilibrium and Assumptions 2 and 3 hold, their first lemma shows that the aggregate output moves in the same direction as firm i's output. In this case, due to the acquisition of the M firms by owner 1, there is an exogenous decrease in the output of owner 1 in A, as shown by (14). Therefore, by Farrell and Shapiro (1990), total output in A decreases. This implies the following:

$$P(Q_A) < P(Q_{MA})$$

Conversely, due to the acquisition of the M firms by owner 1, there is an exogenous increase in the output of owner 3 in B, as shown by (15). Therefore, by Farrell and Shapiro (1990), total output in B increases. This implies the following:

$$P(Q_B) > P(Q_{MB})$$

Proof of Part (ii):

This proof is identical to that of Proposition 3 in Kamien and Zang (1991). ■

Proof of Proposition 2:

Consider the possibility of an equilibrium where owner 1 acquires all firms owned by a single owner, say owner a, in A, and all firms owned by a single owner, say owner b, in B. Let $\bar{\pi}_1$ be the Stage 2 profits of owner 1 if he is successful in acquiring these firms. Let $\tilde{\pi}_1$ be the Stage 2 profits of owner 1 if he does not acquire any firms. Let $\bar{\pi}_a$ ($\bar{\pi}_b$) be the Stage 2 profits of owner a (b) if this owner unilaterally rejects owner 1's bid whilst the other owner does not. It follows that owner 1 has to pay at least $\bar{\pi}_a$ ($\bar{\pi}_b$) in order to induce owner a (owner b) to accept the offer. We have that

$$\bar{\pi}_i|_S < \bar{\pi}_i|_I, \quad i = a, b \tag{16}$$

The inequality in (16) follows from Lemma 2 and Assumptions 3 and 3'. The discussion is identical to that of the proof of Proposition 1. Let owner 1's gain from acquiring the firms of owners a and b be denoted by:

$$\bar{G} = \bar{\pi}_1 - \bar{\pi}_a - \bar{\pi}_b - \phi - \tilde{\pi}_1$$

We note that since $n_A = n_B$ and $P_A(.) = P_B(.)$, we have that

$$\bar{\pi}_1|_S = \bar{\pi}_1|_I \tag{17}$$

and

$$\tilde{\pi}_1|_S = \tilde{\pi}_1|_I \tag{18}$$

We have $\bar{G} \geq 0$ if and only if

$$\phi \leq \bar{\phi} \equiv \bar{\pi}_1 - \bar{\pi}_a - \bar{\pi}_b - \tilde{\pi}_1 \tag{19}$$

It follows from (16), (17) and (18) that

$$\bar{\phi}|_S > \bar{\phi}|_I \tag{20}$$

Proposition 2 follows directly from (9). ■

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