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On the Effects of Economic Integration on Greenfield Investments and Cross-border Mergers and Acquisitions Location Pattern

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Abstract

This paper investigates the linkages between economic integration and horizontal Foreign Direct Investment (FDI) location. In a three-country partial equilibrium model with differentiated Cournot and Bertrand competition, we incorporate the two main FDI modes: Greenfield Investment (G.I.) and cross-border Merger and Acquisition (M&A). We also allow regionally-based firms to invest outside the regional area. Economic integration characterized by internal and external transaction costs may affect entry modes (G.I. vs. M&A) and its location (intra - extra regional flows). Our findings suggest the existence of complex linkages between economic integration and FDI location pattern depending simultaneously on set-up fixed costs, the competitive mode of market interaction and the product differentiation. However, the role of cross-border M&A as well as the importance of FDI outflows from the regional area is highlighted.

• **JEL Classification:** F15, F23, L10, L13, G34

• **Key words:** FDI, integration, location, entry mode, mergers and acquisitions

I. Introduction

In recent years, a wave of regional integration agreements has surged. This wave has reshaped multinational companies strategies as several empirical studies have

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confirmed it[1]. Theoretical works usually emphasize two opposite consequences of economic integration on horizontal foreign direct investments (FDI). If FDI is motivated by tariff-jumping arguments, regional integration is expected to decrease FDI flows and to encourage cheaper exports. Conversely, a reduction in barriers to trade should increase FDI if the major motive for internationalization is the exploitation of intangible assets (Blomström and Kokko, 1997). Many authors[2] have more precisely examined the linkages between regional FDI inflows and economic integration. Norman and Motta (1993, 1996) or Neary (2002) have particularly enriched economic analysis by examining the FDI pattern in a three-country model framework. Indeed, firms could react differently to the formation of a regional area according to whether they are located within (insiders) or outside this trade area (outsiders). Norman and Motta (1996) emphasize the impact of changes in market accessibility and external barriers to trade on outsider and insider FDI in a Cournot setting with identical production costs among competitors. In a previous work (1993), they suppose asymmetric production cost but restrict their analysis to the FDI strategy of the outsider firm. Neary (2002) also focuses on the FDI strategy of the outsider firm putting forward tariff-jumping and export platform motives.

However, to our knowledge, the incidence of economic integration on FDI outflows from the regional area has been not studied although FDI substitution effects within and outside the region may appear because of financial or organizational constraints (Blomström and Kokko, 1997). Consider for instance the case of the NAFTA (North America Free trade agreement) signed by the USA, the Canada and Mexico in 1992, and really implemented in 1994. During the corresponding period 1990-1997, a significant increase in the ratio U.S. extra-regional FDI (to other OECD countries) over U.S. intra-regional FDI (to Mexico and Canada) is observed. This ratio[3] goes from 2.4 in 1990 to 3.7 in 1997. It remains to understand to what extent this regional integration agreement could have contributed to this evolution.

In addition, almost all these papers in international economics traditionally

[1]See for instance Dunning (1997) for the European community.

[2]Smith (1987) or e.g. Horstmann and Markusen (1992) study the impact of economic openness on market structure.

[3]Source: OECD (Authors calculation).

consider FDI only as a Greenfield Investment[4] (G.I.). They rule out cross-border mergers and acquisitions (M&A) strategies. However, this simplifying assumption has become questionable, moreover as the G.I. vs. M&A distinction may imply important consequences in term of economic policy (WIR, 2000). Indeed, FDI have been submitted to a major change in composition since the beginning of the nineties. There has been an increasingly share of cross-border M&A in FDI (at the expense of G.I.). 53.7% of FDI transactions value in 1993 took the form of M&A (Kang and Johansson, 2000). In 2000, it represented almost 85%. The total number of cross-border M&A grew very quickly from 4 149 transactions in 1991 to 5 373 transactions in 1998 (with a peak of 6 310 in 1995). Almost 90% of these cross-border M&A concerned developed country firms. It consisted mainly in horizontal consolidation. In 1999, 70% of cross-border M&A value corresponded to horizontal FDI. In 1989, this share was only of 59%. Moreover, it concerned almost all sectors. Industries such as automobile, steel, pharmaceuticals or e.g. petroleum experienced a very high M&A activity.

This recent M&A activity corresponds to a new wave of industrial restructuring. Many firms have strengthened their position at an international level. In terms of value and number of deals, cross-border M&A have accounted on average for a quarter of all M&A in the 1990s. To this respect, it is interesting to highlight a historic parallel between M&A activity and the formation of national or regional unified markets. For instance, the first U.S. M&A wave goes back to the period 1887 - 1904 (WIR, 2000). It coincided with the formation of the American market[5]. Firms were looking for M&A to reach economies of scale and above all to restore their market power. With the removal of internal national barriers to trade, firms coped suddenly with an intensified competition and larger outlets.

Two main motives drive companies to undertake M&A: the search for market power or/and efficiency gains. While M&A incentives have been largely analysed in a closed economy framework, cross-Border M&A have received paradoxically scare attention as Lipsey (2000) rightly pointed out. Only very recently some authors have begun to analyse theoretically cross-border M&A flows and notably

[4]We define G.I. as the establishment of a new production facility in contrast to cross-border M&A where a firm purchases shares of an existing foreign firm. Note that we will use indistinctly the terms merger and acquisition.

[5]It stemmed from substantial improvements in transport and communication infrastructure (railroad and telegraphic networks, etc.). Nevertheless, new mass production technology, financial market development (etc.) also contributed to this expansion.

their interactions with G.I. For instance, in a two-country model with Cournot competition and homogeneous goods, Horn and Persson (2001a) investigate the impact of a transport cost variation on national and cross-border M&A. Bjorvatn (2001) studies the profitability of cross-border M&A under Cournot competition and homogenous goods. Cross-border M&A enables a foreign firm to access a new host market. Neary (2003) investigates cross-border M&A in a general equilibrium framework. M&A between low-cost firms and higher-cost foreign firm are found to be profitable under Cournot competition. Finally, Norbäck and Persson (2002) emphasize the strategic role of valuable domestic asset in the entry mode choice.

With respect to these previous studies, it remains to explore more accurately to what extent firms adopt different strategies of internationalization with market integration. For instance, in the automobile sector, some multinational firms have undertaken cross-border M&A (e.g. Renault-Nissan or Daimler-Chrysler) to adjust to economic integration while others (such as Peugeot or Toyota) have opted for an internal growth strategy[6].

Therefore, the purpose of our paper is to enlarge the theoretical analysis[7] on linkages between economic integration and horizontal FDI location by relaxing the traditional assumption on the nature of horizontal FDI. In comparison to others studies, we incorporate cross-border M&A and G.I. strategies in a three-country partial equilibrium model framework. Our work addresses a further issue: the impact of regional trade agreement on FDI regional inflows and outflows. Moreover, our framework provides a comprehensive study under Cournot and Bertrand competition with product differentiation, which is important when studying M&A strategies: in a closed economy framework, the profitability of M&A is related to the competitive mode of market interaction.

Our results suggest that the removal of internal and external regional transaction costs plays a role at two different levels: a fall in transaction cost savings (tariff-jumping and export platform motives); a pro-competitive effect on price - quantity equilibrium. These two forces alter deeply not only the FDI entry mode, but also its location. The market structure equilibrium depends on complex linkages which are simultaneously function of set-up fixed costs, the competitive mode of market

[6]Many other factors influence this trade-off such as timing consideration (e.g. first mover advantage) or the production capacity of the industry.

[7]We neglect normative issues. On these questions, see for instance Barros and Cabral (1994) or Falvey (1998).

interaction (Bertrand vs. Cournot competition) and the product differentiation. Nevertheless, the role of cross-border M&A as well as the importance of FDI outflows from the regional area is confirmed.

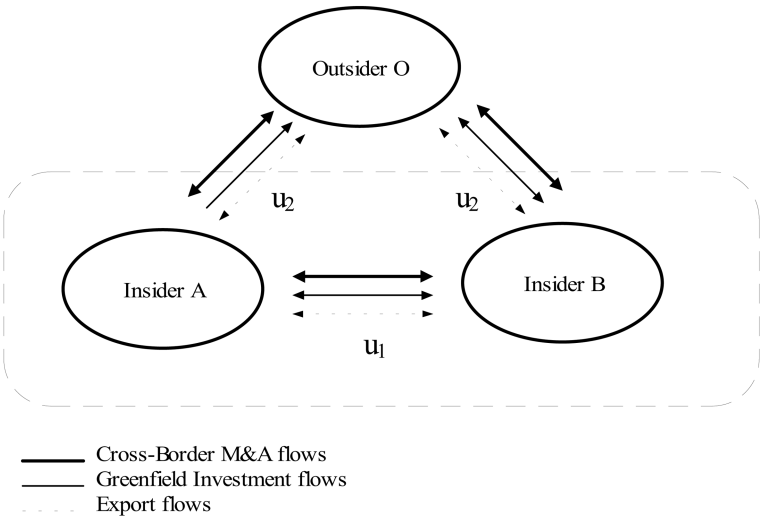
The paper proceeds as follows: in the section II, we present the framework of our model. Then, the section III reports market structure equilibria with economic integration, before concluding.

II. The Model

We consider three countries A, B and O (see figure 1). Each country contains one single firm. We denote a, b and o the parent company established respectively in countries A, B and O. Countries A and B are involved in a regional agreement (insiders). The country O is a non-member country (outsider). Economic integration is characterized by distinct intra-regional transaction costs u_1 and extra-regional transaction costs u_2 ($u_2 \geq u_1$). Transaction costs may include not only tariff and non- tariff barriers to trade but also transport costs.

Each firm (insiders and outsider) has three ways of servicing foreign markets. A firm may export, build a new plant abroad (G.I.) or merge with a local company (M&A). However, we exclude firms from owning more than two factories: organisational costs could deter companies from managing too many plants.

Figure 1. A insider-outsider three countries model



Imperfect financial markets could also constrain their capacity of funding investments (Stevens and Lipsey, 1992). As a result, FDI within and outside the region will be regarded as substitute.

Therefore, we model a three-stage game[8] : first, Insiders or insider outsider firms decide whether or not to merge. Second, when two firms have previously merged, the non-participant firm chooses to build or not a plant abroad. If no M&A has happened, all firms simultaneously decide to set up or not a plant overseas. Third, firms compete through quantities or prices. We use the subgame-perfect Nash equilibrium as an equilibrium concept. We proceed by backward induction.

We denote X the market structure. X is written $\{H_a, H_b, H_o\}$. The terms into parenthesis designate respectively the strategy of the firm a, b and o.$H_i = \{E, M, GJ\}$ where i = $\{a, b, o\}$. We use the letters E and M as the export and M&A strategies. GJ expresses the location of a G.I. in country J with J = $\{A, B, O\}$. Thus, for instance, (*E, E, E*) means that no firm merges. Firms supply all foreign markets through exports. (*M, M, E*) indicates that firms a and b merge. In the configuration, (*E, E, GB*) the firm o sets up a factory in the country B. Furthermore, $q_i^J(X)$ and $q_i^J(X)$ are respectively the quantity and the price of the good i in country J for the market structure X. $\pi_i(X)$ and $\pi_{ij}(X)$ represent respectively the profit of firm *i* and the joint-profit of firm *i* and *j* in all countries A, B and O. $\pi_i^J(X)$ and $\pi_{ij}^J(X)$ describe profits only in market J. Now, we turn to the specification of each stage, backward.

A1. Stage three: product market interaction

The characteristics of firms and countries are as follows: firms sell symmetrically differentiated goods. They own an exclusive technological knowledge in the production of their particular brand. The utility function of a representative consumer (identical in market A, B and O) is written

$U = \sum_{i=1}^{3} q_i - \sum_{i=1}^{3} \frac{q_i^2}{2} - \alpha \sum_{i=1}^{3} \sum_{j=1}^{3} q_i q_j$ where $i \neq j$, $\alpha \in [0, 1]$ and q_i is the quantity of brand i (Lommerud and Sorgard, 1998). The inverse demand and demand functions are respectively $p_i = 1 - q_i - \alpha \sum_{j \neq 1} q_j$ and $q_i = \frac{(1-\alpha) - (1+\alpha)p_i + \alpha(\sum_{j \neq 1} q_j)}{(1-\alpha)(1+2\alpha)}$.

The parameter α measures the substitutability between products. A low (respectively

[8]The game order is justified by timing considerations. Building a factory requires more time than taking-over a local firm. Therefore, the M&A decision should precede the G.I. one.

high) α means a high (low) product differentiation.

Marginal production costs are normalized to zero[9]. Firms pay only transaction cost when exporting. We set $u_2 \in [u_1, \bar{u}_2]$ and $u_1 \in [0, \bar{u}_1]$ with $\bar{u}_2 = \bar{u}_1 = \frac{3\alpha^2 - \alpha - 2}{\alpha^2 - 3\alpha - 2}$. We hypothesize that each firm finds profitable to export to foreign markets under all market structure configurations[10].

We explore firms' strategic behaviours on these segmented markets under Bertrand and Cournot competition. Bertrand competition is inherently more competitive than Cournot competition (see e.g. Singh and Vives, 1984). Prices and profits at equilibrium are lower and outputs larger in Bertrand competition than in Cournot competition[11].

A2. Stage two: Greenfield Investments

Establishing a plant in a host market allows an investing firm to avoid some transaction costs but incurs an exogenous plant-level fixed cost: the insider firm a (b) may invest in the other partner country B (A) or in the non-partner country O to reduce transaction costs respectively in market B (A) or O (tariff jumping argument; Neary, 2002). Without loss of generality (A and B countries are in a symmetric position), we restrict the outsider firms location choice to country B. By locating in B, o benefits from a better access in B (tariff jumping argument) and A (export platform motives). It now exports to A from B at a lesser transaction cost . However, the investor has then to pay a fixed cost $u_1 (u_2 \geq u_1)$. For analytical purposes, only polar cases are assumed in a first step: $F = 0$; $F > \bar{F}$ (no G.I. for all value of transaction costs). In a second step, we relax this assumption in a standard model framework with homogeneous goods and Cournot competition. Besides, parent companies are assumed to have already incurred the set-up fixed cost of their home country plant.

Choices of G.I. are modelled as a location Nash game: a configuration of G.I.

[9]As a result, this framework is more suited to a North - North integration than a North - South integration.

[10]Even in the worse situation, a firm finds profitable to export. Thus, under Bertrand competition, when the firm b locates in A, the firm o has positive exports to A for $u_2 \in [u_1, \bar{u}_2]$ *and* $u_1 \in [0, \bar{u}_1]$.

[11]Firms have fewer incentives to cut prices in Cournot. Under the Cournot (Bertrand) equilibrium, they choose their optimal output (price) taking the other firms' quantities (prices) as given. Thus, in Cournot (resp. Bertrand) competition, they expect the others to cut (to hold) prices (constant) in response to a fall in its price.

locations is a Nash equilibrium if no firm is encouraged to deviate from her location strategy given other competitors location choices. Formally, H_a^*, H_b^*, H_o^* with $H_i = \{E, GJ\}$ is a Nash equilibrium[12] only if conditions (1), (2) and (3) are respected:

$$\pi_a(H_a^*, H_b^*, H_o^*) \geq \pi_a(H_a^*, H_b^*, H_o^*),\ \forall H_a^*, H_a^* \neq H_a \quad (1)$$

$$\pi_b(H_a^*, H_b^*, H_o^*) \geq \pi_b(H_a^*, H_b, H_o^*),\ \forall H_b^*, H_b^* \neq H_b \quad (2)$$

$$\pi_o(H_a^*, H_b^*, H_o^*) \geq \pi_b(H_a^*, H_b^*, H_o),\ \forall H_b^*, H_o^* \neq H_b \quad (3)$$

When the firm a and o merge (resp. b and o), the firm b (resp. a) then wonder whether to invest in A(B) or in O. When the firm a and b merge, the firm o has to decide to invest or not in B. Firms will invest if the change in their gross profit is superior to the fixed cost incurred.

A3. Stage one: cross-border Mergers and Acquisitions

The Horn and Persson (2001b) approach[13] is used to analyse the endogenous formation of M&A. The M&A stage is modelled as a cooperative game of coalition formation.

Three steps have to be respected.

1. The definition of decisive owners:

Decisive owners are all owners involved in the break-up or the formation of a coalition when comparing two market structures. Compare (M, M, E) with (E, E, E). The decisive owners include a and b. o is supposed not to interfere with this M&A decision (lateral payment is excluded). Now, examine the market structures (M, M, E) and (E, M, M). All firms are defined as decisive owners.

2. The dominance relation and the ranking of ownership structures:

[12]For the sake of simplicity, we rule out some Nash equilibria. A firm chooses a G.I. when she is indifferent between exporting and building a new plant. Besides, a (resp. b) prefers to locate in O when locating in B (resp. A) or in O is strictly equivalent.

[13]It displays some appealing advantages. It remains tractable when dealing with firms endowed with asymmetric characteristics. It does not arbitrary specify the identity of the seller and the buyer, nor the bargaining power.

A market structure X dominates a market structure Y via a decisive group if the sum of decisive owners profit is larger in X than in Y. Take the prior examples.

21. $(M, M, E) \succ (E, E, E) \Leftrightarrow \pi_{ab}(E, E, E) + \pi_b(E, E, E)$.

Firms merge only when their post-merger profits exceed[14] the sum of their profits that they would earn without merging (traditional joint-profit criterion). A M&A has two main effects. First, it reduces competition in all markets where merging firms meet each other. However, in a closed economy setting, such anti-competitive strategy (i.e. higher price - lower quantity sold) could be non profitable. Under Cournot competition, homogeneous goods and no efficiency gains, M&A participants reduce their production level (Salant, Switzer and Reynolds, 1983). The non-participant firms respond by producing more (goods are strategic substitutes), which harms merging firms. It makes the M&A unprofitable when the rise in price, affected negatively by the non-participants' reaction, does not compensate for the decrease in production. Nevertheless, with price competition, the firm's decision variables and prices, which are strategic complements. Merging firms are led to fix a higher price (Deneckere and Davidson, 1985). Non-participants react by raising in turn their price, which reinforces the initial rise in price. These strategic interactions improve both merging and non-merging firm profits. In price-setting games, M&A are always profitable.

Second, M&A imply also rationalization gains. Merging partners rationalise outputs across their plants. They transfer production from the least efficient factory to the most efficient one. Moreover, further efficiency gains are introduced. Once they have merged, each of theirs plants is able to produce the two differentiated goods: we assume perfect knowledge transfers between merging partners (through e.g. cross-patent licensing). Such efficiency gains heighten M&A profitability. It may put an end to Salant et al. paradox (see e.g. Farrell and Shapiro, 1990).

22. $(M, M, E) \succ (E, M, M) \Leftrightarrow \pi_{ab}(M, M, E) + \pi_o(M, M, E) > \pi_{bo}(E, M, M) + \pi_a(E, M, M)$.

The condition of M&A profitability is not sufficient. Industry profits have also to be compared[15]. A M&A deal is struck only if a merging firm (the firm b in this example) does not find an other M&A agreement more satisfactory ($\pi_{ab}(M, M, E)$ vs. $\pi_{bo}(E, M, M)$) and she (here the firm o and a) is not better off by letting her

[14]Merging firms are assumed to agree on a joint profit's share which satisfies all participants.

[15]Again, merging firms are supposed to agree on a joint profits share satisfying all participants.

competitors merge ($\pi_o(M, M, E)$ vs. $\pi_a(E, M, M)$). Non-merging firms may benefit (resp. suffer) from positive (negative) externalities through M&A anti-competition (efficiency) effects (see also Kamien and Zang, 1990)).

This second condition may also been regarded as an auction game where b is the seller, and a and o the buyers. The buyers a and o are ready to pay respectively a maximum price corresponding to $\pi_{ab}(M, M, E) - \pi_a(E, M, M)$ and $\pi_{bo}(E, M, M) - \pi_o(M, M, E)$. They take into account not only the new entitys joint-profit, but also the profit obtained when losing the auction[16].

23. The determination of the market structure equilibrium:

We define undominated market structures as market structures at equilibrium[17]. For instance, suppose that there are four possible market structures: (E, E, E), (M, M, E), (M, E, M), (E, M, M). (M, M, E) is an equilibrium if the following conditions are respected:

$$(M, M, E) \succ (E, M, M) \Leftrightarrow \pi_{ab}(M, M, E) + \pi_o(M, M, E) > \pi_{bo}(E, M, M) + \pi_a(E, M, M)$$

$$(M, M, E) \succ (E, E, E) \Leftrightarrow \pi_{ab}(M, M, E) > \pi_a(E, E, E) + \pi_b(E, E, E)$$

$$(M, M, E) \succ (M, E, M) \Leftrightarrow \pi_{ab}(M, M, E) + \pi_o(M, M, E) > \pi_{ao}(M, E, M) + \pi_b(M, E, M)$$

III. Economic Integration and FDI Location Pattern

First, we comment on the impacts of economic integration on market structure in a general framework. Polar cases (Prohibitive/no plant-level fixed costs) are examined. Second, we extend our analysis to intermediate fixed costs in a standard model (Cournot competition and homogeneous good).

A. Polar cases

Firms lower their variable production costs and thus gain market shares by setting up a new plant abroad. However, they have to pay an additional fixed cost.

[16]The seller has a reservation price equal to zero.

[17]We may find no equilibrium (denoted by 0) or multiple equilibria in some cases: the dominance relation is intransitive since dominance rankings may imply the definition of distinct decisive owners groups.

A1. Prohibitive fixed costs

In this first polar case, it is too costly by definition to build a factory overseas. The M&A is the only available FDI mode. Hence, firms trade off between exports and M&A: only market structures (E, E, E), (M, M, E), (E, M, M) and (M, E, M) may constitute a game equilibrium (figure[18] 2 to 4). Now, we examine the profitability, then the geographic scope of cross-border M&A for prohibitive fixed costs.

A11. The profitability of cross-border Mergers and Acquisitions

A merger is defined as profitable if there is an additional profit for merger participants when merging. For analytical purposes, suppose first that all markets are perfectly integrated[19] ($u_2 = u_1 = 0$). No efficiency gains are expected. We then

Figure 2a, b. High product differentiation

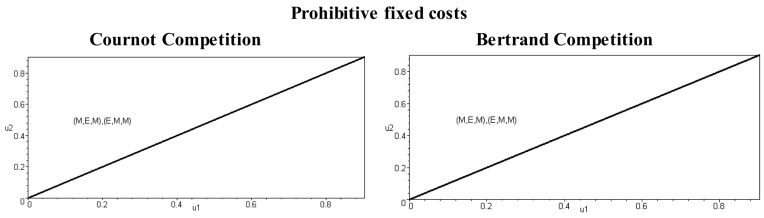


Figure 3a, b. Medium product differentiation.

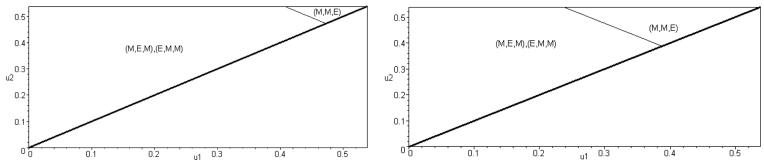
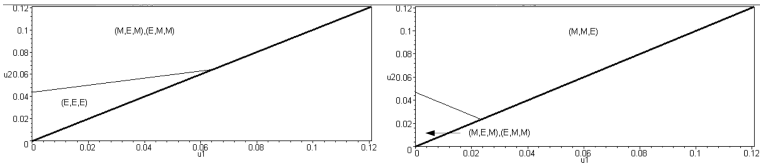


Figure 4a, b. Low product differentiation.



[18]We describe only market structures for transaction costs above or on the diagonal ($u_2 \geq u_1$). In some cases, we may find no equilibrium (0) or multiple equilibria.

[19]For $\alpha = u_2 = u_1 = 0$, the combined equilibrium profits do not vary.

come to the well established Salant et al. paradox[20] with Cournot competition and homogeneous goods ($\alpha = 1$). A merger reduces the joint-profit of participating firms. The non-merging firm reaction harms the M&A strategy. However, a higher product differentiation softens this reaction and its impact (Lommerud and Sorgard, 1998). The change in joint-profit is found[21] to be positive for $\alpha \in [0, 0.55]$. Under Bertrand competition, a M&A is always profitable.

Now, assume positive internal and external transaction costs ($u_2 > 0$, $u_1 > 0$). We first set $\alpha = 0$: there is no strategic product interaction. In this context, M&A are only motivated by rationalization gains: an insider insider – merger enhances merging firms efficiency gains in A and B when u_1 goes up (tariff-jumping motives). Thus, under both Cournot and Bertrand competition, it could be shown that an insider-insider M&A profitability increases with intra-regional transaction costs. In contrast, an insider - outsider merger improves participant firms' efficiency gains and therefore the joint-profit (in A, B and O) with increasing extra-regional transaction costs u_2 (tariff-jumping and platforms motives) but worsens it with intra-regional transaction costs u_1 (in one intra-regional market).

Then, suppose that products are not perfectly substitutable ($\alpha > 0$). M&A (by reducing the number of competitors) and increasing transaction costs (by introducing barriers to trade) may entail anti-competitive effects. In addition, assume that extra-regional transactions are positive ($u_2 > 0$) but that regional markets are perfectly integrated. Thus, we only[22] consider the anti-competitive effect of external transaction cost ($u_1 = 0$ meaning no M&A efficiency effects). An increase in u_2 has two impacts. On the one hand, it reduces competition in market A and B by protecting regionally-established firms. Nevertheless, this anti-competitive effect increases the insiders' profits in markets A and B whether a merger takes place or not. Indeed, under Cournot competition, the non-merging outsider firm exports less to market A and B. Merger participants then increase their supply in regional markets whether they have merged or not. However, these firms expand less their output when merging: they internalize pecuniary externalities, which push them to contract good production (see Annexe A). Therefore, this anti-competitive strategy is profitable under Cournot competition only if goods are distant enough ($\alpha \in [0, 0.55]$),

[20]The variation in joint-profit is equal to -1/24 independently to merging firms' identity.

[21]Further information is available upon request.

[22]All commentaries about anti-competitive effects apply to an Insider – Outsider M&A.

which attenuates the non-merging firm's reaction and its impact. Under Bertrand competition, the outsider sets a higher price when u_2 goes up. The insiders react by increasing their price whether a merger takes place or not. For similar reasons, this rise in price is more pronounced when these firms take the form of a single entity: this anti-competitive strategy is always profitable under Bertrand competition.

On the other hand, an increase in external transaction costs has an impact on the extra-regional market. Merging firms see their combined profit fall in market O with or without M&A (rise in production costs levels). With Cournot competition, participants decrease their production level, but to a lower extent that when they merge. For a low differentiation product (α>0.55), the decrease of participants' profits is lower when merging (inversely for $\alpha \in [0, 0.55]$). However, this result is again sensitive to the strategic variable employed. Under price competition, an increase in u_2 deteriorates always more the participants combined profit when merging. They increase less their prices when merging.

Transaction cost savings and anti-competitive impacts alter simultaneously market structure equilibrium patterns for $\alpha > 0$, $u_1 > 0$ and $u_2 > 0$. For $\alpha = \{0.1, 0.5\}$, M&A (between insiders or insider and outsider) are profitable under Cournot and Bertrand competition (figure 2a, 2b, 3a and 3b). Product differentiation guarantees M&A profitability. When product differentiation is lower, the merger profitability is always positive in Bertrand (figure 4b), but not in Cournot (figure 4a). Only high efficiency gains could make an insider-outsider M&A profitable (high value[23] in u_1 and u_2).

A12. The geographic scope of cross-border Mergers and Acquisitions

The profitability of Cross-border M&A is not a sufficient condition. A firm wonders also with which firm she should merge and whether she should not let her competitors merge. The merging firms' identity is determined by comparing industry profits in an insider-insider M&A case and an insider-outsider M&A case. We denote D this industry profits difference. In imperfect integrated markets[24], the geographic scope of M&A is a function of internal and external transaction costs since they influence the efficiency level in an industry.

[23]Higher external transaction costs mean higher efficiency gains in market A, B and O. Higher internal transaction cost has the opposite effect in market A. However, the former effect is stronger than the latter.

[24]In perfectly integrated markets ($u_2 = u_1 = 0$), D = 0 since product characteristics are symmetric.

Further notations are introduced: $D_1 = [\pi_{ab}(X_2) + \pi_o(X_2)] - [\pi_{ao}(X_3) + \pi_b(X_3)]$ with $X_2 = (M, M, E)$ and $X_3 = (M, E, M)$[25]. $D_1 = D_{11} + D_{12}$ where

$$D_{11} = [\pi^O_{ab}(X_2) + \pi^O_o(X_2)] - [\pi^B_{ao}(X_3) + \pi^B_b(X_3)]$$
$$D_{12} = [\pi^A_{ab}(X_2) + \pi^A_o(X_2)] - [\pi^A_{ao}(X_3) + \pi^A_b(X_3)]$$

M&A modify the firms efficiency. They alter the sensitivity of merging firms' profits to transaction costs (Term D_{11}). Considering this, an insider-outsider merger is always more efficient than an insider-insider merger: $\pi^O_{ab}(X_2) \leq \pi^B_{ao}(X_3)$ is checked since $u_2 \geq u_1$. However, the non-participant firm could be willing to make the deal fail while participants may wish to stay outside from a M&A. Assume an insider-insider merger. Now, insiders pay a transaction cost (u_2) only in the extra-regional market O. Suppose a decrease in u_2: it improves the merging firms' competitiveness in this market. Therefore, insiders have more incentives to merge together. However, a fall in u_2 harms the non-merging firm' profits, which encourages it to outbid to stop this merger. Thus, the impact on the equilibrium outcome is found to be a priori uncertain. The increase in the merging firms joint-profits may or not compensate for the decrease in non-merging firms profits according to product homogeneity and the initial level of transaction costs. Furthermore, the non-participant suffers more from a higher participants competitiveness when products become less differentiated ($\frac{\partial^2 O}{\partial \alpha \partial u_2} > 0$) and competition are under Bertrand rather than Cournot competition ($\frac{\partial^2 D^b_{11}}{\partial \alpha \partial u_2} > \frac{\partial^2 D^c_{11}}{\partial \alpha \partial u_2}$). Compare this merger to an insider - outsider merger between a and o. Now, a and o pay a transaction cost (u_1) only in the regional market B. A decrease in u_1 raises the merging firms' competitiveness in this market but to the detriment of the non-participants profit. The impact on market structure at equilibrium is again ambiguous.

Reversely, anti-competition effects engendered by trade barriers are more important with an insider-insider merger (Term D_{12}): $\pi^A_{ab}(X_2) > \pi^A_{ao}(X_3)$. Extend our previous reasoning: a decrease in u_2 (resp. u_1) raises the non-merging firm o (resp. b)'s profit in market A but to the detriment of merging firms a and b (resp. a and o)' joint - profit. The overall effect on industry profit is not clear. Thus, for a prohibitive fixed cost, the relationship between industry profits and transaction costs is non monotonic (See Annexe B). In a Cournot setting, if products are

[25]The result is similar for X_3 = (E, M, M).

homogeneous enough ($\alpha > 0.7$) or if a higher product differentiation is associated with a low initial level of transaction costs ($\alpha < 0.7$ and $u_2 < \underline{u_2^c}$), a drop in external transaction costs u_2 prompts insiders to merge (inversely for $\alpha < 0.7$ and $u_2 < \underline{u_2^c}$). Under Bertrand competition, for low transaction costs $u_2 < \underline{u_2^b}$ ($\alpha \in [0, 1]$), a fall in u_2 encourages insiders to merge (inversely for $u_2 < \underline{u_2^b}$). Furthermore, $\underline{u_2^b} < \underline{u_2^c}$. The inverse relations are found for internal transaction costs u_1 (with $\underline{u_1} = \underline{u_2}$).

We can refer to graphical illustrations. For $\alpha = 0.1$ (high degree of differentiation), we observe an insider – outsider merger under both modes of competition (figures 2a and 2b). These merging firms benefit from high efficiency gains without harming the non-merging insider. This firm has few incentives to prevent this operation. In the opposite, for a low ($\alpha = 0.9$) and medium product differentiation ($\alpha = 0.5$), too strong efficiency gains encourage the non-merging firm to outbid to merge with the other insider – firm. Thus, if an insider insider M&A emerges at equilibrium for high internal and external transaction costs, their gradual removal results in an outsider – insider M&A (figures 3a, 3b and 4b).

A2. No fixed cost

Consider F = 0: firms set up a production unit abroad if they do not merge. Firms trade off between a G.I. and a cross-border M&A.

A21. Location choices of Greenfield Investments

Three distinct cases are distinguished:

1. The firms a and b have merged previously. In this case, o builds a factory in the country B.

2. An insider - outsider merger has taken place. We set[26] X_1 = (M, GA, M) and X_2 = (M, GO, M). $\pi_b(X_2) - \pi_b(X_1) = \pi_b^A(X_2) - \pi_b^O(X_1)$. The non-merging insider evaluates her opportunity cost not to build somewhere else. She compares her profit in the extra-regional market when she builds a plant in the neighbouring intra-regional market to her profit in the intra-regional market when she sets up a factory in the extra-regional market. Since the export profit depends negatively on transaction costs, it is easily checked that $\pi_b^A(X_2) \geq \pi_b^O(X_1)$ holds under a Cournot and Bertrand competition ($u_2 \geq u_1$). Thus, when an insider-outsider merger occurs, the non-merging insider firm locates outside the regional market: the reduction in

[26]The result is similar for the location of the firm a with X_1 = (GB, M, M) and X_2 = (GO, M, M).

transaction cost is more important when investing in the extra-regional market. The insider has no incentive to locate her plant within the regional area if there is no difference in production costs (cheaper inputs) or demand (greater market size) between regional and extra-regional markets.

3. There has been no merger. 18 market structures exist when we combine all firms location strategies. In fact, some market equilibria are ruled out as equilibrium. First, some choices are incompatibles because the countries A and B have a symmetric position[27]. Second, some market structures are never an equilibrium[28] for $u_2 \in [u_1, \overline{u_2}]$ and $u_1 \in [0, \overline{u_1}]$. It is then easy but tedious to show that (GO, GO, GB) and (GO, GA, GB) are the only equilibrium. While the insider b always locates in the extra-regional market when a and c merge, here the market structure equilibrium depends on the insider bs trade-off (equal to $T_1 = \pi_b(GO, GO, GB) - \pi_b(GO, GA, GB)$) between an investment within (in A) or outside the regional market[29] (in O).

$T_1 = T_2 + T_3$ with $T_2 = \pi_b^A(GO, GO, GB) - \pi_b^O(GO, GA, GB)$ and $T_3 = \pi_b^O(GO, GO, GB) - \pi_b^A(GO, GA, GB)$. T_2 and T_3 are interpreted respectively as a gain in terms of transactions costs and as anti-competitive effects. Examine T_2. An increase in u_1 (resp. u_2) lowers firm bs profits in market A (resp. O) when investing in O (resp. A). Since export profits depend negatively on transaction costs, $\pi_b^A(GO, GO, GB) \geq \pi_b^O(GO, GA, GB)$ is verified ($u_2 \geq u_1$) and then $T_2 \geq 0$. Now, analyse T_3. A change in u_2 does not modify her profit in country O when investing in O (her competitors are also established locally). On the other hand, an increase in u_1 improves her profit in market A when locating in A. Indeed, the outsider is only established in market O and B. With higher u_1, she incurs higher costs in A: $\pi_b^O(GO, GO, GB) \leq \pi_b^A(GO, GA, GB) \Leftrightarrow T_3 \leq 0$ because $u_1 \geq 0$. Moreover, a lower product differentiation strengthens these anti-competition effects ($T_3 = 0$ for $\alpha = 0$ and $\frac{\partial T_3}{\partial \alpha} \leq 0$). These effect are also stronger under Bertrand competition than Cournot one (higher $\left|\frac{\partial T_3}{\partial \alpha}\right|$). Firms selling close substitutes are more urged to differentiate their locations in order to relax price competition.

[27]For instance, (E, GA, E) cannot be a Nash equilibrium. When the firm a sets up a plant in B, b finds advantages to build a plant in A too.

[28]For instance, (E, GO, E) is not an equilibrium. If b builds a plant in O (fall in transaction costs in O), o has also incentives to locate abroad in A (fall in transaction costs both in A and B).

[29]a will never find optimal to locate within the regional market. In locating in country B, transaction costs savings are less substantial. Competition may also be tougher (greater number of locally-established firm).

To sum up, the search of transaction costs reduction leads this insider to locate in the extra-regional market whereas anti-competitive effects drive it to build a plant in the intra-regional market. Decreasing external transaction costs discourages it from locating in O rather in A (transaction cost savings motive). Decreasing internal transaction costs has the opposite outcome (transaction cost savings and anti-competitive effects motive).

A22. Cross-border Mergers and Acquisitions: profitability and geographic scope

With no plant-level fixed costs, merger participants build a new plant abroad if the M&A agreement fails. The presence of an alternative FDI mode lowers the M&A profitability since the M&A participants' gross profit is higher in G.I. case (lower variable costs) than in the export one. For instance, take a low value of u_1 and u_2. (GO, GO, GB) is the only equilibrium with no M&A. Compare it to a M&A between b and o. Merging does not enable participants to get stronger efficiency gains. In both G.I. and M&A cases, b and o sell in B and O with no transaction costs and in A for a unit cost u_1. In addition, the non-merging participant locates abroad when two firms merge, which shelters him from transaction costs to the detriment of the merging firms' competitiveness. For example, when a and b merge, o sets up a plant in B. It removes all anti-competitive effects of external transaction costs in A and B.

Because of these two combining effects, a M&A could be non profitable even under Bertrand competition, which contrasts to traditional results in a closed economy. Graphically, for $\alpha = \{0.1, 0.5\}$ (figure 5a, 5b, 6a and 6b), firms only merge for low internal and external transaction costs not only under Cournot, but also under Bertrand competition. For lower product differentiation ($\alpha = 0.9$), we come to more traditional outcomes (figure 7a and 7b). With Bertrand competition, a M&A is more profitable than a G.I. The opportunity cost associated to a G.I. accentuates the decrease in joint-profits when firms behave à la Cournot.

The geographic scope of M&A (depending on industry profits) is also modified with F = 0. D_2 is written $[\pi_{ab}(M, M, GB) + \pi_o(M, M, GB)] - [\pi_{ao}(M, GO, M) + \pi_b(M, GO, M)]$. $D_2 = D_{11}$, which refers to the link between the merger participants' efficiency and industrial profits. Anti-competition effects from trade costs disappear (see section III A12).

Figure 5a, b. High product differentiation

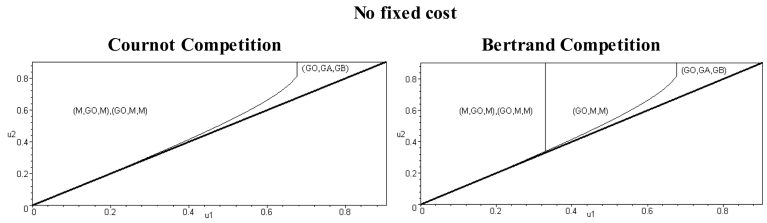


Figure 6a, b. Medium product differentiation

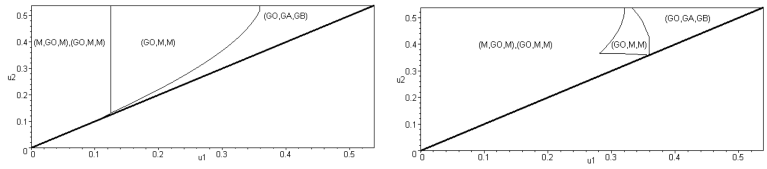
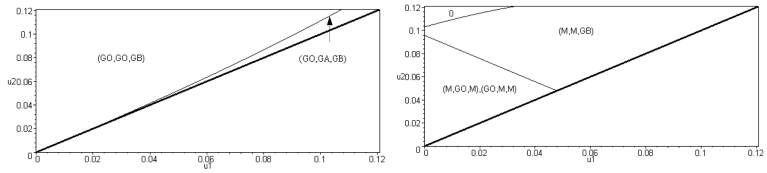


Figure 7a, b. Low product differentiation



In a Cournot setting, if products are homogeneous enough ($\alpha > 0.5$) or if a higher product differentiation is associated with a low initial level of transaction costs ($\alpha < 0.5$ and $u_2 < \frac{2-\alpha^2}{\alpha^2+2\alpha+2}$), decreasing external transaction costs incites insiders to merge. Under Bertrand competition, for low transaction costs, ($u_2 < \frac{(\alpha-1)(4\alpha^3+\alpha^2-4\alpha-2)}{2\alpha^4-3\alpha^3-\alpha^2+4\alpha+2}$), decreasing external transaction costs motivates insiders to merge. All these observations apply to any change in internal transactions costs.

We observe graphically in Cournot competition an outsider insider M&A (figure 5a and 6a). Such a pattern occurs in Bertrand competition (figure 5b and 6b) only for a high product differentiation ($\alpha = 0.1$). For $\alpha = 0.9$, an insider insider M&A takes place for high external and internal transaction cost values (figure 7b).

B. Plant-level fixed costs and market equilibrium in a standard model

To this point, we have investigated polar cases. In order to compare our model with previous analyses on FDI and economic integration, we examine the effect of intermediate plant-level fixed costs in a standard model of economic integration

with Cournot competition and homogenous goods[30].

B1. Plant-level fixed costs and location choices of Greenfield Investments

The market structure equilibrium varies with transport costs and plant-level fixed costs. For given trade costs, a firm sets up a plant abroad only for a specific range of fixed costs:

a. A Merger has occurred in the first stage. F_a (resp. F_b) is defined as the level of fixed costs[31] above which the non-participant outsider (insider) prefers to export. If $F > F_a$, no non-participant firm undertakes a G.I. If $F_a > F > F_b$, then the non-participant outsider locates in B in the case of an insider-insider merger. When the outsider and one insider merge, the non-participant insider does not build a plant abroad. Lastly, for $F_b > F$, any non-participant firm builds a factory overseas when a merger takes place.

b. No merger has occurred in the first stage. For prohibitive fixed costs, (E, E, E) is the only equilibrium. It is not anymore sustainable[32] for $F < F_1$ with $F_1 = \pi_O(E, E, GB) - \pi_O(E, E, E)$. With no fixed costs, (GO, GO, GB) and (GO, GA, GB) are the only equilibrium. They are again not sustainable for $F > F_2$ and $F > F_3$ where[33] and $F_2 = \pi_O(GO, GO, GB) - \pi_O(GO, E, GB)$.

B2. Plant-level fixed costs and Mergers and Acquisitions

A fall in plant-level fixed costs affects the M&A profitability. Below some threshold of plant-level fixed costs, merger participants build a new plant abroad in the absence of a M&A deal, which harms the M&A profitability (see section III A22). In addition, a decrease in *F* lowers it for two further reasons: a fall in F

[30] Trade costs are enlarged to $\overline{u_2} = \overline{u_1} = \frac{2-\alpha}{\alpha+2} = \frac{1}{3}$ (we do not compare anymore with Bertrand competition).

[31] $F_a = \frac{4u_1(u_1-1)}{9} + \frac{8u_2(1-u_2)}{9}$; $F_b = \frac{4u_2(1-u_2)}{9}$ $where\ F_a - F_b = \frac{4u_1(u_1-u_2)(u_1-1+u_2)}{9} \geq 0.$

[32] $F_1 = \frac{3u_1(u_1-2)}{16} + \frac{3u_2(2-3u_2)}{8} + \frac{3u_2u_1}{4}$

[33] $F_2 = \frac{3u_2(3u_2-2)}{16}$; $F_3 = \frac{3u_1(3u_1-2)}{16}$

increases the gross profit of M&A participants if they set up a new plant; it also incites the non-participant firm to locate abroad (removal of anti-competitive effects from trade barriers).

The geographic scope of M&A is influenced by the level of fixed costs too. However, the overall effect of a decreasing F is ambiguous, furthermore as these effects are discontinued. On the one hand, all things being equal, it improves industry profits if the non-merging firm sets up a plant abroad. On the other hand, the non-merging firm by locating abroad protects herself from transaction costs in some markets to the detriment of M&A participants. The variation in gross industry profit is therefore uncertain. Three different cases are distinguished according to whether $F > F_a$, $F_a > F > F_b$ or $F_a > F$. Note that for $F_a > F > F_b$, (M, M, GB) is found to be not an equilibrium.

B3. Market structure equilibrium and intermediate fixed costs

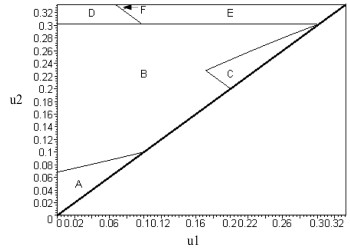
In comparison with prior sections of this paper, all the mechanisms based on transaction costs savings and pro-competitive effects from trade integration remain valid. But, contrary to prohibited plant-level fixed costs, for a high[34] (but not too strong) value of fixed cost (see figure 8a), a G.I. (from the non-merging firm) and an (insider-insider or insider-outsider) M&A may simultaneously take place. Nevertheless, M&A are also not profitable when markets are almost perfectly integrated. For a medium value of fixed costs (figure 8b), G.I may replace cross-border M&A. Then, again, insider firms tend to locate their G.I. outside the regional area. Finally, comparing to the case of zero fixed costs, with low fixed costs (figure 8c), a G.I. is not always the most profitable means of servicing foreign markets: all firms export for a very high level of economic integration. But when investing abroad, the insiders locate outside the regional area (even if they have fewer incentives to invest abroad than the outsider). Besides, an insider-outsider M&A may occur for a medium level of trade costs.

Now, with respect to other studies on FDI and economic integration (e.g. Norman and Motta, 1996), economic integration is also likely to have an asymmetric effect on firms based within or outside the regional area. Similarly, a fall in internal tariff barriers and a rise in external tariff barriers (creating a

[34]The intermediary fixed costs $F_{int}^{a} = 0.03125$ (low fixed costs), $F_{int}^{b} = 0.0625$ (medium fixed costs) and $F_{int}^{c} = 0.09375$ (high fixed costs) correspond to the quartiles of the range [0, 0.125] where 0 and 0.125 refer respectively the minimum value of both F_2 and F_3 and to the maximum value of F_1.

Figure 8a. High plant-level fixed costs **Figure 8b.** Medium plant-level fixed costs

Cournot competition with homogeneous goods



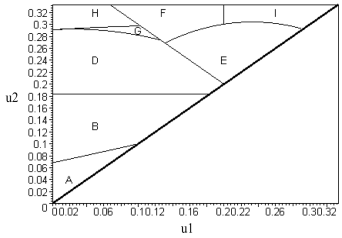
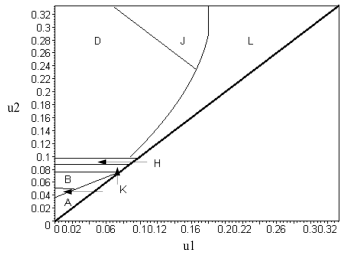


Figure 8c. Low plant-level fixed costs



A : (E, E, E)
B : (M, E, M), (E, M, M)
C : (M, M, E)
D : (M, GO, M), (GO, M, M)
E : (M, M, GB)
F : (GO, E, GB), (E, GO, GB)
G : (M, GO, M), (GO, M, M), (GO, E, GB)
H : (M, GO, M), (GO, M, M), (GO, E, GB), (E, GO, GB)
I : (M, M, GB), (E, GO, GB)
J : (GO, GO, GB)
K : (E, E, GB)
L : No equilibrium

"regional fortress") are not equivalent in term of composition and orientation of FDI flows. In addition, even if trade policies towards the outsider country remain unchanged (constant u_2), a regional agreement (lower u_1) affects outward and inward regional FDI.

However, our model displays some noticeable differences. First, with high and medium plant-level fixed costs, FDI very often take the form of cross-border M&A (except for a high level of external costs). For low plant-level fixed costs, a G.I. becomes a more optimal entry mode. Nevertheless, in all these cases, firms prefer only exporting to foreign markets when trade costs are very low: M&A without efficiency gains are not profitable. Similarly, firms do not build a factory overseas. Trade cost savings do not compensate for the fixed cost incurred. Second, FDI flows (M&A and/or G.I.) from insiders usually locate outside the trade area when there is no difference in production costs or demand between regional and extra-regional markets. Intra-regional FDI flows take exclusively the form of M&A. Another feature is that location and entry mode choices interact strongly. The location of FDI may not be identical[35] when firms merge or establish a new plant

[35]For instance, for a medium fixed cost and high internal and external trade costs, in the absence of M&A, (M, M, GB) is replaced by (GO, GA, GB) or (E, GO, GB).

abroad (and reciprocally).

IV. Conclusion

The goal of our model is to explore and identify some theoretical linkages between economic integration and horizontal FDI when we incorporate cross-border M&A strategies. We characterize economic integration by both external and internal regional transaction costs in a three-country setting. We also allow insider firms to invest outside the regional area. FDI within and outside the region are substitutes. We get results in a broad framework of differentiated Cournot and Bertrand oligopoly.

It is found that economic integration modifies both FDI modes and its location. It has two main impacts on FDI. First, it decreases transaction costs savings stemming from tariff-jumping and/or export platform motives. Second, it intensifies competition between firms by opening more widely domestic markets. It has a pro-competitive effect on price – quantity market equilibrium. These two effects depend on the product differentiation, the competitive mode of market interaction and set-up fixed costs. When product differentiation is high, the market structure pattern is almost similar under Cournot and Bertrand competition. An insider – outsider M&A happens, except for low set-up fixed costs and high external – internal transaction costs. Then, firms undertake G.I. Insiders spread over new plants locations both inside and outside the regional area. In the opposite, when products are quasi-homogeneous, economic integration influences very differently market structure and location pattern according to the competitive mode of market interaction. In Bertrand competition, M&A remain the most profitable way of internationalization. While insiders merge for high internal and external transaction costs, an insider – outsider M&A emerges with the gradual removal of internal and external transaction costs. Under Cournot competition, mergers are often unprofitable. Firms may prefer to export or to undertake a G.I. For low fixed costs, insiders concentrate in most cases their G.I. outside the regional area. However, for high set-up fixed costs and high external - internal transaction cost values, insiders are willing to merge.

In comparison to other studies on FDI and economic integration, our model confirms the role of cross-border M&A as well as FDI outflows from the regional area in a standard model framework of economic integration (Cournot competition and homogeneous goods). FDI takes very often the form of cross-border M&A

(mainly between insider and outsider). In addition, not only FDI (M&A and/or G.I.) inflows within the regional area are stimulated, but also FDI (M&A and/or G.I.) outflows from the regional area (as substitute for intra-regional FDI flows) may be observed. These two new dimensions are important because the mode and the orientation of FDI affect clearly the welfare of home and host countries.

Appendix A

We denote X_1 = (E, E, E) and X_2= (M, M, E). We set $u_1 = 0$. The product differentiation is symmetric so that $q_a^J(X) = q_b^J(X)$ and $p_a^J(X) = p_b^J(X)$.

Under Cournot competition, for $\alpha \in [0, 1[$, $\left|\frac{\partial q_a^A(X_2)}{\partial q_o^A(X_2)}\right| - \left|\frac{\partial q_a^A(X_1)}{\partial q_o^A(X_1)}\right| = -\frac{\alpha^2}{2(\alpha+1)(\alpha+2)} \leq 0.$

$\left|\frac{dq_a^A(X_2)}{dq_o^A(X_2)}\right| - \left|\frac{dq_a^A(X_1)}{dq_o^A(X_1)}\right| = -\frac{\alpha}{2}\frac{dq_a^A}{dq_o^A}$ where $-\frac{\alpha}{2}dq_b^A$ represents the externality of the good b on the good a. Under Bertrand competition, $\left|\frac{\partial p_a^A(X_2)}{\partial p_o^A(X_2)}\right| - \left|\frac{\partial p_a^A(X_1)}{\partial p_o^A(X_1)}\right| = \frac{\alpha^2}{2(\alpha+2)} \geq 0$ for $\alpha \in [0, 1]$. $\left|\frac{dp_a^A(X_2)}{dp_o^A(X_2)}\right| - \left|\frac{dp_a^A(X_1)}{dp_o^A(X_1)}\right| = \frac{\alpha}{2(\alpha+2)}\frac{dp_a^A}{dp_o^A} \geq 0$ for $\alpha \in [0, 1[$. $\frac{\alpha}{2(\alpha+1)}$

dp_b^A is the externality of the product b on the product a.

When u_2 goes up, q_o^A decreases, which leads to an increase in q_b^A. With a larger q_b^A, the externalities of a on b are stronger. Indeed, a rise in q_a^A decreases p_b^A on a larger volume of good b. Hence, merger participants have fewer incentives to expand q_a^A. The same reasoning prevails for the product b. In price competition, an increase in u_2 pushes upwards p_o^A and then p_b^A. It means stronger externalities of a on b since an increase in p_a^A widens q_b^A for a higher mark-up level of good b. Thus, merger participants are encouraged to fix a higher price p_a^A.

Similarly in market O, under Cournot competition,

$$\left|\frac{\partial q_a^O(X_2)}{\partial u_2}\right| - \left|\frac{\partial q_a^O(X_1)}{\partial u_2}\right| = -\frac{\alpha}{2(\alpha+1)(\alpha+2)} \leq 0.$$

Under price competition, $\left|\frac{\partial p_a^O(X_2)}{\partial u_2}\right| - \left|\frac{\partial p_a^O(X_1)}{\partial u_2}\right| = -\frac{\alpha}{2(\alpha+2)} \leq 0.$

Appendix B

In this appendix, the non monotonic relation between D_1 and u_2 under Cournot competition is demonstrated (the effect of u_1 is inversed since $\frac{\partial D_1}{\partial u_1} = -\frac{\partial D_1}{\partial u_2}$).

$$\frac{\partial D_1}{\partial u_1} = \frac{(\alpha^3+5\alpha^2+8\alpha+6)u_2 - \alpha^3+3\alpha^3-6}{(\alpha^2-2\alpha-2)^2}; \frac{\partial D_1}{\partial u_2} = 0$$

$$\Leftrightarrow \underline{u_2^c} = \frac{\alpha^3-3\alpha^3+6}{(\alpha+3)(\alpha^2+2\alpha+2)} > 0,$$

$\alpha \in [0, 1]$. We have assumed that $u_2 \leq \overline{u_2} = \frac{3\alpha^2-\alpha-2}{\alpha^2-3\alpha-2}$. $\underline{u_2^c} - \overline{u_2} > 0$ if $\alpha > 0.7$. Then, $\underline{u_2^c} - \overline{u_2} \leq 0$ if $\alpha < 0.7$. So, if $\alpha > 0.7$, $\frac{\partial D_1}{\partial u_2} < 0$, $\forall u_2$. If $\alpha < 0.7$, $\frac{\partial D_1}{\partial u_2} < 0$ only if $u_2 < \underline{u_2^c}$. The same reasoning prevails for Bertrand competition with

$$\underline{u_2^b} = \frac{(\alpha-1)^2(2\alpha^3+15\alpha^2+18\alpha+6)}{(\alpha+3)(2\alpha^4-3\alpha^3-\alpha^2+4\alpha+2)} (\underline{u_2^b} < \underline{u_2^c}).$$

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